Abstract

Diabetes and Periodontal diseases are the most prevalent metabolic disorders around the globe. The high blood glucose in Diabetes Mellitus impairs the functioning of the major systems of the body like cardiovascular system and increases the body’s susceptibility to infections. Periodontal diseases are caused by bacterial infection of oral cavity and affect the periodontium (alveolar bone, periodontal ligament) which comprises the supporting structure of the tooth. The exact mechanism by which Diabetes and Periodontal disease negatively impact each other is not clearly understood but it may be attributed to altered immune response affecting activity of the Neutrophils, Macrophages, and Monocytes. Hence this review focuses on how essential it is for the medical and dental practitioner to work hand in hand to keep both of these disorders at bay.

Key words – Diabetes, Immune Response, Infection, Periodontal Disease.

Introduction

Diabetes is a widespread global metabolic disorder. It is considered to be a worldwide epidemic affecting more than 347 million people according to WHO statistics. Diabetes is characterized by hyperglycaemia (high blood glucose level) because the body is unable to produce insulin. Type 1 or juvenile-onset diabetes generally affects young children due to an abnormality in the beta cells of pancreas; or the body is unable to utilize the insulin effectively (type 2) affecting adults or it could be a combination of both. Type 1 diabetes is congenital but type 2 diabetes also called non-insulin dependent diabetes where the body develops insulin resistance largely caused by lifestyle factors contributing to obesity, high blood pressure and cholesterol. Having excessive visceral fat called central obesity or abdominal obesity and pre-diabetes increases the risk factor. Owing to this glucose levels keeps increasing in the body but they body cells are unable to use it for metabolic purposes leading to a damaging effect on the entire cardiovascular system, visceral organs and can progressively cause diabetic coma, a life threatening complication. One of the main characteristic of diabetes is increased susceptibility to infections as high blood glucose affects major organs leading to an increase in bacterial and other pathogenic invasion. It also causes a weakened response by the immune system of the body. The oral cavity including the gums is one of the common sites of infections in diabetic individuals.

Periodontal diseases are some of the most common gum diseases known to mankind. They have a complex classification and takes into account age at diagnosis, clinical presentation and other factors. Periodontal diseases include gingivitis (in which inflammation is limited to the region of the gingiva, it can be reversed with good oral hygiene) and periodontitis (in which there is extension of the inflammation resulting in resorption of alveolar bone and destruction of the tissue). Periodontal disease is characterized by the destruction of the collagen fibres present in the periodontal ligament supporting the tooth leading to a periodontal pocket formation between gingiva and the tooth. These diseases are a slowly progressing variety but tissue destruction caused by them is largely irreversible. The condition does not show symptoms at an early stage and this is a cause for the general unawareness of the patient, awareness comes on the worsening of the condition leading to tooth mobility. The pockets deepen as fibres of the periodontal ligament are progressively destroyed. The bacteria are generally considered responsible for plaque formation on tooth surface, if oral hygiene is not proper (like brushing, flossing) it may lead to gingivitis which precedes periodontitis, gradually the toxins secreted by bacteria and inflammatory response of body may cause resorption of supporting structures of tooth. If condition remains untreated all the supporting tissues of the tooth gradually undergo destruction causing fragility of tooth and leaving extraction as the only option.

In Periodontal disease, initially bacteria form a plaque which further forms tartar and on further progression if left unchecked leads to periodontal pocket formation and reduction in the bone level. (figure 1)
the risk factors for periodontal diseases include diabetes, conditions characterized by a decreased immune (like-HIV), nutritional defects, osteoporosis, medications that cause drug induced gingival overgrowth (e.g.-some calcium channel blockers-phenytoin, cyclosporine),genetic factors (as yet poorly defined) and local factors(anatomical deficiencies in alveolar bone).³

**Links between Diabetes and Periodontal diseases**

Research and investigative studies have shown how diabetic individuals face an increased risk of developing periodontal problems compared to non-diabetic individuals and the reverse is also true how patients suffering from periodontal diseases have an adverse effect on the glycaemic control of the body.

History has shown how diabetes is associated with periodontal diseases. One of these compares the outcome of studies of Pima Indians residing in Arizona who may have the world’s highest prevalence of type II diabetes and in whom type I diabetes is virtually non-existent with a group of Danish men aged 20 to 40 years having type 1 diabetes. The prevalence of advanced periodontal disease was substantially higher in both type 1 and type 2 diabetics than in non-diabetics. In Pima Indian population, the onset of bone and attachment loss in those with diabetes were early and rate of progression was almost 3 times then in non-diabetics.⁴⁵

In a more recently conducted large study of 350 children aged 6-18 years old (of whom 325 had T1DM) and 250 non-diabetic controls, the assessed subjects suffering from diabetes had more attachment loss and high gingival inflammation compared to the controls.⁶

The impact of periodontitis on changes in HbA1c was assessed in a prospective 5 year study of 2973 non diabetic individuals those participants with most advanced periodontitis at baseline demonstrated an approximately fivefold greater absolute increase in HbA1c over the 5 years of the study compared with those with no periodontitis at baseline (change in HbA1c 0.106+0.03% vs 0.023+0.02%).⁷ One of the first studies proving how progression of diabetes was affected by periodontitis among individuals who were non diabetic and may also provide us an insight as to how change in the HbA1c levels could lead to increased incidence of diabetes in 10 years.

**A brief insight into the Pathophysiology of the Relation**

The exact mechanism by which a metabolic disorder like diabetes leads to periodontal destruction is not fully apprehended. Initial research in this field linked the mechanism to a possible difference in the microbial flora of the sub-gingival region of diabetic and non-diabetic individuals because periodontal diseases were considered to be contagious ones but more recent studies have linked the mechanism to possible differences in inflammatory response. The cells like neutrophils, macrophages and monocyes have an essential role immunologically; diabetes impairs the functioning of these cells and hence they are unable to destroy the bacteria that accumulate in periodontal pocket hence increase the incidence of gum diseases. In diabetic patients there will be changes in the collagen synthesis and maturation, advanced glycation end products (AGEs) are proposed to form on collagen this leads to a more stable form of collagen which occludes blood flow in vessels and since blood supply to oral cavity is reduced it enhances infection.⁸⁹¹⁰

Hyperglycaemia even leads to higher level of glucose in saliva and oral fluids hindering activity of fibroblasts which have a very critical role in wound healing.

Diabetes and periodontitis both share mutual relation, affecting the immune system and inflammatory response of the body thus negatively impacting each other.¹¹ (figure2)

![Diagram](https://via.placeholder.com/150)

**Figure 2:- Correlation between Diabetes and Periodontitis**

**Clinical importance of the Relation**

Diabetes mellitus and periodontal diseases have been an extensive topic of research down the ages. Epidemiological studies have shown how diabetes has increased risk and extent of periodontal diseases, however diabetic patients who have their HbA1c levels well under control ¹² the risk for periodontitis has decreased consequently; an improper glycaemic control again has led to an enhancement in the risk level. Patients with diabetes have been increasingly presenting themselves to a dentist with periodontal abscesses. The patients suffering from hyperglycaemia may have a fruity breath in addition these patients also tend to develop xerostomia and increase in risk of caries and mouth ulcers.¹³

On the other hand periodontal therapy and treatment have had an impact on diabetics by enhancing their glycaemic control. Any Periodontal treatment which decreases the periodontal inflammation may play a positive role in restoring insulin sensitivity thereby improving glycaemic control.¹⁴

A total of 371 patients were included in a research were actual change in A1C (ΔA1C) was taken as the result and periodontitis as a predictor. The duration of this experiment was 3–9 months. All studies led to a conclusion of a research population of type 2 diabetic patients in whom glycemic control was positively affected hence improved
after periodontal therapy compared with the group who were kept as a control (range ΔA1C: Δ−1.17 up to Δ−0.05%). The studies in a meta-analysis demonstrated a weighted mean difference of ΔA1C before and after therapy of −0.40% (95% CI −0.77 to −0.04%, P = 0.03) favouring periodontal intervention in type 2 diabetic patients. This has proved how periodontal treatment have positively impacted control of diabetes and can significantly reduce the menace of encountering it.

**Recommendations for patients**

Firstly there should be careful examination of oral cavity of children and adults suffering from diabetes or having a poorly controlled diabetic condition to possibly diagnose the development of any periodontal problems before the situation turns grave. Secondly patients suffering from should be advised to undergo periodontal therapy to improve the glycaemic control of his body as these diseases share a bidirectional relationship. Thirdly medical and dental clinicians could collaborate closely for increasing awareness and preventing the worsening of these two diseases.

**Conclusion**

In 2007 WHO executive board acknowledged the intrinsic link between oral health general health and quality of life. A Lancet editorial had stated ‘oral health is a neglected area of global health’ hence awareness and promotion of a proper oral health has been a part of the Government’s health policies and that of practitioners.

A proper maintenance of oral health is essential for general wellbeing. Majority of the population of the world overlook and disregard their oral health. In this review there has been a special emphasis on the negative effect of periodontal diseases and diabetes mellitus on each other hence it is obligatory for an individual to attend to his oral health. Keeping in mind the high frequency of these metabolic disorders it becomes essential for the medical and dental practitioner to work in coordination in its treatment and prevention. Medical specialists should advice and encourage diabetic patients to visit their dentists to control any factors which may manifest itself in form of periodontal diseases, such as control of sustained bacterial presence in periodontal pocket. The dentist should give such a periodontal treatment that it keeps bacterial growth in sub-gingival tissue under check and also instruct patients to maintain a proper oral hygiene. The dental practitioner should also keep in mind that impairment in the metabolism of sugar, diabetes can influence the deterioration of periodontal diseases.

**References**


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