CORRELATION BETWEEN DIABETES AND HYPERTENSION IN PATIENTS WITH PERIODONTITIS - A RETROSPECTIVE STUDY

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ABSTRACT

Hypertension and Diabetes mellitus are major metabolic disorders and hypertension is one of the main predisposing risk factors leading up to cardiovascular disorders. Diabetes mellitus is mainly characterised by hyperglycemia. For decades it has been suspected that periodontics could affect glycemic control in diabetes and lead to vascular inflammation and hypertension. Over the years and the vast literature that has been present it has been noticed that the presence of systemic comedians such as diabetes and hypertension leads to periodontitis and in certain cases where periodontitis worsens the factors. Evaluation of 538 patients with diabetes and hypertension and evaluating them for the presence of periodontitis in Saveetha dental college from the period June 2019 to March 2020. Excel tabulation was done and SPSS results were generated. This study was able to evaluate and notice that periodontics was very high and Diabetes and hypertension act as predisposing factors leading up to it. It was seen that 44.4% of the study group had generalised chronic periodontitis. 66-85 years had the most number of patients with generalised chronic periodontitis, Pearson Chi Square value- 2.546a, p value-0.863, p value >0.05(statistically insignificant). For this study we can conclude that diabetes and hypertension act as very important risk factors leading to more severity to the nature of periodontitis and the older age group with poor oral hygiene and maintenance of the systemic conditions are most affected.
INTRODUCTION

Periodontitis is one of the most common dental diseases next to dental caries and it affects the survival of teeth in the dentition. The prevalence of periodontitis is about 5 to 10% of the overall adult population. Periodontitis in India is a growing health condition which affects and has a prevalence percentage of 66.2% in adults (1). Periodontal diseases mainly include gingivitis and periodontitis of which gingivitis is the most common among the two. Periodontal diseases are mainly characterised by inflammation of surrounding tissues and the tooth supporting tissues caused due to bacterial invasion leading to inflammation and destruction (1). Generalised Chronic periodontitis is a multifactorial inflammatory disease which is characterised by progressive destruction of the tooth-supporting structures and is associated with dysbiotic dental plaque biofilms (2). Periodontitis is mainly a Gram-negative infection resulting in severe inflammation; it spreads the mechanism of vascular dissemination of microorganisms and their products such as lipopolysaccharides throughout the body (3). Over the vast literature it has been seen that there is a strong association between Diabetes and Periodontitis. Periodontal disease is not purely a microbial disease but host associated disease, because the host immune response to the microbes becomes hyperresponsive leading to release of cytokines and other inflammatory markers causing destruction of our own tissues. Periodontitis is a non communicable disorder that has the same risk determinants and risk factors similar to several other disorders such as heart disease, hypertension and cancer (4–10).

Diabetes mellitus is a systemic disease that is characterised by hyperglycemia this is due to a defect in the insulin secretion by the pancreatic β cells or it can be because of a reduction in insulin sensitivity (11). Diabetes is majorly classified into Type 1 and Type 2 diabetes. Type 1 diabetes is insulin dependent diabetes while type 2 diabetes is non insulin dependent diabetes also known as adult onset diabetes. Both type 1 diabetes and type 2 diabetes mellitus are involved with elevated levels of systemic markers of inflammation (12). Periodontal disease is the most prevalent oral complication in patients with type 2 Diabetes mellitus. From a study conducted it was reported that type 1 diabetes also known as juvenile diabetes has been associated with an increase in the risk periodontitis in adolescents (13) and with greater bleeding index, probing pocket depth (14,15). Generalised chronic periodontitis has been identified as the sixth complication of diabetes alongside retinopathy, nephropathy, neuropathy, macro-vascular disease and poor wound healing (16). Inflammation is the main feature in both diabetes and periodontal disease, and inflammatory processes are increased in periodontal tissues in diabetic patients. There is a wide range of mechanisms by which diabetes adversely affects the periodontium and, vice versa, how periodontitis influences control of diabetes (17–21).
The periodontium is a highly vascularized connective tissue. Thus, accumulation of advanced glycation end products and their effects on cell-to-matrix and matrix-to-matrix interactions, increased tissue oxidant stress, altered endothelial cell function and elevated activity of matrix metalloproteinases. Neutrophil adherence, chemotaxis and phagocytosis are impaired, this leads to the bacteria to persist in the deep periodontal pockets and leading to increase in periodontal destruction. Patients with diabetes have increased apoptosis, which is associated with prolonged wound healing (22–26).

Hypertension is a major global health disorder affecting about 972 million adult population (27). Over the years from the vast literature it has been noted that Periodontitis is linked to an increased risk of cardiovascular diseases. The chronic inflammatory process of periodontitis and the host response provide the basis for the hypothetical association between Periodontitis and Cardiovascular disorders (28,29). Hypertension increases the risk of various adverse cardiovascular events such as atherosclerosis, stroke, and coronary heart disease. The pathogenesis of hypertension includes Oxidative stress, endothelial dysfunction. Hypertension and periodontitis share common risk factors, namely, smoking, stress, increased age, and socioeconomic factors. These risk factors may confound the association between hypertension and periodontitis.

Hypertension and periodontitis are two diseases which seem to have any correlation. Periodontitis is a chronic oral infection that leads to inflammation, over the years the identification of periodontitis being a risk factor for hypertension has increased lately. Literature supports that Periodontitis as an important risk factor for Cardiovascular disorders mainly including stroke (30), peripheral artery disease (31,32), and coronary heart disease (33). The periodontal micrograms involved in the inflammation and destruction leading to periodontitis are P. gingivalis, Prevotella intermedia, Prevotella nigrescens, T. forsythia, T. denticola, F. nucleatum, Aggregatibacter actinomycetemcomitans (2,34–36). These periodontal pathogens lead destruction and invasion of gingival tissues by proteolysis. These periodontal pathogens on entering the systemic circulation cause transient bacteraemia, periodontal microbes may lead to vascular inflammation causing atherosclerosis (37). This eventually being the main cause for cardiovascular disease.

From the current study we aim to evaluate the prevalence of periodontitis in patients with Diabetes and hypertension. This will help us with understanding the severity of the spread and what measures could be taken to help in maintaining and managing periodontitis among adults with systemic disorders.

MATERIALS AND METHODS

Study Setting
The study was conducted with the approval of the Institutional Ethics Committee [SDC/SIHEC/2020/DIASDATA/0619-0320]. The study consisted of one reviewer, one assessor and one guide.

Study Design

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The study was designed to include all dental patients above 20 years with diabetes and hypertension. The patients who did not fall into these inclusion criteria were excluded.

**Sampling Technique**

The study was based on a non probability consecutive sampling method. To minimise sampling bias, all case sheets of patients who had diabetes and hypertension were reviewed and included.

**Data Collection and Tabulation**

Data Collection was done using the patient database with the timeframe work 01 June 2019 and 31 March 2020. About 538 case sheets were reviewed and those fitting under the inclusion criteria were included. Cross verification was done with the help of Photographs and radiographic evidence. To minimise sampling bias all data were included. Data was downloaded from DIAS and imported to Excel, Tabulation was done. The values were tabulated and analysed.

**Statistical Analysis**

Descriptive statistics were performed using SPSS by IBM on the tabulated values. Chi-Square test was performed and the p value was determined to evaluate the significance of the variables it was used to evaluate the association between the age and gender with the prevalence of periodontitis in patients with diabetes and hypertension. The results were obtained in the form of graphs and tables.

**RESULTS AND DISCUSSION**

It was seen from our study out of 538 patients with diabetes and hypertension, it was found from our study that 44.4% of the study group had generalised chronic periodontitis, 20.4% had localised chronic periodontitis, 32.7% had generalised chronic gingivitis, 2.4% had drug induced gingival enlargement. From this we were able to see that periodontics is one of the main predisposing factors leading to diabetes mellitus and hypertension.

Based on age wise distribution , we were able to see that generalised chronic periodontitis was most commonly among the age group 46-65 years and 66-85 group , this could be attributed to the fact age is one of the most important factors affecting periodontitis. This could be seen in acceptance with previous studies conducted that was done to conclude age and stress may lead to hypertension. In a study conducted by (11) he concluded that there was a statistically significant relationship between age and periodontitis in diabetic patients. (31) Concluded from his study that there was a significant relationship between periodontitis and patients with hypertension.

Based on gender wise distribution of the study we were able to see that generalised chronic periodontitis was more among the males, they were affected by metabolic disorders and are more prone to periodontitis as an inflammatory oral condition. This was seen similarly in other studies, in a study conducted by (11), he was able to conclude that there was a significant correlation between gender and periodontitis in diabetic patients. This corroborates other studies reporting that periodontal problems are more prevalent and more severe among diabetic men. Such a finding
implies that public healthcare services need to actively seek changes in clinic hours and other measures that address care for men with diabetes, as males seek health services less often than women (38).

Various studies have been conducted to evaluate the correlation between diabetes and periodontitis. Cianciola et al. (13) reported from his study that the higher prevalence of gingival inflammation and periodontitis in young adults with young adults. Ervasti et al (39) reported from his study that patients with uncontrolled diabetes and poorly controlled diabetes and high gingival bleeding compared to non diabetics. Patients with type 2 diabetes also had greater gingival inflammation than control subjects without diabetes. Papapanou et al. (2) observed from his study that there was a significant association between diabetes and periodontitis. He was also able to notice that patients with long standing type 2 diabetes had higher range of bleeding on probing, increased clinical attachment loss and overall destruction of alveolar bone and periodontium. From this we can see that poor glycemic control in patients with diabetes is associated with an increased risk of progressive loss of periodontal attachment and alveolar bone (40,41). Taylor et al. (42) was able to conclude from his study that there was a six fold increased risk of worsening glycemic control in patients with type 2 diabetes who had severe periodontitis compared with non diabetics patients.

There is strong evidence for an association between diabetes mellitus and periodontitis. Diabetes mellitus increases the risk for and severity of inflammatory periodontal diseases. There have also been studies to prove that treatment of periodontitis leads to improvement in glycemic control in patients with type2 diabetes.

On the other hand, the presence of periodontal diseases can have a significant impact on the metabolic state in diabetes. Periodontitis is also associated with an increased risk for diabetic complications. In a study by Thorstensson et al., (43) he reported that 82% of diabetic patients with periodontitis experienced one or more major cardiovascular, cerebrovascular problems.

From the vast literature that debates the relation between diabetes and hypertension, (44), (33) reported that periodontitis is associated with increased blood pressure, Holmund et al observed that the severity of periodontitis is increased with hypertension. While few articles studied that (45) reported that hypertension is increased in patients with periodontics. (46) It was observed in his study that hypertension associated with severe chronic periodontitis. Many cross sectional studies show the association between hypertension and periodontitis. However, there is no strong proof to indicate that a causal relationship exists. Previous studies demonstrated that elevation in blood pressure being associated with periodontitis. In the future studies must be conducted to achieve a better understanding of the mechanisms and interactions between hypertension and periodontitis.

Whilst further studies are needed, the available evidence does highlight the importance of good oral health in relation to systemic health.
CONCLUSION

From the limits of this study we were able to conclude that there was a strong correlation between Diabetes, hypertension and Periodontitis. Our study showed 44.4% of the patients with diabetes and hypertension had periodontitis. From our study we were able to see that males are most likely to develop periodontitis in the presence of systemic factors such as diabetes and hypertension. Multiple determinants and risk factors, such as age gender, are associated with the prevalence of periodontitis among patients with diabetes and hypertension.

AUTHOR CONTRIBUTION
All authors contributed equally to the work.

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REFERENCES


7. Varghese SS, Thomas H, Jayakumar ND, Sankari M, Lakshmanan R. Estimation of salivary tumor necrosis


<table>
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<td>32(5.95%)</td>
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<td>199(36.99%)</td>
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<td>65(12.08%)</td>
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<td>297(55.02%)</td>
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Table 1 - describes the distribution of study population based on age and gender. It is found that the majority of the participants with diabetes and hypertension have generalised chronic periodontitis in the age group 46-65 years. In the age group 25-45 years, more females (9.29%) were present and in the age group 46-65 years more male patients were present (36.99%), in the age group 66-85 years more males were present (12.08%). It can be inferred from this that Males over the age of 46 years are more prone to systemic diseases such as diabetes and hypertension and their chances of developing periodontitis is high.
Figure 1: The graph represents the distribution of periodontal health among patients with diabetes and hypertension. X axis - Periodontal health; Y axis - Number of patients with diabetes and hypertension. It was observed from this graph that 44.42% of patients with diabetes and hypertension had Generalised chronic Periodontitis, 32.71% had localised chronic periodontitis, 20.45% had generalised chronic gingivitis, 2.42% had drug induced gingival enlargement. From this we were able to infer that Generalised chronic periodontitis was the most commonly present periodontal disease among patients with diabetes and hypertension.
<table>
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<td>Likelihood Ratio</td>
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Table 2: Graph depicting age wise distribution of periodontitis among patients with diabetes and hypertension
Figure 2: The graph represents the association between age and prevalence of periodontitis in patients with diabetes and hypertension. X axis represents the age distribution. Y axis represents the total number of patients with diabetes and hypertension. There was a higher predilection of generalised chronic periodontitis (green) in the age group 46-65 years, however there was no significant association between age and prevalence of periodontitis in patients with diabetes and hypertension. Pearson Chi Square value: 2.546, p value: 0.863, p value >0.05 statistically insignificant.

Figure 3: The graph represents the association between gender and prevalence of periodontitis in patients with diabetes and hypertension. X axis represents the gender distribution. Y axis represents the total number of patients with diabetes and hypertension. There was a higher predilection of generalised chronic periodontitis (green) in
males. However, there was no significant association between gender and prevalence of periodontitis in patients with diabetes and hypertension. Pearson Chi Square value - 0.614, p value - 0.893, p value > 0.05 statistically insignificant.