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Impact of Non-Surgical Periodontal Therapy on Diabetics and Hypertensive Patients- A Novel Review

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Abstract:- Background of the study: **Dental plaque and associated pathogenic microorganisms are often considered as the primary etiological agents of gingival and periodontal diseases. Besides microorganism and plaque, numerous studies have shown periodontitis as a disease of multi-factorial origin involving several associated local factors such as age, gender, oral habits, malocclusion and systemic risk factors like diabetes and cardiovascular diseases. Successful periodontal management in patients with these associated systemic factors depends on the host tissue response and underlying disease mechanism.** ***Aim:*** **The present literature review was carried out to apprehend and explore the various clinical aspects associated with diabetic and hypertensive patients following periodontal therapy.** ***Materials and methods*****: A structured literature search for articles written in the English language in PubMed, MEDLINE, Embase, Google Scholar and Web of Science databases from 2000 to till date was retrieved by using MeSH terms "periodontal therapy", "diabetes and periodontitis", "Management of periodontitis", "oral and systemic complications" "Periodontal Complications" "Hypertension and oral disease", "systemic disease and Periodontal treatment" and "prognosis in periodontitis".** ***Discussion:*** **Diabetes mellitus of type 2 variant have shown a strong risk factor for bone loss caused by periodontitis and it was also observed that poor control of diabetes is correlated with markers of periodontal disease activity however the exact mechanism was not clearly understood. In nearly all epidemiological studies, intervention studies impact of periodontal therapy on blood pressure was either not clear or inconclusive.** ***Conclusion:*** **From the above review, it can be noted that improvement in HbA1c levels along with clinical parameters such as plaque index, bleeding on probing, pocket probing depth, clinical attachment level, and gingival recession is directly associated with effective nonsurgical management of periodontitis and vice-versa thus supporting the concept of "Bi-Directional mechanism". Similarly though periodontal disease can be considered as a potential risk factor for hypertension, but the reverse could also be true. Hence Future studies should be directed to produce better understanding of the mechanisms and relations between diabetes, hypertension and periodontitis, which will further support the effective management.**

Keywords:- *Diabetes, Hypertension, Modified therapies, Periodontal complications, Prognosis, Quality of life.*

I. INTRODUCTION

Accumulation of Dental plaque and associated pathogenic microorganisms are often considered as the primary etiological agent for development of gingival and periodontal diseases [1]. Among these, gingivitis is the most prevalent reversible inflammatory condition of the gingival soft tissue characterized by redness, swollen gingiva, bleeding during tooth-brushing and flossing. Gingivitis may progress into periodontitis with further destruction of underlying periodontal ligament tissue and supporting alveolar bone if left untreated. On the other hand, Periodontitis is an inflammatory condition of supporting structures of the teeth characterized by progressive damage to periodontal tissue caused by the host response to the pathogenic bacterial colonies and also by the endotoxins produced by the bacteria [2]. Effective management of periodontitis includes adequate oral hygiene counseling, creating awareness about the role of diet, oral hygiene practices like proper tooth brushing, flossing accompanied by professional cleaning of the teeth and gum tissues using hand instruments or ultrasonic devices. In advanced cases along with these non-surgical management techniques, antibacterial mouth rinses and local or systemic antibiotics were also recommended [3].

Besides microorganism and dental plaque, numerous studies have shown periodontitis as a disease of multi-factorial origin involving several associated risk factors which may enhance the host response to the bacterial infection, increase the prevalence and also play an important role in prognosis of the disease. These risk factors includes age, gender, oral habits, malocclusion, smoking, malnutrition, hormonal changes, stress, poor oral hygiene practices and systemic diseases like diabetes, hypertension [4].Over the years dental practitioners and researchers have observed that periodontal disease is significantly worse in individual with diabetes to the extent that periodontitis has been considered a sixth complication additional to the existing complications such as peripheral neuropathy, retinopathy, renal failure, atherosclerosis, and microangiopathy. Diabetes mellitus of type 2 variant have shown a strong risk factor for bone loss caused by periodontitis and it was also observed that poor control of diabetes is correlated with markers of periodontal disease activity however the exact mechanism was not clearly understood [5]. Another systemic factor of periodontal importance are manifestations of cardiovascular disease predominantly hypertension. There are very few evidences that support periodontitis as an important risk factor for cardiovascular diseases like stroke, peripheral artery disease and coronary heart disease. Particularly, the inflammatory response accompanying periodontitis has been anticipated as a significant factor that may impart adverse effects on the regulation of blood pressure [6]. Studies have shown periodontal therapy could reduce blood pressure yet the mechanism behind such phenomenon remains inconclusive. In nearly all epidemiological studies, intervention studies impact of periodontal therapy on blood pressure was either not clear or in conclusive. Thus, the present review was carried out to apprehend and explore the various clinical aspects associated with diabetic and hypertensive patients following periodontal therapy.

II. MATERIALS AND METHODS

A structured literature search for articles written in the English language in PubMed, MEDLINE, Embase, Google Scholar and Web of Science databases from 2000 to till date was retrieved by using MeSH terms “periodontal therapy”, “diabetes and periodontitis”, “Management of periodontitis”, “oral and systemic complications” ”Periodontal Complications” “Hypertension and oral disease”, “systemic disease and Periodontal treatment” and “prognosis in periodontitis”.

III. LITERATURE REVIEW

Shay in 2002 published a review on infectious complications of dental and periodontal diseases in the elderly population. He focused on various aspects of caries and periodontal disease and their growing importance in the elderly population and concluded that bacterial metastasis of periodontal disease origin causes serious cardiac ailments and uncontrolled dental and periodontal diseases lead to serious morbidity, mortality with considerable loss of quality of life and oral health [7].

Almeida et al in 2006 performed a study to compare the response to conventional periodontal treatment between patients with or without type 2 diabetes mellitus. The study results showed improvement in HbA1c levels along with clinical parameters such as plaque index, bleeding on probing, pocket probing depth, clinical attachment level, and gingival recession. He concluded that after 3 and 6 months of basic non-surgical periodontal therapy clinical improvement with significant metabolic control was evident suggesting a positive correlation with prognosis [5].

Mealey and oates in 2006 through their review provided the basic aspects of the existing relationship between diabetes mellitus and periodontal diseases. The authors concluded that diabetes increases the risk of periodontal diseases by acting at the microbial levels however less clear literature was available on the exact mechanism on changes in glycemic control levels. It is often believed that inflammatory periodontal diseases may increase insulin resistance in a way similar to other similar conditions like obesity, thus aggravating glycemic control [8].

Singh et al in 2008 investigated the effect of improved periodontal health status on glycemic control in type 2 diabetes mellitus patients with diagnosed generalized periodontitis. The results of this study showed that nonsurgical periodontal management and periodontal treatment is significantly associated with decreased Glycated hemoglobin thus improving the glycemic control in type 2 DM patients [9].

Franek et al in 2009 conducted a study to evaluate the association of increased aortic stiffness and elevated central blood pressure (CBP) with chronic periodontitis (CP) patients. He observed CP influences Left ventricular mass (LVM) in hypertensive as well as in healthy subjects; however the exact pathophysiology is not clearly known. The study showed a positive association between age, aortic systolic and pulse pressure with CPITN index values and concluded that severe and more aggressive forms of periodontal diseases are associated with increased blood pressure and LVM in patients with primary hypertension [6].

Vidal et al in 2009 aimed to evaluate the effects of non-surgical periodontal treatment on plasma levels of inflammatory markers such as interleukin [IL]-6, C-reactive protein [CRP], and fibrinogen in severe periodontitis and refractory arterial hypertensive patients. Significant reduction in the probing depth, bleeding on probing, and clinical attachment level was noted along with reduced plasma levels of inflammatory markers. The study concluded that non-surgical periodontal therapy was effective in improving overall periodontal health status by reducing the plasma levels of inflammatory markers such as IL-6, CRP, and fibrinogen especially in hypertensive patients with severe periodontitis [10].

Huttner et al in 2009 briefly discussed on effects of human aging on periodontal tissues. His review focused on various aspects like alteration and proliferation of bone cells,

role of inflammatory mediators, cellular responses, oral microbiota and alterations in elderly people caused by systemic endocrine disorders like diabetes. He observed that there is an increase in periodontal disease expectancy among the dentate elderly people and concluded that severe periodontal diseases are more attributed to systemic diseases and failure of therapy [11].

Teeuw et al in 2010 conducted a study to evaluate the strong evidence based observation on improvement of glycemic control in periodontally treated diabetic patients. All studies defined predominantly type 2 diabetic patients in whom glycemic control improved following periodontal therapy over a period of 3 to 9 months. He concluded that periodontal treatment leads to significant improvement of glycemic control in type 2 diabetic patients over a minimum period of 3 months [12].

Preshaw in 2012 emphasized on two-way relationship between diabetes and periodontal disease. It is evident that the risk of periodontal disease is increased by approximately threefold in diabetic individual along with other complications like xerostomia and candida infections. Similarly the author supported the hypothesis that Severe periodontitis was associated with an increased risk of poor glycaemic control in diabetic individuals. Furthermore, several studies have also shown diabetic participants who managed their periodontal status successfully also tended to report better glycemic control with lower mean HbA1c levels of 8.1% compared with poor oral hygiene status groups [13].

Leong et al in 2014 examined the association between periodontal disease and hypertension and also aimed to explore the likely biological pathways underlying the linkage between these health and illnesses. In summary he concluded that though various epidemiological data and cross-sectional studies have shown association between hypertension and periodontitis, there are no strong clinical based evidences to indicate that a causal relationship really exists [14].

Paizan and Vilela-Martin in 2014 discussed the clinical evidences, experimental suggestions, pathophysiologic mechanisms and inter-relationship between periodontal disease, hypertension and cardiovascular disease. He observed that periodontal disease and hypertension are multi-factorial disease with significant common risk factors. In patients with signs and symptoms of poor oral and periodontal health status one can suggest a medical evaluation (blood pressure measurement) and comprehensive periodontal status examination. The author believes simple periodontal evaluation can be a useful tool for assessing cardiovascular risk especially in the hypertensive population and non-surgical periodontal intervention might improve the overall health status of an individual [15].

Teshome and Yiteyah in 2017 assessed the effectiveness of periodontal therapy on glycated hemoglobin (HbA1c) and fasting plasma glucose level (FBS) in type 2 diabetic patients. In this systematic review and meta-analysis, there is a significant reduction of FBS and HbA1c levels on type 2 diabetic periodontal patients managed with non-surgical periodontal therapy [16].

Naiff et al in 2018 published a mini review to create awareness among health professionals about the risk of periodontitis towards the onset or exacerbation of complications in individuals with type 2 diabetes mellitus. He suggested that the mechanical or non-surgical treatment of periodontal disease and reestablishment of oral health status are essential for the metabolic control of patients with type 2 DM [17].

Guzik et al in 2019 performed a two-sample Mendelian randomization analysis to ascertain the effect periodontal diseases on blood pressure (BP). It was observed that Systolic BP reduction was significantly correlated to periodontal status improvement similarly Diastolic BP and endothelial function were also improved by non-surgical periodontal therapy. He concluded that there is significant relationship between periodontitis-linked single nucleotide polymorphisms and Blood pressure phenotypes thus resulting in improved hypertensive control [18].

IV. OBSERVATIONS OF THE STUDY

Inflammation is considered as the hallmark feature in the pathogenesis of both diabetes and periodontitis. Numerous studies have shown reduced inflammatory markers are positively correlated with improvement in clinical parameters, decreases HbA1c levels and significant metabolic control after 3 and 6 months of basic non-surgical periodontal therapy suggesting a better prognosis. We also observed that bacterial metastasis of periodontal disease origin causes serious cardiac ailments and uncontrolled dental and periodontal diseases lead to serious morbidity, mortality with considerable loss of quality of life and oral health. Studies have also concluded that non-surgical periodontal therapy was effective in improving overall periodontal health status by reducing the plasma levels of inflammatory markers such as IL-6, CRP, and fibrinogen especially in hypertensive patients with severe periodontitis.

V. CONCLUSION

From the above review, it can be noted that improvement in HbA1c levels along with clinical parameters such as plaque index, bleeding on probing, pocket probing depth, clinical attachment level, and gingival recession is directly associated with effective nonsurgical management of periodontitis and vice-versa thus supporting the concept of “Bi-Directional mechanism”. Similarly though periodontal disease can be considered as a potential risk factor for hypertension, but the reverse could also be true. Hence Future studies should be directed to produce better understanding of the mechanisms and relations between diabetes, hypertension and periodontitis, which will further support the effective management.

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