International Journal of Psychosocial Rehabilitation, Vol. 24, Issue 01, 2020
ISSN: 1475-7192

PREVALENCE OF DIABETES MELLITUS AND HYPERTENSION AMONG DENTAL PATIENTS - A HOSPITAL BASED STUDY

Type of manuscript : Original study

Running title : Prevalence of diabetes mellitus and hypertension among dental patients

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ABSTRACT :

Diabetes Mellitus and Hypertension are two chronic , non - communicable diseases with increasing incidence worldwide . DM and HT are interrelated diseases that strongly predispose an individual to cardiovascular diseases and other systemic diseases . Hence diabetes mellitus and hypertension are quite important in dental settings as may present as an emergency during dental treatment or may necessitate a modification in the patient's management . The objective of this study is to determine the prevalence of coexistence of Diabetes mellitus and Hypertension among the group of dental outpatients of Saveetha dental college and to assess the relationship with other systemic conditions and dental problems .The data from 86 , 000 patients visited Saveetha dental college during the time period of June 2019 to March 2020 were reviewed and the data of patients with medical history of coexisting Diabetes Mellitus and Hypertension were collected. The data of additional systemic diseases and the dental problems of such patients were also collected . The obtained data were entered in an excel sheet . Then the data were imported to statistical analysis software [SPSS] and analysed for significance .Among 24,132 patients, 279 patients have coexisting prevalence of Diabetes mellitus and Hypertension . The predominant age group of the patients was 41 to 70 yrs [87 %] . The gender was predominantly Male [52 %] . 84 % of these patients were not having any added systemic illness . 8 % of these patients have myocardial infarction . The predominant dental complaint of these patients was pulpitis [41 %] followed by edentulousness 19% , dental caries 18% and periodontitis 13%. The diet status of these patients was predominantly Non - veg [97 %]. Dentists should note that co-existence of Diabetes mellitus and hypertension in a dental patient was an index of increased morbidity and mortality and should always screen for these medical conditions.

Keywords :*Prevalence ; Coexisting ; Hypertension ; Diabetes mellitus ; Dental patient*

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Received: 18 Nov 2019 | Revised: 09 Dec 2019 | Accepted: 02 Jan 2020

I. INTRODUCTION :

Hypertension and Diabetes mellitus are two chronic non - communicable diseases with increasing worldwide (Shaw, Sicree and Zimmet, 2010; Ulasi *et al.*, 2011). Diabetes mellitus is a common and a serious disease with chronic complications and constitutes a substantial burden for both patient and health care system (Whiting *et al.*, 2011) . Sex , age and ethnic background are important factors in determining the risk of developing DM (Shaw, Sicree and Zimmet, 2010)(Shaw, Sicree and Zimmet, 2010; Ulasi *et al.*, 2011)(Shaw, Sicree and Zimmet, 2010) . Hypertension in insulin resistance states is generally attributed to hyperinsulinemia with resulting increases in renal sodium retention and Hypertension is about twice as frequent in individuals with diabetes as in those without ('National High Blood Pressure Education Program Working Group Report on Hypertension in the Elderly. National High Blood Pressure Education Program Working Group', 1994) . Hypertension and Diabetes mellitus both are rapidly emerging as public health problems in developing countries (Bhardwaj *et al.*, 2010) . DM and HT frequently coexist in many individuals . The possible reason for their coexistence may be the common risk factors such as obesity , sedentary lifestyle and poor dietary choices (Bakris and Gonzalez, 2007).

About 75 % of diabetes patients will develop hypertension overtime through diverse mechanism such as activation of tissue based renin angiotensin aldosterone axis, hyperglycemia, reduced baroreceptor response, loss of circadian rhythm without the normal nighttime depression in blood pressure, endothelial dysfunction and vascular oxidative stress (Simonson, 1988; Opeodu and Adeyemi, 2015) . The rate at which hypertension co-exists with DM is such that diabetes are 1.5 to 2 times more likely to be hypertensive than their non - diabetic counterpart (Simonson, 1988) . Coexistence of two conditions tends to increase morbidity and mortality , as affected individuals are at increased risk of complications such as retinopathy , non - traumatic amputation , renal impairment and cardiovascular diseases (Lonati *et al.*, 2008)(Tiptaradol and Aekplakorn, 2012). Malignant oral lesions were also prevalent in patients with coexisting Diabetes mellitus and Hypertension (G. Jayaraj *et al.*, 2015; Gupta and Ramani, 2016; Thangaraj *et al.*, 2016; Sridharan, Ramani and Patankar, 2017)(Shaw, Sicree and Zimmet, 2010; Ulasi *et al.*, 2011)(G. Jayaraj *et al.*, 2015; Gupta and Ramani, 2016; Thangaraj *et al.*, 2016; Sridharan, Ramani and Patankar, 2017)**.**

The presence of these two conditions or any one of them in a dental patient poses a major risk to the management of such an individual as any of the conditions may present as an emergency during dental procedure or necessitate a modification in the treatment plan (Opeodu and Adeyemi, 2015) . These medical conditions are there of utmost importance to a dentist as patients may not be sure of their medical condition or may have a wrong notion of being in perfect health in the absence of symptoms . Uncontrolled diabetes mellitus predisposes to delayed wound healing and infection , which may necessitate prophylactic antibiotics before dental treatment (Vernillo, 2003) . Uncontrolled hypertension may predispose to excessive bleeding during dental treatment such as a tooth extraction . Despite the fact that the conditions are important to the successful management of dental patients , few dental practitioners will go beyond the routine of verbal confirmation of the presence or absence of these conditions to screening patients for the conditions before embarking on treatment.(Greenwood and Lowry, 2002)(Gheena and Ezhilarasan, 2019) . Documentation of the clinical appearance of various related DM and HT needs a good photograph to assess the progression and regression of lesions over a period of time. (Hannah *et al.*, 2018)

The present study was therefore conducted to assess the prevalence of coexisting Diabetes mellitus and Hypertension among dental patients of the Outpatient department in Saveetha dental college and to correlate the relationship between DM & HT with other systemic conditions and dental / oral health problems.

II. MATERIALS AND METHODS:

This study was done in a hospital setting of a varied population (predominantly South Indians). The approval for the study was given by IRB and the study includes all the patients reported to dental hospital for a period of 6 months [Sept 2019 to Feb 2020] with coexistent Diabetes Mellitus and Hypertension. The coexistence of Diabetes mellitus and Hypertension was confirmed the past medical history of the patient .

This was a retrospective cross sectional study. All case sheets for the period of 6 months were reviewed and cross verified. Samples of all the patients with coexisting DM and HT were filtered and entered in an excel sheet.

The data from 86,000 patients visited Saveetha dental college during the time period of June 2019 to March 2020 were reviewed and the data of patients with medical history of coexisting Diabetes Mellitus and Hypertension were

collected. All the data were tabulated. The incomplete data were verified from concerned departments or patients and gross incomplete data which have possibilities of bias were not included .

The data were imported to statistical software SPSS by IBM and Chi - square test was the statistical test used. Chi - square test measures how well the observed distribution of data fits with the distribution that was expected if the variables were independent. Keeping age , gender , diet as independent variables and DM & HT as dependent variables Chi - square correlation analysis was done and the p value level of significance set at 0.05.

III. RESULTS AND DISCUSSION:

Among 24,132 patients, 279 patients were found to have coexisting prevalence of Diabetes mellitus and Hypertension . The predominant age group of the patients was 41 to 70 yrs (87 %) . Among the study samples , 4% were 30 to 40 yrs old , 23 % were 41 to 50 yrs old , 30 % were 51 to 60 yrs old , 34 % were 61 to 70 yrs old and 9 % were 71 to 80 yrs old (Table 1) .

In the present study , the predominant age of the patients was 61 - 70 yrs old (37 %) . The previous literature (Kapil *et al.*, 2018) have similar findings of mean age of Males as 69.5 ± 7.4 yrs old and mean age of Females as 67.8 ± 7.2 yrs old . On the other hand , the study (K, Venugopal and Mohammed, 2014) have opposing findings of mean age as 40 yrs old . Many previous literature consensus with the parameter as the prevalence of DM & HT increases with age . Factors like Diet status , work pattern and lifestyle changes were the major reasons for DM & HT to be more prevalent among middle aged adults .

The gender of the sample population was predominantly Male (52 %) (Table 2) Previous literature (Kishore *et al.*, 2016) have similar findings of increased prevalence in Males . On the other hand , the study (K, Venugopal and Mohammed, 2014) has opposing findings as increased prevalence in females. Many previous literature consensus with the parameter as it depends on personal habits, lifestyle patterns and diet of the individual.

In the present study 84 % of the patients with coexisting DM and HT were not having any added systemic illness. 8 % of patients have Coronary heart disease and 3 % have Myocardial infarction . Other systemic conditions such as Renal disorder , Gastric disorder , Epilepsy , Malignancy , Asthma were also associated among the patients (< 2 to 3 %) (Table 3) The second most prominently associated coexisting systemic illness of these patients was Cardiovascular diseases . Previous literature (Jones and Hall, 2002) , (Petrie, Guzik and Touyz, 2018)(Shaw, Sicree and Zimmet, 2010; Ulasi *et al.*, 2011)(Petrie, Guzik and Touyz, 2018)(Swathy, Gheena and Varsha, 2015) have similar findings that cardiovascular diseases were exacerbated by Diabetes Mellitus and Hypertension. Many previous studies are in concordance with the parameters as DM & HT were associated with risk factors of endothelial dysfunction, vascular inflammation , arterial remodelling , coronary artery disease and myocardial infarction .

The predominant dental complaint of these patients was Pulpitis (41 %) . 19 % of them have complained of edentulousness, 18 % have dental caries, 13 % have periodontitis, 6 % have abscess, 3 % have stains and calculus and 1 % have ulcers (Table 4) . The p value for the correlation of other systemic conditions and dental diseases was significant ($p < 0.05$) (Table 6) . The diet status of these patients was prominently Non - vegetarian - 97 % (Table 5). The study (Mealey, 2014) have similar findings and consensus with the parameters as diabetes mellitus is a risk factor prone for infections & it leads to delayed wound healing, periodontal problems and other oral diseases(Sivaramakrishnan and Ramani, 2015)(Jangid *et al.*, 2015). It was reported that periodontal problems such as Periodontitis, Mobility of teeth were most common in patients with coexisting diabetes mellitus and hypertension. Other dental conditions such as Abscess were also more common in such patients.

In the present study, 1 % of the patients have the complaint of oral malignant ulcers (Gifrina Jayaraj, Ramani, *et al.*, 2015). The imbalance of regeneration and destruction of the extracellular matrix due to plethora of Chema and cytokines, elevated matrix metalloproteinases, bacterial contamination and repetitive painless tissue damage can lead the chronicity of a wound especially in diabetic patients having delayed wound healing, causes malignant ulcers. (G. Jayaraj *et al.*, 2015; Sherlin *et al.*, 2015; Viveka *et al.*, 2016; Shree *et al.*, 2019; Sridharan *et al.*, 2019)(Gifrina Jayaraj, Sherlin, *et al.*, 2015).

The prominent diet habits of the patients in the present study was Non - vegetarian (Table 5). Previous literature (Apidechkul, 2018) have similar findings and consensus with the parameter as the high cholesterol diet intake leads to obesity which is a major risk factor of Diabetes mellitus, Hypertension and Cardiovascular diseases. In India, Hypertension and Diabetes are the major causes of morbidity and mortality in population and are the risk factors of many other diseases including heart attack, stroke, kidney failure, leg amputation, vision loss, blood vessels & peripheral nerve damage (Kapil *et al.*, 2018)

The present study has certain limitations such as less sample size, Cross sectional study done in short duration and confined to a single centre. There was an absence of assessment of correlation with blood sugar level and HbA1C. Future scope includes study for a large population of long term observational study. Assessment of correlation with dental diagnosis and treatment outcomes .

Table 1: Represents the frequency of Age of the patients with DM and HT

AGE	**FREQUENCY**	**PERCENT**
30 to 40 yrs	13	4.7
41 to 50 yrs	63	22.6
51 to 60 yrs	85	30.5
61 to 70 yrs	94	33.7
71 to 80 yrs	24	8.6
TOTAL	279	100.0

Table 2 : Represents the frequency of Gender of the patients with DM and HT

GENDER	**FREQUENCY**	**PERCENT**
Male	145	52
Female	134	48
TOTAL	279	100.0

Table 3 : Represents the frequency of Other systemic conditions of the patients with DM and HT

OTHER SYSTEMIC CONDITIONS	**FREQUENCY**	**PERCENT**
Asthma	4	1.4
Asthma , Malignancy	1	0.4
Asthma , Myocardial infarction , Renal disorder	1	0.4
Coronary heart disease	21	7.5

Coronary heart disease , Myocardial infarction	1	0.4
Coronary heart disease , Renal disorder	1	0.4
Epilepsy	3	1.1
Gastric disorder	2	0.7
Myocardial infarction	7	2.5
Myocardial infarction , Malignancy	1	0.4
Renal disorder	3	1.1
Nil	234	83.9
TOTAL	279	100.0

Table 4 : Represents the frequency of Dental complaints of the patients with DM and HT

DENTAL COMPLAINTS	FREQUENCY	PERCENT
Abscess	17	6.1
Calculus	3	1.1
Dental caries	50	17.9
Edentulousness	52	18.6
Periodontitis	36	12.9
Pulpitis	113	40.5
Stains	7	2.5
Ulcer	1	0.4
TOTAL	279	100.0

Table 5 : Represents the Diet status of the patients with DM and HT

DIET STATUS	FREQUENCY	PERCENT
Non - Vegetarian	272	97.5
Vegetarian	7	2.5
TOTAL	279	100.0

Table 6 : Represents Chi - square comparison and p value for various parameters

COMPARISON	p VALUE	SIGNIFICANCE
Age Vs Other systemic conditions	0.541	P > 0.05(Not significant)
Age Vs Dental complaints	0.225	P > 0.05(Not significant)

Gender Vs Other systemic conditions	0.222	P > 0.05 (Not significant)
Gender Vs Dental complaints	0.371	P > 0.05 (Not significant)
Other systemic conditions Vs Diet status	1.000	P > 0.05 (Not significant)
Other systemic conditions Vs Dental complaints	0.000	P < 0.05 (Significant)

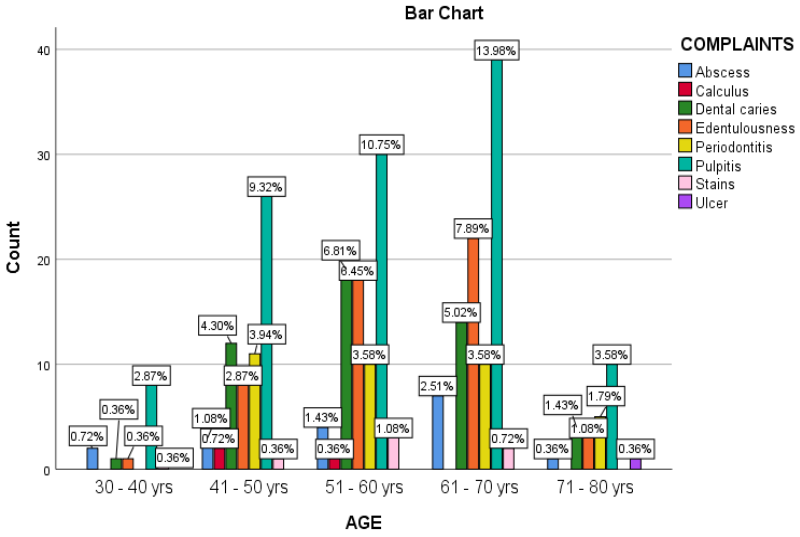

Figure 1: Bar graph representing the comparison of Age and Dental complaints of the Patients with co-existent diabetes and hypertension. The X axis represents the Age group of the patients and the Y axis represents the frequency of patients with dental complaints such as Abscess (Blue), Calculus (Red) , Dental caries (Dark Green) , Edentulousness (Orange) , Periodontitis (Yellow) , Pulpitis (Mint green) , Stains (Pink) and Ulcers (Violet) . There was no significant association between Age and Dental complaints of the patients . Pearson Chi square p > 0.05.

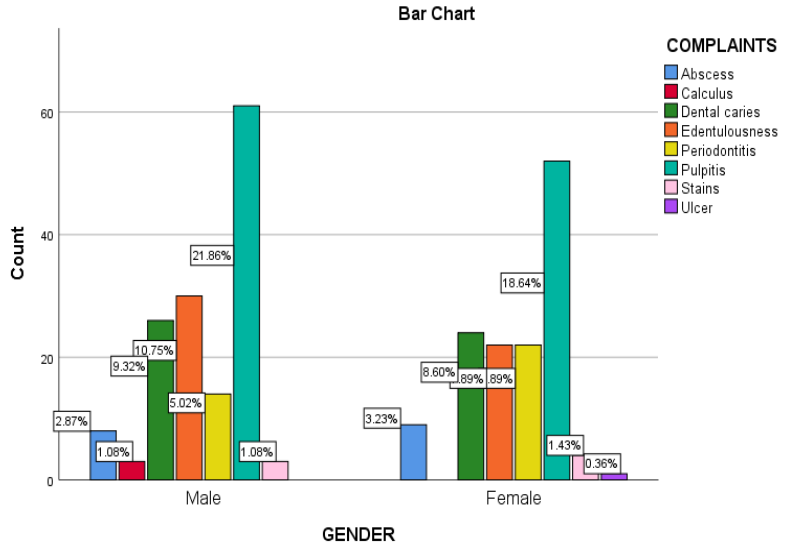

Figure 2 : Bar graph representing the comparison of Gender and Dental complaints of the Patients with co-existent diabetes and hypertension. The X axis represents the Gender of the patients and the Y axis represents the frequency of patients with dental complaints such as Abscess (Blue) , Calculus (Red) , Dental caries (Dark Green) ,

Edentulousness (Orange) , Periodontitis (Yellow) , Pulpitis (Mint green) , Stains (Pink) and Ulcers (Violet) . There was no significant association between Gender and Dental complaints of the patients . Pearson Chi square p > 0.05 .

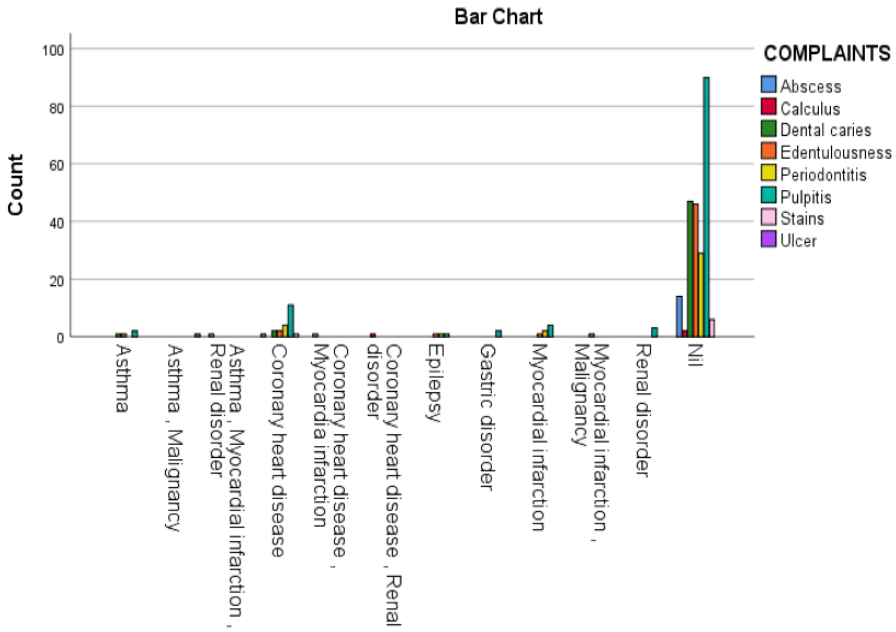

Figure 3 : Bar graph representing the comparison of Other systemic conditions and Dental complaints of the Patients with co-existent diabetes and hypertension. The X axis represents other systemic conditions of the patients and the Y axis represents the frequency of patients with dental complaints such as Abscess (Blue) , Calculus (Red) , Dental caries (Dark Green) , Edentulousness (Orange) , Periodontitis (Yellow) , Pulpitis (Mint green) , Stains (Pink) and Ulcers (Violet) . Majority of patients with coexistent DM and HT were not associated with other systemic illness and did not seem to affect the risk of developing dental disease. This was found to be statistically significant. (Pearson Chi square p < .001)

IV. CONCLUSION :

The coexisting Diabetes mellitus and Hypertension seems to be a risk factor for dental and oral conditions such as Pulpitis , Periodontitis , Abscess, Dental caries and various other mucosal diseases. Dentists should note that coexistence of diabetes mellitus and hypertension in dental patients is an index of increased morbidity and mortality. Extra care should be taken in patients with coexisting DM & HT before dental treatment along with investigation of blood sugar level and blood pressure level .

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