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PREVALENCE OF GINGIVITIS AND PERIODONTITIS AMONG DIABETIC AND HYPERTENSIVE PATIENTS VISITING A UNIVERSITY DENTAL HOSPITAL - A RETROSPECTIVE ANALYSIS

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Abstract

Background*: The most common risk factors of periodontal disease are diabetes and hypertension which plays a significant role in modulating the pathogenesis of periodontitis.*

Aim*: The aim of the study is to find the prevalence of gingivitis and periodontitis among diabetic and hypertensive patients visiting a university dental hospital.*

Materials and Methods: *This retrospective study was carried out by analysing the case records of patients who visited Saveetha Dental College during a period between June 2019 to March 2020. The data included patients who had a history of diabetes and hypertension. Demographic details such as Age, Sex, Marital Status, Occupation, Address, Medical Status were recorded. Periodontal parameters such as bleeding on probing, probing pocket depth, loss of attachment were recorded to assess the periodontal status of the study population. The data was tabulated and entered in excel and the data was analysed using Statistical Package for Social Sciences (SPSS) software, chi square test was done and a p value of 0.05 was set to be statistically significant. Non parametric chi square test was done for statistical analysis and the variables compared were age, gender, gingivitis, periodontitis among diabetic and hypertensive patients.*

Results*: The total number of patients in the study were 2858 patients. Prevalence of gingivitis in diabetic patients was 52.85% , hypertensive patients was 27.85% and both diabetes and hypertension was 19.3%. The prevalence of periodontitis in diabetics was 53.84%, hypertensives was 24.37% and in patients with both diabetes and hypertension was 21.72%. There was higher male predilection among the diabetic and hypertensive patients. The mean age age group of gingivitis and periodontitis in diabetic and hypertensive patients was 53.38±10.97 years.*

Conclusion*: Within the limitations of the study, we found male predilection among both diabetic and hypertensive patients. Gingivitis and Periodontitis was more common in the age group of 46-60 years. Among diabetic patients, 41.26% had gingivitis and 58.74% had periodontitis. There was a higher prevalence of periodontitis (55.07%) than gingivitis (44.93%) in the hypertensive group. Similarly, among the patients who had both diabetes and hypertension , there was a higher prevalence of periodontitis (61.15%) than gingivitis (38.85%).*

Keywords*: Gingivitis; Periodontitis; Periodontal diseases; Diabetes; Hypertension*

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Introduction

Periodontal disease is a chronic inflammatory disease which has deteriorating effects on esthetic and functional aspects of the dentition [1,2]. The disease initially begins as gingivitis due to microbial plaque accumulation around the teeth [3]. Gingivitis if left untreated may lead to periodontitis resulting in the formation of periodontal pockets,clinical attachment loss and mobility leading to tooth loss [4]. Various other risk factors like tobacco use, immunodeficiency like acquired immunodeficiency syndrome, neutrophil disorders, osteoporosis, dietary factors, genetic factors play a crucial role in the disease pathogenesis [5]. The most common systemic risk factors of periodontal diseases are diabetes and hypertension.

Previously our team had conducted various studies on treatment modalities for periodontal diseases and periodontal procedures [1,6–12]. There were many studies done over the past 5 years correlating various disease and factors related to periodontal disease, [13,14] radiological, in vitro studies, case studies [15–17] reviews [18,19]. The idea for this research stemmed from the current interest in our community and its cultural habits.

Diabetes mellitus and Hypertension are among the most common multifactorial disorders , chronic non-communicable diseases affecting both developing countries and also the developed countries. It occurs at a higher prevalence in the older age group and result from both genetic and environmental etiological factors [20]. Diabetes mellitus is a chronic disease increasing in explosive patterns in India [21]. India has been called “the diabetes capital of the world” because of its high diabetes rates; ∼41 million Indians have diabetes, accounting for one-fifth of all diabetes cases worldwide [22].

Diabetes mellitus is defined as a metabolic disorder which causes hyperglycemia due to defect in both the insulin action and insulin secretion or sometimes either one [23]. The elevated blood sugar levels adversely affects oral health, manifesting itself in several oral diseases and conditions [24]. Diabetes causes poor healing, xerostomia with subsequent increased accumulation of plaque and food debris, higher susceptibility to infections, and pronounced hyperplasia of gingiva all contributing to the increased incidence of periodontal disease in diabetics [25,26]. Periodontitis has been referred to as the sixth complication of diabetes [27]. Both diabetes and periodontal diseases are thought to share a common pathogenesis that involves an enhanced inflammatory response to the periodontal microflora that can be observed at the local and systemic level [28,29].

Similarly, HT is considered to be one of the most common causes of morbidity and mortality affecting about one billion people worldwide [30,31]. Both hypertension and periodontitis have several common risk factors like increased age, smoking, stress and socioeconomic factors [32]. There are pathophysiological mechanisms and links involved between both periodontal diseases and hypertension [33]. The possible pathways which link both hypertension and periodontitis could be inflammation, infections in oral cavity, oxidative stress and endothelial dysfunction [34].

Epidemiological studies on periodontal diseases vary considerably in prevalence between countries and between geographic regions within the countries [35–38]. Assessment of the prevalence of these diseases in our population can add valuable information to the oral health planners for proposing strategies and also can aid in bringing awareness to the public. Thus the aim of this retrospective study was to assess the prevalence of gingivitis and periodontitis among diabetic and Hypertensive patients visiting Saveetha dental college and Hospitals.

MATERIALS AND METHODS

This present study was conducted as a retrospective cross sectional study with consecutive non probability sampling among the outpatients of private dental institute , Chennai, Tamil Nadu. The study design was reviewed and approved by the institutional ethical committee. The study setting was a University setting. This study was done by examining 86000 records of patients who underwent treatment at the dental hospital during the time period of June 2019 to March 2020.

Patients who had a medical history of diabetes, hypertension and both were included in the study. Patients who had other systemic complications along with diabetes and hypertension were excluded from the study. Case sheets with incomplete data were also excluded. From the 86000 records, a total of 2858 patients visiting the hospital were included in the study. Demographic details such as Age, Sex, Marital Status, Occupation, Address, Medical Status were recorded. Periodontal parameters such as bleeding on probing, probing pocket depth, loss

of attachment were recorded to assess the periodontal status of the study population. The age group of the patients were categorised as 18 to 25 years, 26 to 45 years, 46 to 60 years and above 60 years.

Data Analytics

Data was entered and tabulated into a spreadsheet using Excel version 16.37 (Microsoft Corp, Redmond, Wash) and was analysed using Statistical Package for Social Sciences (SPSS) software, version 1.0.0.1347 64 bit (IBM corp., NY, USA). The frequency and percentages of all the study variables were represented in the form of graphs and tables. The data was represented by the means of bar graphs. Non parametric chi square test was used and results were correlated and associated. In this present study, the significance level was predetermined at the probability value of 5% or less. $p<0.05$ was considered to be as the level of statistical significance.

RESULTS

The study evaluated the prevalence of gingivitis and periodontitis among diabetic and hypertensive patients visiting SIMATS. The total number of patients in the study were 2858 patients. The age range of the patients was 21 to 84 years. The mean age of the study population was 53.38±10.97 years.Around 57% (1391) of the total study population were males and 42% (1025) of them were females, $p<0.05$ (Figure 1). Among the total study population about 1192 patients (41.71%) had gingivitis and 1666 patients (58.29%) had periodontitis, $p<0.05$ (Table 1). Prevalence of gingivitis was more (53.69%) in males and than females (46.3%), $p<0.05$ (Table 1) . Gingivitis was most commonly seen in the age group of 46 to 60 years(48.15%) and least (0.75%) among the age group of 18 to 25 years, $p<0.05$ (Figure 2). Prevalence of periodontitis in males were higher (59.43%) than females of 40.52%, $p<0.05$ (Table 1). Patients in the age group of 46 to 60 years old were more prone to periodontitis(52.10%) than the lesser age groups, $p<0.05$ (Figure 3).

There were 1527 (53.43%) of diabetic patients, 739 (25.86%) were hypertensive and the remaining 592 (20.71%) patients were having both diabetes and hypertension, $p<0.05$ (Figure 4). There was a higher prevalence of male patients with diabetes among the gingivitis patients when compared to the others, $p<0.05$ (Figure 5). There was a higher number of male patients with diabetes among the periodontitis patients when compared to the others, $p<0.05$ (Figure 6) Patients of age 46 to 60 years with diabetes were higher in the gingivitis group when compared to the others, $p<0.05$ (Figure 7). There is a higher number of patients of age 46 to 60 years with diabetes among the periodontitis patients when compared to the others, $p<0.05$ (Figure 8)

Among the hypertensive patients, 22.29% of 26 to 45 years, 50% of 46 to 60 years, 27.71% of the age above 60 years had gingivitis, $p<0.05$ (Figure 9). The age distribution of periodontitis patients with hypertension was 0.25% of 18 to 25 years, 20.64% of 26 to 45 years, 51.35% of 46 to 60 years, 27.77% of the age above 60 years, $p<0.05$ (Figure 10). The age distribution of diabetic and hypertensive patients with gingivitis was 16.96% of 26 to 45 years, 49.13% of 46 to 60 years, 33.91% of the age above 60 years, $p<0.05$ (Figure 11). The age distribution of diabetic and hypertensive patients with periodontitis was 13.54% of 26 to 45 years, 51.38% of 46 to 60 years, 35.08% of the age above 60 years, $p<0.05$ (Figure 12).

The statistical software SPSS was used for the descriptive and inferential analysis. A chi square test was done to check the association and a p value of < 0.05 was considered statistically significant.

Table 1: Table representing the Gender Distribution among Gingivitis and Periodontitis patients.

Gender	Gingivitis	Periodontitis
Male	640 (53.69%)	990 (59.43%)
Female	552 (46.31%)	675 (40.52%)
Transgender	-	1 (0.06%)
Total	1192	1666

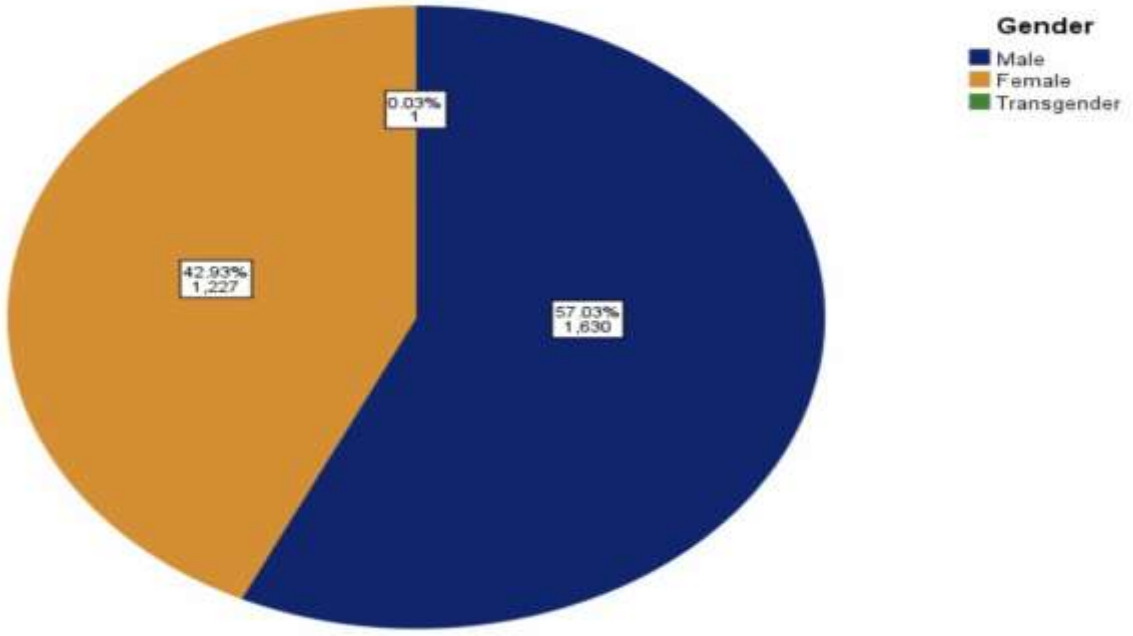

Figure 1: This pie chart shows the distribution of study subjects based on gender. Dark blue colour represents the male patients, yellow represents the female patients and dark green represents the trangender patients. Among the study participants males formed the majority

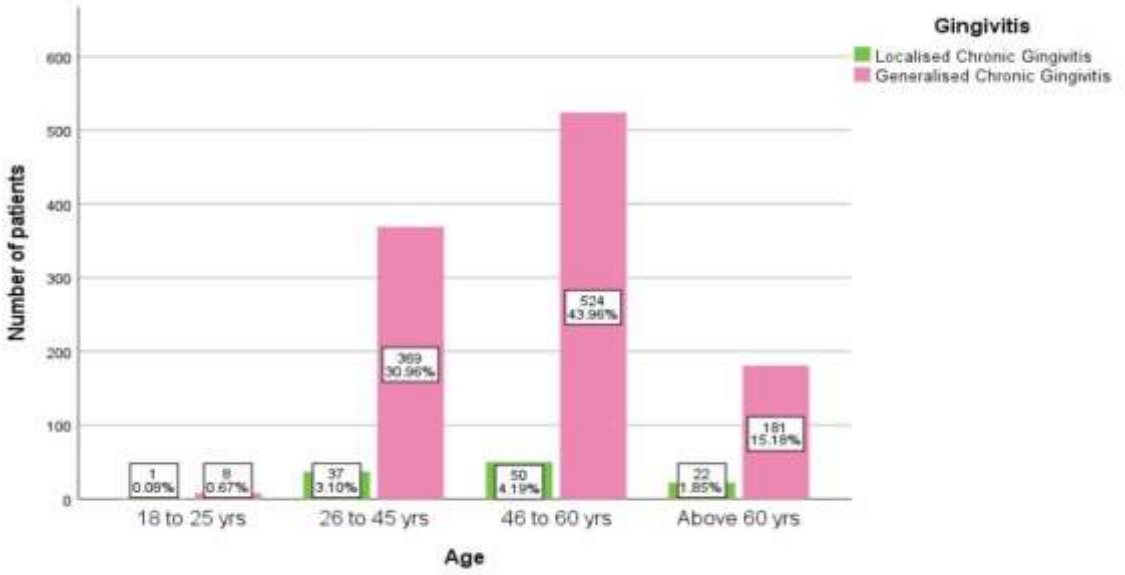

Figure 2: This bar graph represents the association between the age distribution and gingivitis among the patients, where the x axis denotes the age distribution and the y axis denotes the number of patients with gingivitis. The green colour denotes the localized chronic gingivitis patients and pink colour represents generalized chronic gingivitis. Chi square test was done and the association between age groups and the type of gingivitis, was found to be statistically significant with p value of 0.001 (p value <0.05). There were a higher number of patients in the 46 to 60 years age group among the gingivitis patients when compared to the others.

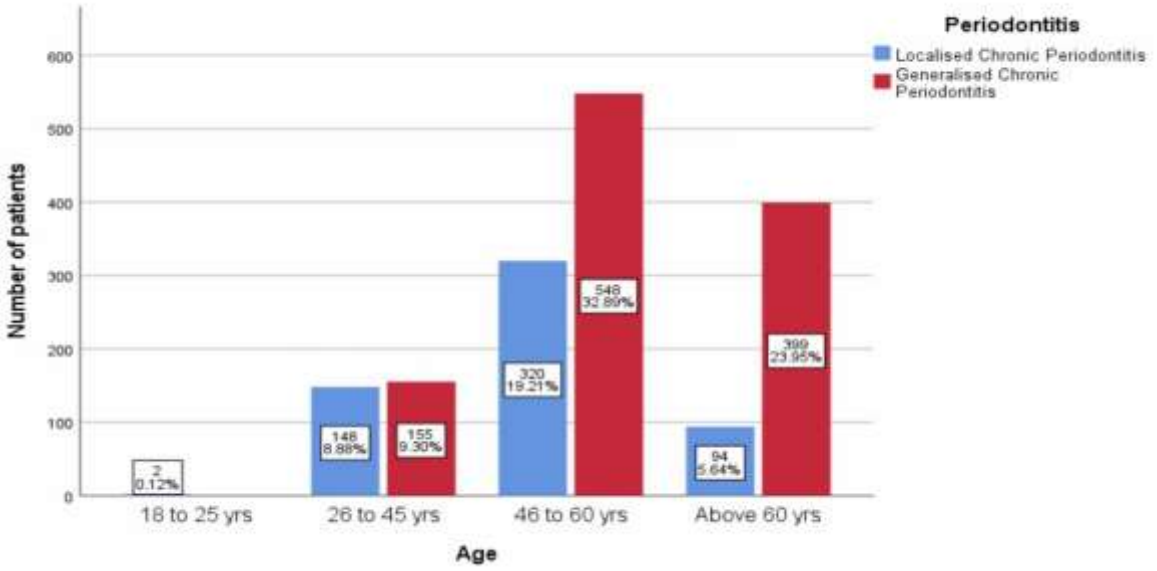

Figure 3: This bar graph represents the association between the age distribution and periodontitis among the patients, where the x axis denotes the age distribution and the y axis denotes the number of patients with periodontitis. The blue colour denotes the localized chronic periodontitis patients and red colour represents generalized chronic periodontitis. Chi square test was done and the association between age groups and periodontitis was found to be statistically significant with a p value of 0.001 (p value <0.05). Patients in the age group of 46 to 60 years predominantly had periodontitis when compared to the other age groups.

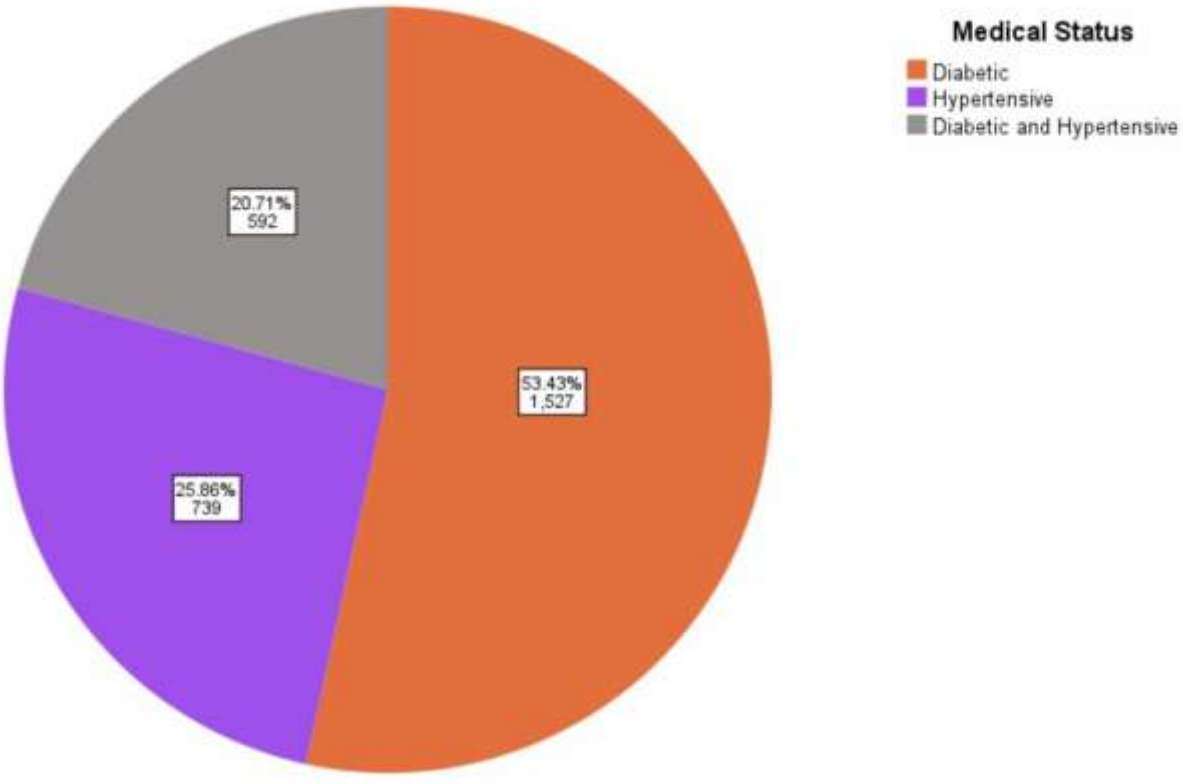

Figure 4: This pie chart represents the medical status count among all the patients. The orange colour represents diabetic patients, purple colour represents hypertensive patients and grey colour represents patients with both

diabetes and hypertension. There were 1527 diabetic patients, 739 hypertensive patients and 592 patients who had both diabetes and hypertension . There were higher number diabetic patients in the study population than hypertensive patients.

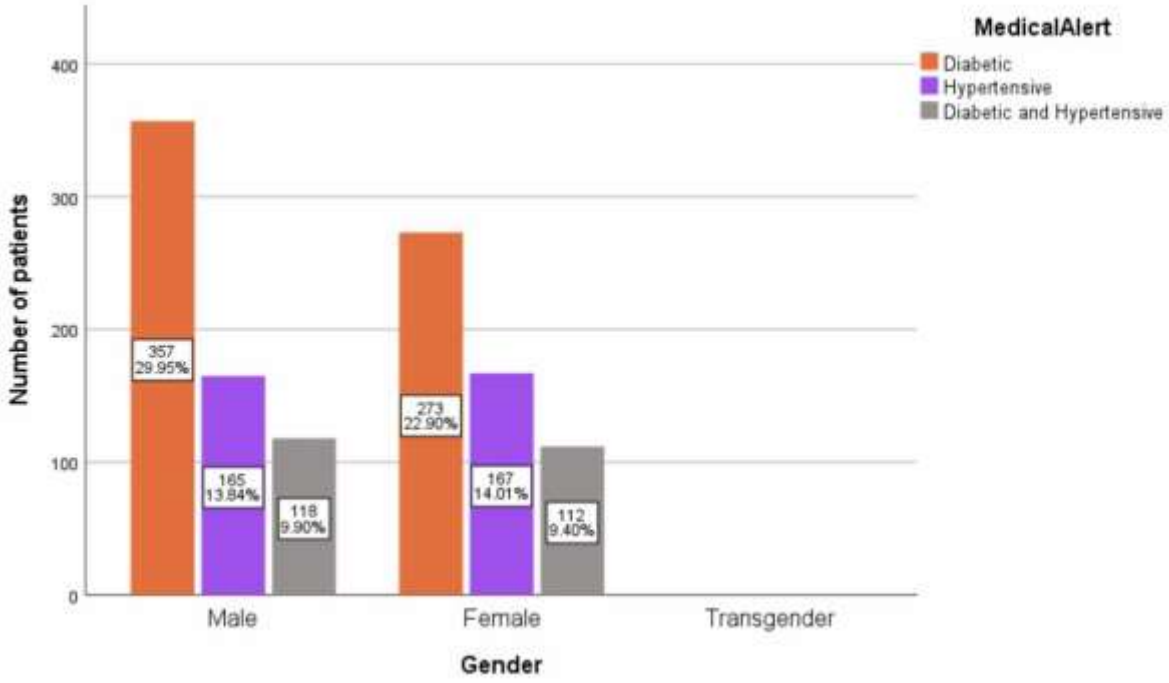

Figure 5: This bar graph represents the relationship between the gender distribution and the systemic status of the gingivitis patients , where the x axis denotes the medical status and the y axis denotes the gender distribution across the scale of number of patients with gingivitis. The orange colour represents diabetic patients, purple colour represents hypertensive patients and grey colour represents patients with both diabetes and hypertension. Chi square test was done and the association between gender and systemic status of gingivitis patients was found to be statistically significant and with p value of 0.001 (p value <0.05). There was a majority of male patients with diabetes among the gingivitis patients when compared to females.

Figure 6: This bar graph represents the relationship between the gender distribution and the systemic status of the periodontitis patients , where the x axis denotes the systemic status and the y axis denotes the number of patients with periodontitis. The orange colour represents diabetic patients, purple colour represents hypertensive patients and grey colour represents patients with both diabetes and hypertension. Chi square test was done and the association between gender and medical status of periodontitis patients was found to be statistically significant and with p value of 0.016 (p value <0.05). There was a majority of male patients with diabetes among the periodontitis patients when compared to the other groups.

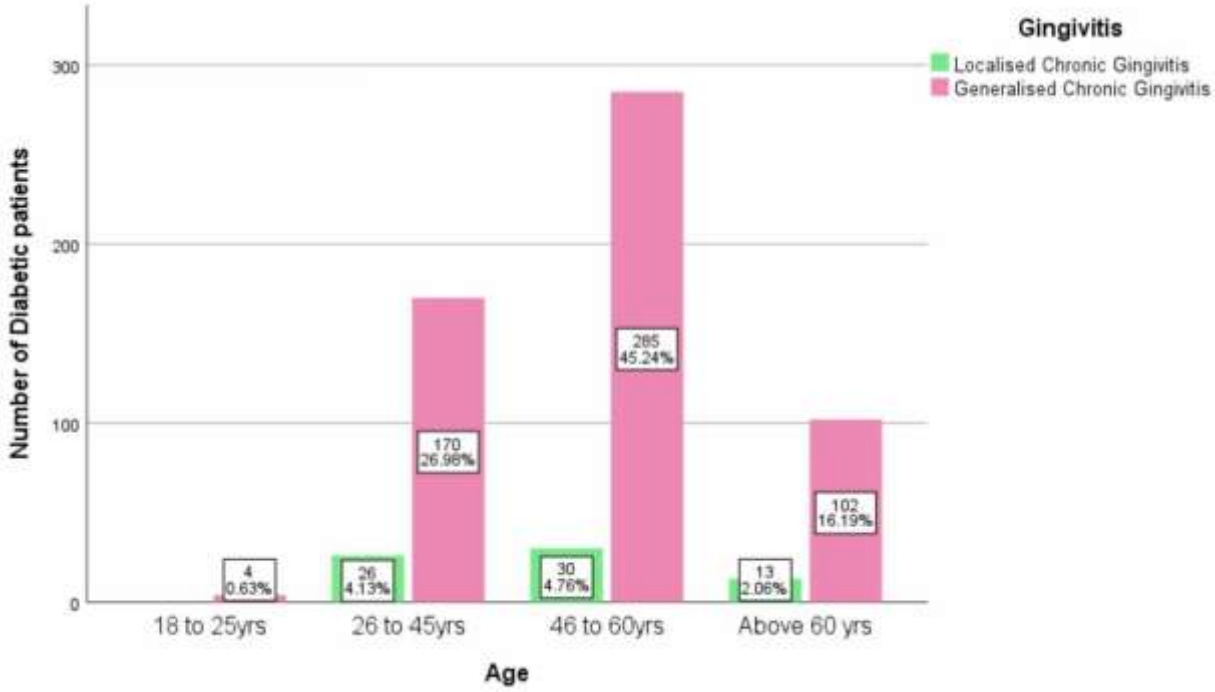

Figure 7: This bar graph represents the association between the age distribution and gingivitis among the diabetic patients, where the x axis denotes the age distribution and y axis denotes the number of patients with gingivitis. The green colour represents the localized chronic gingivitis patients and pink colour represents generalized chronic gingivitis. Chi square test was done and the association between age groups and gingivitis among diabetic patients was found to be statistically significant and with p value of 0.001 (p value <0.05). There

were more patients of age 46 to 60 years with gingivitis among the diabetic patients when compared to the others.

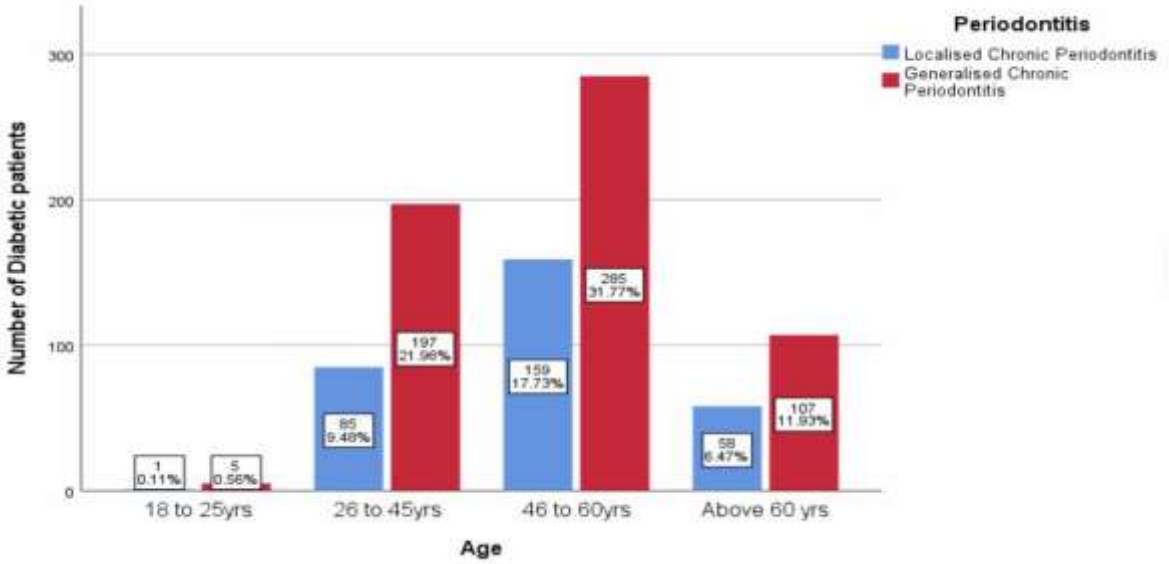

Figure 8: This bar graph represents the association between the age distribution and periodontitis among the diabetic patients, where the x axis denotes the age distribution and y axis denotes the number of periodontitis patients. The blue colour represents the localized chronic periodontitis patients and red colour represents generalized chronic periodontitis. Chi square test was done and the association between age groups and periodontitis among diabetic patients was found to be statistically significant and with p value of 0.001 (p value <0.05). There were more patients of age 46 to 60 years with periodontitis among the diabetic patients when compared to the others.

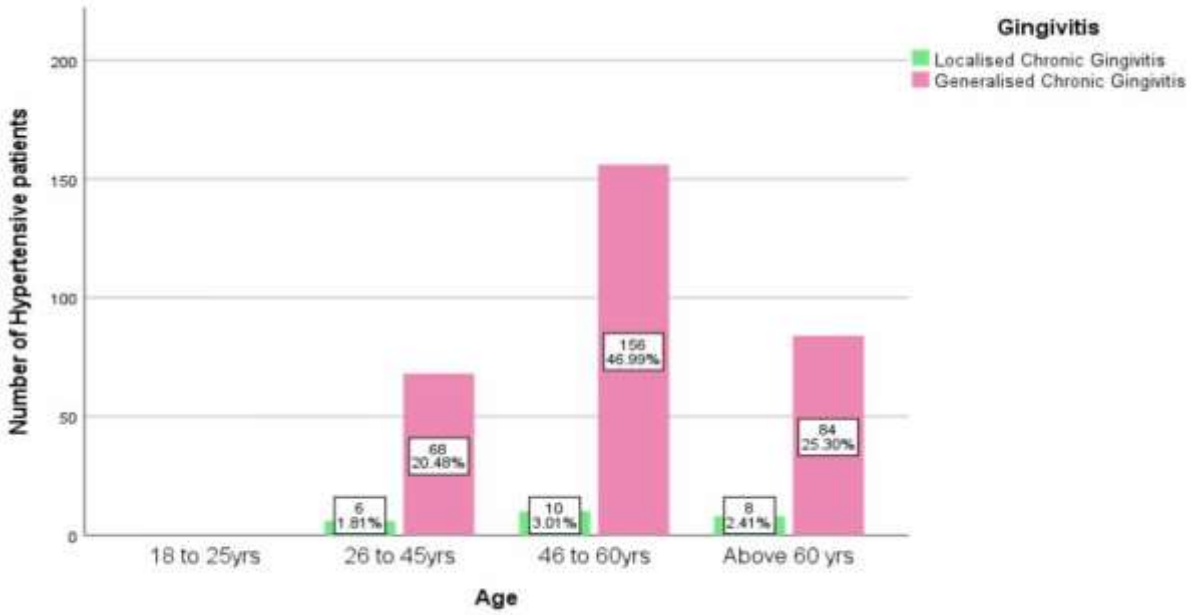

Figure 9: This bar graph represents the association between the age distribution and gingivitis among the hypertensive patients, where the x axis denotes the age distribution and y axis denotes the number of gingivitis patients.The green colour represents the localized chronic gingivitis patients and pink colour represents generalized chronic gingivitis. Chi square test was done and the association between age groups and gingivitis among hypertensive patients was found to be statistically significant, with p value of 0.001 (p value <0.05).

There were more patients of age 46 to 60 years had gingivitis among the hypertensive patients when compared to the others.

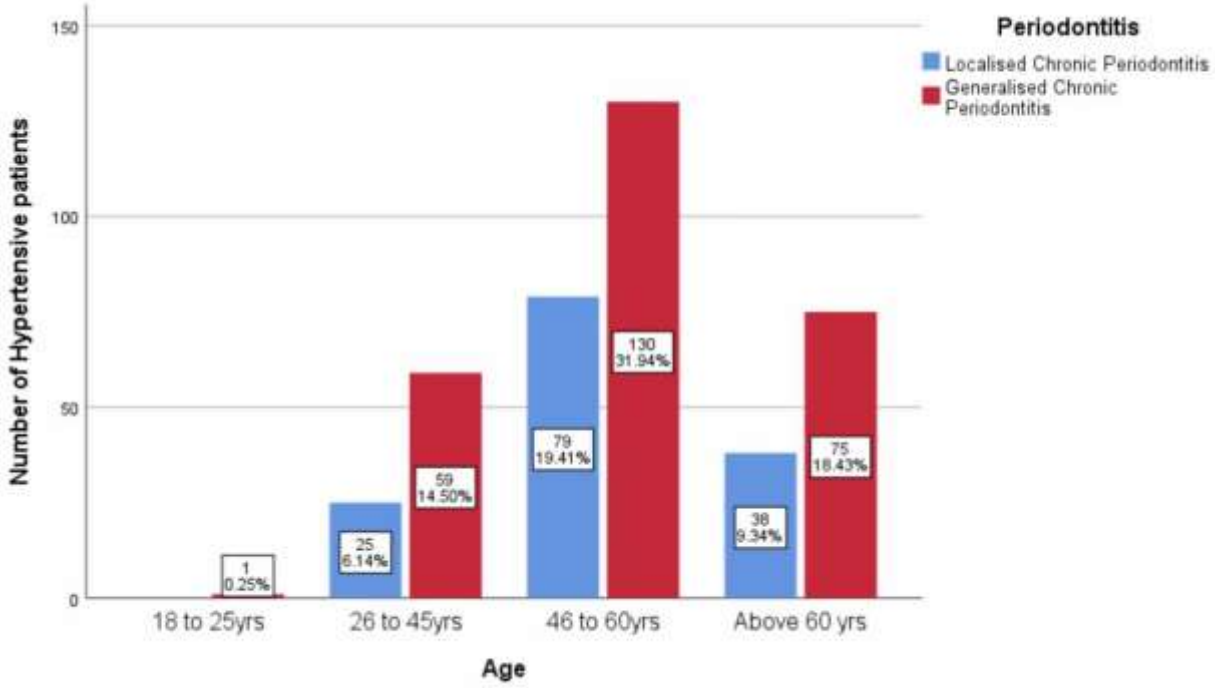

Figure 10: This bar graph represents the association between the age distribution and periodontitis among patients with hypertension, where the x axis denotes the age distribution and y axis denotes the number of periodontitis patients.The blue colour represents the localized chronic periodontitis patients and red colour represents generalized chronic periodontitis. Chi square test was done and the association between age groups and periodontitis among hypertensive patients was found to be statistically significant and with p value of 0.001 (p value <0.05). Patients in the age group of 46 to 60 years had more periodontitis among hypertensive patients when compared with the other age groups.

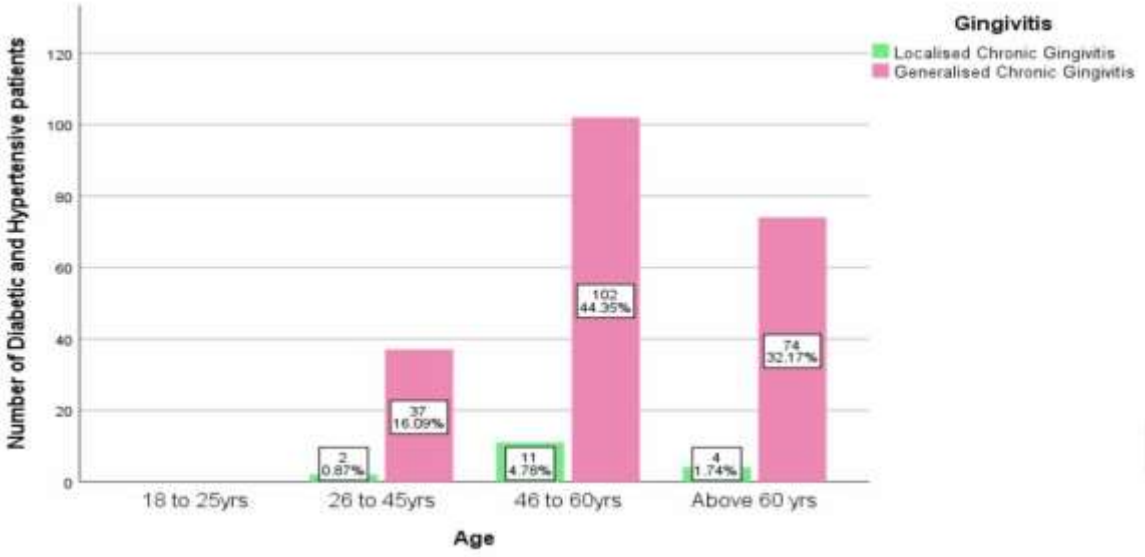

Figure 11: This bar graph represents the association between the age distribution and gingivitis among patients with both diabetes and hypertension, where the x axis denotes the age distribution and y axis denotes the number of gingivitis patients.The green colour represents the localized chronic gingivitis patients and pink colour represents generalized chronic gingivitis. Chi square test was done and the association between age groups and

gingivitis among diabetic and hypertensive patients was found to be statistically significant and with p value of 0.001 (p value <0.05). Majority of patients who had gingivitis among patients with both diabetes and hypertension belonged to the age group of 46 to 60 years.

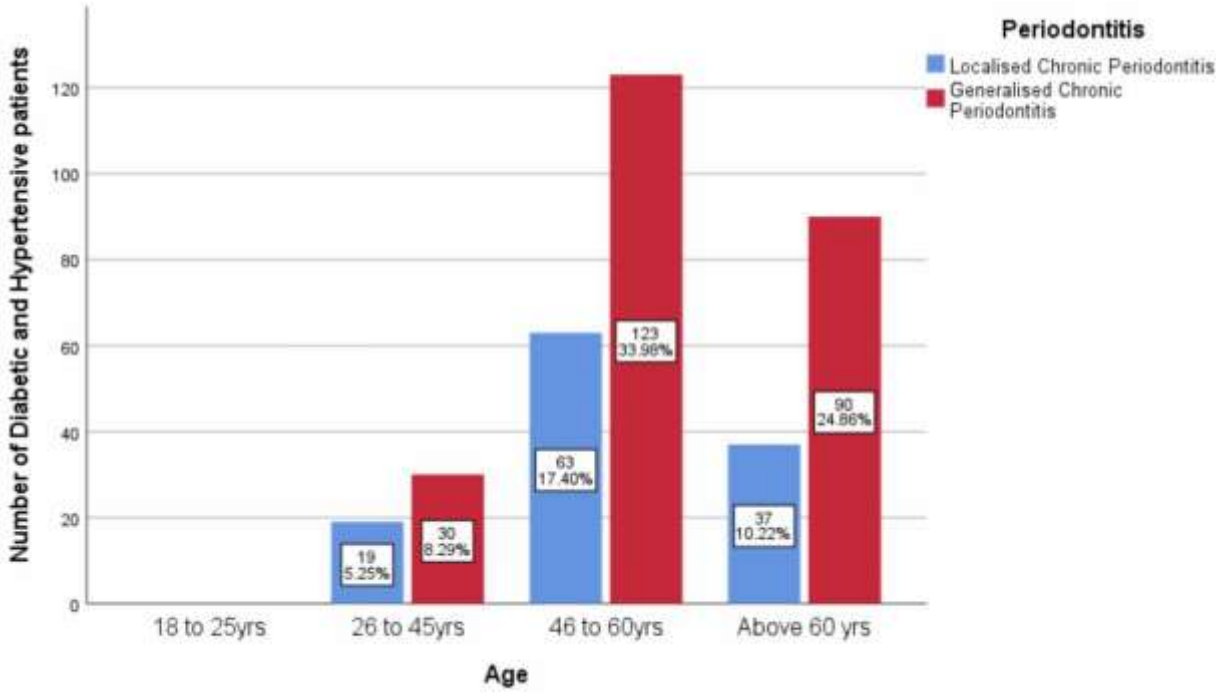

Figure 12: This bar graph represents the association between the age distribution and periodontitis among patients with both diabetes and hypertension, where the x axis denotes the age distribution and y axis denotes the number of periodontitis patients.The blue colour represents the localized chronic periodontitis patients and red colour represents generalized chronic periodontitis. Chi square test was done and the association between age groups and periodontitis among diabetic and hypertensive patients was found to be statistically significant and with p value of 0.001 (p value <0.05). Majority of patients who had periodontitis among patients with both diabetes and hypertension belonged to the age group of 46 to 60 years.

DISCUSSION

The mean age of the study population was 53.38±10.97 years which was similar to the study done by Sekino S et al, 2020 [4]. Prevalence of gingivitis was more at the 46 to 60 years age group. This was in contrast to the study done by Mathur 2002 B et al 2002 where the prevalence of periodontal diseases (89.6%) was in 35 to 45 years and 79.9% in 65.74 years [39]. Prevalence of periodontitis was more in the age group of 46 to 60 years which was contradicting the study done by Mathur B et al., 2010 [39]. Periodontitis had a male predilection, which is similar to the findings given by Eke at al., 2012 [40]. This could be due to poor oral hygiene and also to habits such as smoking.

Periodontitis is a host mediated inflammatory disease which is triggered by pathogenic microorganisms and is characterized by elevated levels of various cytokines and inflammatory mediators [6,18]. The inflammatory mediators and tissue breakdown products are usually detected at gingival tissues, gingival cervicular fluid, serum and saliva [9] Periodontitis and diabetes have a bi-directional relationship, which can influence the clinical outcomes of each other [41,42]. Hyperglycemia has shown to cause depression in polymorphonuclear leukocyte chemotaxis and apoptosis which leads to retention of the leukocytes in the periodontal tissue and causes more tissue destruction [43,44]. The exposure of collagen fibres to increased glucose levels causes nonenzymatic glycation and oxidation which changes the physical properties and reduces the collagen solubility and increases the connective tissue degradation [45]. Adipokines contribute to the susceptibility of diabetes and periodontitis, the leptin properties can be important in the upregulation of periodontal inflammation in people with diabetes [46]. Since diabetes is a confirmed major risk factor for periodontitis, the glycemic level control is of key importance [47–49]. Periodontal therapies could result in reduction of blood glucose levels thus benefiting the diabetic patients [45,50].

The chronic inflammatory process of periodontitis and the host response causes a hypothetical association between periodontitis and cardiovascular disease [51,52]. Many studies have documented that hypertensive patients had higher prevalence of periodontitis [53–56]. The inflammatory response with periodontitis causes adverse effects on the regulation and control of the blood pressure , indicating that inflammation can be a potential link between hypertension and periodontitis [34]. The periodontal pathogens can destruct and invade gingival tissues by proteolysis and introduces endothelial cell activation which is also involved in the pathogenesis of hypertension [57]. When periodontitis worsens, periodontal inflammation increases the reactive oxygen species into the systemic circulation [58,59]. This oxidative stress which is induced is implicated in hypertension also [34]. Studies suggest that the endothelial dysfunction is reversible after periodontal therapy in hypertensive patients [60,61].

From our present observations the prevalence of diabetes was more among the study population than hypertension. Diabetes is alarmingly gaining the status of a possible epidemic in India having more than 62 million diabetic patients who are currently diagnosed with the disease [62] . In our study, males had a higher prevalence of diabetes when compared to females. Male prevalence of systemic disease was also reported in the study by Danan G et al, 2011[63]. On the contrary, a study by Kapil et al 2018 stated female prevalence of diabetes and hypertension[64]. But recently it has become more apparent that middle aged male have a more significant chance of having diabetes than females in several other populations [65]. The prevalence of gingivitis and periodontitis was more in the age group of 46 to 60 years,which was consistent with the study done by Bacic in 1998.[66] This could be attributed with to the age changes in the periodontium, along with the untoward effects of diabetes on the collagen metabolism.

The prevalence of gingivitis and periodontitis in hypertension is more in the age group of 46 to 60 years. One major reason for this trend is the patterns of Blood pressure changes and increasing hypertension prevalence with age [67]. Prevalence of gingivitis and periodontitis among patients having both diabetic and hypertension is high among 46 to 60 years.This could be related to the current lifestyle modifications and other environmental risk factors.

The findings from the present study population can have a huge impact on raising awareness on prevalence of gingivitis and periodontitis among diabetic and hypertensive patients. However the current study had a geographic limitation of analysing only the South Indian population. For future scope of the research with larger sample size and inclusion of different ethnicity will provide better results . Further longitudinal and interventional studies can provide deeper knowledge to oral health planners for proposing strategies to help in development of dental health care management.

CONCLUSION

Within the limitations of the study, we found male predilection among both diabetic and hypertensive patients. Gingivitis and Periodontitis was more common in the age group of 46-60 years. Among diabetic patients, 41.26% had gingivitis and 58.74% had periodontitis. There was a higher prevalence of periodontitis (55.07%) than gingivitis (44.93%) in the hypertensive group. Similarly, among the patients who had both diabetes and hypertension , there was a higher prevalence of periodontitis (61.15%) than gingivitis (38.85%).

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CONFLICT OF INTEREST : None declared

AUTHORS CONTRIBUTION

Author 1 (Swetha Ilangovan) carried out the retrospective study by acquisition of the data and performing the necessary statistical analysis and interpretation of the data and drafted the manuscript. Author 2 (Dr. Priya Lochana Gajendran) helped with the conception and the design of the topic and participated in the study design, statistical analysis and supervised the drafting of the article and revised the manuscript critically for important intellectual content. Author 3 (Dr. Geo Mani) participated in the study design and coordinated in the preparation and development of the manuscript. All the authors had made a substantial contribution to the final manuscript and gave the approval for the version to be submitted.

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