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Salivary Biomarkers in Periodontal Diseases: A Review

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science, Dentistry College,
Tikrit University, Tikrit,
Iraq.**Abstract**

Saliva represents an important biological material for diagnosis of oral problems. Salivary biomarkers like enzymes, proteins, or oxidative stress are used for early screening of oral diseases and evaluating of disease activity, and also measure the efficacy of therapy, therefore; it is used for determination of periodontal disease activity and prognosis. Salivary biomarkers are potentially important for determining the presence, risk, and progression of periodontal disease, therefore; it is not only reflecting the current status of periodontal diseases but may predict their progression and response to treatment. The prevalence of periodontitis is about 5–15% worldwide. There are some factors that may increase the incidence of periodontitis like smoking, obesity, diabetes, and heart diseases. Method of assessing and monitoring periodontal disease must be quick, easy and reliable and should provide important diagnostic information that improves and speeds treatment decisions.

Introduction:

Saliva is a hypotonic fluid, comprising 98% water plus electrolytes (sodium, potassium, calcium, bicarbonate), mucus, white blood cells, epithelial cells (from which DNA can be extracted), enzymes (such as amylase and lipase), antimicrobial agents such as secretory IgA, and lysozymes (1). Saliva contains about 5000 types of proteins, and it is the clear choice versus blood for hormone testing such as estrogen, testosterone, or cortisol. Saliva may be examined by immunoassays, colorimetric and quantitative mass spectrometric methods (1-4). Periodontal

disease is a chronic inflammatory disease or more likely a number of diseases of the periodontal tissues induced by pathogenic bacteria that results in connective tissue and alveolar bone destruction. In the past several decades, various salivary markers (bacteria, host enzymes, cytokines, and bone metabolic products) have been investigated as targets to differentiate between periodontitis patients and healthy subjects. It affect about 5%-30% of adult population and it is the second most common oral disease next to dental caries(3,4).Periodontal disease is one of

the most common diseases in America, affecting nearly 65 million adults over age 30. There are two types of periodontal disease – gingivitis and periodontitis. Each refers to an accumulation of bacteria along the gum line though one is more severe than the other (5-8).

Types of Periodontal Diseases

There are two types of periodontal disease – gingivitis and periodontitis. Each refers to an accumulation of bacteria along the gum line though one is more severe than the other.

Gingivitis: Gingivitis is the mildest, least invasive form and most common form of periodontitis. This condition is caused by the toxins in plaque and can escalate to more severe forms of periodontal disease.

Periodontitis: the most serious form of a periodontal disease; causes the gums to recede and pull away from the teeth. It is divided to four stages:

- **Periodontitis Stage 1:** Initial.
- **Periodontitis Stage 2:** Moderate.
- **Periodontitis Stage 3:** Severe with potential for tooth loss.
- **Periodontitis Stage 4:** Severe with potential for loss of all the teeth (3,9).

Prevention and Treatment

Proper brushing and flossing techniques can help prevent the accumulation of tartar, which harbor harmful bacteria along the gum line. According to the American Academy of Periodontology, certain lifestyle habits and systemic conditions like smoking and diabetes can also contribute to the development of periodontal disease. Talk to your periodontist or dentist about the changes you can make to reduce your chances of developing gingivitis or periodontitis. Your treatment experience will vary according to the stage of your disease. If gingivitis is the problem, you'll need a thorough professional cleaning and a

topical antibiotic. On the other hand, a treatment for periodontitis may require surgery, as well as bone or tissue grafting. Talk with your periodontist about the treatment options best for you (10-13). Your post-treatment care guidelines will vary according to the type of treatment you have and may include an at-home antibiotic and special instructions for keeping the treatment site clean in the days following your procedure. You will be advised to maintain your treatment results by attending periodic dental cleanings and exams in the future – perhaps more frequently than the standard twice-yearly recommendation. You'll also be encouraged to begin flossing and using a mouth rinse daily once you have recovered from your periodontal treatment (14).

Salivary Biomarkers

The advantages of saliva collection and usage are:

- *Painless during collection.*
- *Readily accessible.*
- *More attractive for patients.*
- *Cheap and don't require dental staff.*
- *Not clotted (10).*

The most important salivary biomarkers include:

- *Immunoglobulins (Ig) which are specific biomarkers and specific defense factors.*
- *Salivary enzymes.*
- *Salivary ions.*
- *Growth factors.*
- *Epithelial keratins.*
- *Hormones.*
- *Inflammatory cells.*

These biomarkers can provide the necessary biological information for a broad range of medical conditions such as cancer, stress, systemic disorders, and neurodegenerative and infectious diseases. Several salivary proteins, including interleukin-8 (IL-8), myeloperoxidase (MPO), Matrix metalloproteinases (MMPs), amylase, albumin, and immunoglobulins have been suggested as diagnostic biomarkers of periodontitis; however, their clinical use has been

challenged by the multifactorial characteristics of the disease. Moreover, salivary levels of some biomarkers are genetically regulated (15-17). Other enzymes like alanine aminotransferase (ALT), aspartate aminotransferase (AST), gamma-glutamyl transferase (GGT), lactate dehydrogenase (LDH) and creatine kinase (CK) may give information about the severity of periodontitis (13). During inflammation, AST tissue level rises; it gets into the blood plasma and also by diffusion through salivary glands into saliva. During periodontal inflammation, it also passes into sulcular fluid and then into saliva (18).

Tissue degradation molecules such as pyridinoline cross-linked carboxyterminal telopeptide of type I collagen (ICTP) that are specific to bone resorption are released into the gingival crevicular fluid (GCF) and can be used as biomarkers for periodontal disease and the previously mentioned cytokines and enzymes. Salivary calcium and phosphorus levels also give important indication about the diagnosis and severity of periodontal

disease due to these elements are important components of teeth (19).

Salivary Biomarkers applications:

- 1- Early detect periodontal stages.
- 2- Give ideas about genetic and molecular alterations.
- 3- They facilitate diagnosis, prognosis, and treatment of periodontal diseases (14).

Conclusions:

The clinician working on periodontal disease should focus on finding of salivary biomarkers for diagnosis, treatment and prognosis, due to these biomarkers will reduce the time, reduce the cost, and also give more information adding to clinical and radiographic diagnosis and finally will help to reduce patient morbidity and mortality.

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