Prevalence of Hypertension among Dental Patients with Diabetes Mellitus: An Institutional Study

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Article History:
Received on: 17 Sep 2020
Revised on: 18 Oct 2020
Accepted on: 19 Oct 2020

Keywords:
Dental Patient, Extractions, Diabetes Mellitus, Hypertension, Prevalence, Systemic Diseases, Oral Surgery

ABSTRACT

Diabetes mellitus and hypertension co-exists in many individuals as the pathogenic relationship between diabetes mellitus and hypertension is actually bidirectional. Extraction of teeth is a common procedure performed in Dentistry and the Co-existence of these systemic diseases in dental patients can cause many complications like delayed wound healing, infection or bleeding during dental extractions. The aim of the present study was to assess the prevalence of hypertension among dental patients with diabetes mellitus in south Indian population. A retrospective study was conducted from the data of 6682 dental patients who visited the outpatient Department of Oral and Maxillofacial Surgery, Saveetha Dental College, Saveetha University, Chennai, for dental extractions due to various reasons during the time period from June 2019 – to March 2020. Patients data was retrieved from the institutional digital data registry and statistically analysed. Among 6682 patients who underwent extractions, 904 [13.5%] patients had diabetes mellitus. Among 904 patients with diabetes mellitus, 419 [46.3%] patients had hypertension. Prevalence of hypertension was more in males than females and the results were statistically not significant [p=0.062, (>0.05)]. Prevalence of hypertension was more in 41-50 years age group and the results were statistically significant. [p<0.001, (<0.05)]. According to our study, a high proportion of patients with diabetes mellitus undergoing dental extractions had hypertension which can cause increased morbidity and mortality. Males and patients belonging to fifth decade of life were more affected by both diabetes mellitus and hypertension.

INTRODUCTION

Diabetes mellitus [D.M.] is a significant health problem throughout the world, and its incidence is steadily increasing (Shaw et al., 2010). Diabetes mellitus can cause several complications in the patient, which can affect the quality of life. Diabetes mellitus and hypertension [H.T.] co-exists in many individuals as the relationship between them is bidirectional, and their frequency increases with increasing age. Hypertension is a prevalent comorbidity amongst persons with diabetes mellitus and is said to be twice as prevalent in people with
diabetes than in non-diabetic individuals. It has also been shown that hypertension in diabetic persons is associated with accelerated progression of both microvascular and macrovascular complications like cardiac disease, peripheral vascular disease, stroke, retinopathy, and nephropathy (de Boer et al., 2017). Extraction of teeth is a very common procedure performed in Dentistry and Co-existence of these systemic diseases in dental patients can cause many complications like delayed wound healing, infection or bleeding during dental extractions.

Co-existing diabetes with hypertension among the Iraqi population was 89.6% (Mansour, 2012), whereas, in the study done in the Nigerian population, it was 50-60% (Unadike et al., 2011; Akhuemokhan et al., 2008). Thus, a high prevalence rate of hypertension in patients with diabetes mellitus was observed, and it varied among the different population based on race, culture and socioeconomic factors.

Very few studies have been done to estimate the prevalence of hypertension among dental patients with diabetes mellitus in our population (Radhakrishnan and Ekambaram, 2015). The development of hypertension in diabetic individuals complicates treatment strategy and increases healthcare costs. A high proportion of diabetic subjects exhibit poorly controlled hypertension which reflects not only poor adherence to the prescribed treatment regimen but also uncertainty regarding the dental treatment results (Tsimihodimos et al., 2018). Understanding the prevalence rate of these co-morbidities in our population will help us to formulate dental treatment protocols accordingly, to prevent morbidity and mortality as they pose medical emergency during dental and oral surgical procedures like extractions and other surgical procedures.

Thus, dental practitioners need to do pretreatment assessment to identify these systemic problems and take necessary precautionary measures and make modifications in dental treatment for successful outcomes. The present study aimed to assess the prevalence of hypertension among dental patients with diabetes mellitus in south Indian population. The objectives of this study were to evaluate the association between age categories and hypertension and to evaluate the gender differences in the prevalence of hypertension.

**MATERIALS AND METHODS**

This cross-sectional, retrospective study was conducted in Saveetha dental college, Saveetha University, Chennai, Tamilnadu, India. The study was initiated after approval from the institutional review board - SDC/SIHEC/2020/DIASDATA/0619-0320. Written consent was already obtained from each participant when their demographic details were collected.

Data of all dental patients aged 18 years and above who underwent extraction of teeth for various reasons in our institution in the out-patient department of Oral and Maxillofacial Surgery from June 2019 to March 2020 were included in the study. Pregnant females, patients aged below 18 years of age, were excluded from the study. Our study data was selected with a convenience non-probability sampling and consisted of 6682 dental patients who underwent extraction of teeth.

Patients data were retrieved from the institutional digital data registry. Data registry provided information on the patient's age, gender, marital status, education level and occupation, smoking, and alcohol habits, past medical history of diabetes mellitus, hypertension, duration of systemic diseases and drug history. A standardized interviewer-administered pre-tested medical questionnaire was used to obtain these details while recording their demographic data and systemic status. Also, before dental extractions, patients' blood pressure and blood glucose levels were evaluated to determine if there were any undiagnosed cases of diabetes mellitus or hypertension.

**Statistical analysis**

The collected data was validated, tabulated and analyzed with Statistical Package for Social Sciences for Windows, version 23.0 (SPSS Inc., Chicago, IL, USA) and results were obtained. Categorical variables were expressed in frequency and percentage; and continuous variables in mean and standard deviation. Chi-square test was used to compare between proportions and tests of association. P-value < 0.05 was considered statistically significant.

**RESULTS**

In our study, a total of 6682 patients undergoing dental extractions with a mean age of 41.72 years and S.D. 15.097 with an age range of 18-91 years were analyzed. There were 3579 [53.6%] males and 3102 [46.4%] females. In the entire study population, 904 [13.5%] patients had diabetes mellitus. In the entire sample, a total of 904 patients had diabetes mellitus with most of them belonging to the age group of 41-50 years (346 [38.3%]), followed by 172 [19%] patients in 51-60 years and 148 [16.4%] patients in 31-40 years. Less prevalence was seen in the 21-30 age group (4[0.4%]). Mean age of all patients with diabetes mellitus in the population...
was 53.87 years [S.D. – 13.162] with an age range of 23-91 years. Among 904 people with diabetes mellitus, 516 were males [57.1%], and 388 were females [42.9%].

Among 904 patients with diabetes mellitus, 419 (46.3%) patients had hypertension [Figure 1]. Among 419 patients with hypertension, most of them belonged to the age group of 41-50 years [29.8%], followed by 81 [19.3%] patients in 61-70 years, 77 [18.4%] patients in 51-60 years and 66 [15.8%] patients in 71-80 years. Less prevalence was seen in 91-100 age group [1 [0.2%)] [Figure 2]. Mean age of 419 patients with hypertension was 57.46 years [S.D. – 13.649] with an age range of 35-91 years. Among 419 people with hypertension, 253 were males [60.38%], and 166 were females [39.62%] [Figure 3].

Males were more affected by hypertension than the females, but the results were statistically not significant [p=0.062 (>0.05), chi-square test] [Figure 4]. Thus, there was no statistically significant association between gender and hypertension among dental patients. Patients in the age group of 41-50 years were most affected by hypertension, followed by 61-70 years group, and the results were highly statistically significant. [p<0.001 (<0.05), chi-square test] [Figure 5]. Thus, there was a statistically significant association between age and hypertension among dental patients.

DISCUSSION

Presence of systemic diseases like diabetes mellitus and hypertension, either alone or in combination in the dental patients undergoing extrac-
In the study by V Morge et al., the prevalence of hypertension which is by the previous literature.

The prevalence of diabetes mellitus in our entire study population was 13.5%. In the entire sample, a total of 904 patients (13.5%) had diabetes mellitus with most of them belonging to the age group of 41-50 years [38.3%], with 57.1% of males and 42.9% of females. The prevalence of hypertension among 904 dental patients with diabetes mellitus was 46.35%. Among patients with hypertension, most of them belonged to the age group of 41-50 years [29.8%]; and males [60.4%] were affected more than females [39.6%]. According to our study, males were affected by hypertension more than the females, and the results were statistically not significant. Prevalence of hypertension was more in 41-50 years statistically significant age group.

Prevalence of D.M. in our study was 13.5%, and males were affected more than females in the age range of 41-50 years. In Sudan (Eltom et al., 2018), the prevalence of D.M. was 18.7% which is under our study. A study done in Ghana found that both hypertension and D.M. were significantly prevalent, 35% and 7.7%, respectively. The prevalence of hypertension (35%) found in this sample was more significant than the estimated average prevalence found in earlier studies in Ghana, as well as greater than the prevalence in countries such as Canada (22%), Egypt (23.6%) and China (13.6%) (Cook-Huyhn et al., 2012). In a study done on a tribal population of northern Thailand, the overall prevalence of Type 2 D.M. and H.T. was 16.8%, and 45.5%, respectively and approximately 9% individuals had co-morbidity of Type 2 D.M. and HT (Apidechkul, 2018), which is in accordance to our study results.

In our study, Prevalence of hypertension among dental patients with diabetes mellitus was 46.3%. Whereas in the study by Unadike et al. (2011) and Akhuemokhan et al. (2008) a higher prevalence of hypertension among persons with diabetes mellitus was present with 54.2% and 58.5% respectively. Studies have shown the co-existence-existence of hypertension with diabetes mellitus in different populations all around the world, with most of them demonstrating a very high prevalence rate of hypertension with a range of 40% up to 80% (Shaw et al., 2010; Colosia et al., 2013; Onuoha and Egwim, 2017). Thus, our study results showed a high prevalence of hypertension which is by the previous literature.

In the study by V Morge et al., the prevalence of hypertension was 21%, and the prevalence of hyperglycaemia was higher among patients aged 40 years Mogre et al. (2014). In another study, around 36% of males and 26% of females were diagnosed as hypertensives (Radhakrishnan and Ekambaram, 2015). In a study by Kokiwar et al. (2012) among the age group 30 years, the prevalence of hypertension was 19.04% in the rural population of central India. Gupta et al. (1997) reported a prevalence of hypertension of 24% in males and 17% in females in the age group of 20 years and above from rural Rajasthan. In a study in rural Tamil Nadu in the age group of 20 years and above the prevalence rate of hypertension was 12.5% Gilberts et al. (1994). The prevalence of hypertension in the Nigerian study by O.I. O et al., was 22.2% (Opeodu and Adeyemi, 2015). Several studies have shown different prevalence rates of hypertension with 30% in the study by Fernandez-Feijoo et al. (2010) and Kellogg and Gobetti (2004) 13.5% by Pyle et al. (2000), and 19.7% in the study by Ojehanon and Akhinobare (2007).

Prevalence of hypertension in our study was significantly higher in males than in females. Similar findings were reported by Gupta et al. (1997) and Dong et al. (2008), but Hazarika et al. (2004) and Malhotra et al. (1999) showed increased prevalence in females when compared with males. Saswata et al. reported that females had a greater chance of developing H.T. than males in a study conducted in western India (Ghosh et al., 2016).

According to a Nigerian study, males are more affected by hypertension than females and prevalence tend to increase with the age of the respondents (Ulasi et al., 2011). The prevalence of hypertension in our study also tends to increase with the age of respondents, which is in agreement with other studies (Kellogg and Gobetti, 2004; Pyle et al., 2000; Ojehanon and Akhinobare, 2007). In a study done among oral surgery patients, a higher prevalence of diabetes mellitus (38.8%) followed by hypertension (32.2%), was observed and most of the affected patients were in the age range of 40-60 years (Kumar and Rajan, 2016), which is in accordance to our study. According to a Dutch study, the prevalence of D.M. and Hypertension increased in the women of the age group 45-54 years and hypertension occurred significantly in the 35-44 years age group; and the results are similar to our study (Elting et al., 2001). According to a study done in Tamilnadu (Radhakrishnan and Ekambaram, 2015), majorities of prediabetics, diabetics and hypertensives were in the age group between 40 and 60 years, which is in accordance with our study.
Different prevalence rates of hypertension among patients with diabetes mellitus were recorded with 25% in the study by Osuntokun (1972), 30% by Okesina et al. (1995) and 35% by Chuhwak et al. (2002). Further, Kumwenda et al. (1992) and Swai et al. (1990) in their reports recorded a prevalence rate between 37% and 45%. The differences in prevalence rates of H.T. could be due to sociocultural and economic, racial differences and varied geographic locations reported in the studies, and most of the patients reside in the developing countries.

There several reports of diabetic patients developing hypertension and vice-versa, with the rate at which the two conditions co-exist poses a diabetic individual an increased risk of between 1.5 to 2 times of developing hypertension when compared with those that do not have diabetes. Hypertension co-morbidity is found to be the most significantly associated factor with the D.M. Hypertension is prevalent in patients with diabetes mellitus [primarily type II D.M] and adequate control of the blood pressure reduces the microvascular and macrovascular complications of D.M. Patients with hypertension are eightfold more likely to develop diabetes than those without hypertension.

Dentists need to be aware of the co-existence-existence of the two conditions in individuals with either condition and take necessary precautions during dental treatment to reduce the morbidity and mortality associated with the co-existence-existence of both conditions. Such patients with either of these chronic conditions must be on lifelong screening for complications. In controlled diabetes mellitus and hypertension patients, dental and oral surgical procedures can be safely performed. Dental patients must have their blood pressures and blood glucose levels checked before any dental procedures. This is of utmost importance as early diagnosis and management are associated with a significant reduction in morbidity and mortality.

Limitations of the study
Our study has few limitations as it is a single institutional-based study. Still, the clinical findings are significant as it shows a high prevalence of hypertension among people with diabetes in our study population.

Future recommendations
It is recommended to establish large scale coordinated national programs to counteract the increasing burden of D.M. in our country. Also, early Hypertension screening should be done in diabetic patients to control co-morbidity and further complications during dental procedures like extractions.

CONCLUSION
According to our study, a high proportion of patients with diabetes mellitus undergoing dental extractions had hypertension which can cause increased morbidity and mortality. Males and patients belonging to the fifth decade of life were more affected by both diabetes mellitus and hypertension. As diabetes mellitus and hypertension often co-exist, a thorough case history must be taken, and the patients with diabetes mellitus must be routinely screened for hypertension before treatment to take precautionary steps during dental and oral surgical procedures, thereby avoiding untoward complications. According to the patient’s systemic status, modifications must be made in the medications prescribed for dental extractions.

Funding Support
The authors declare that they have no funding support for this study.

Conflict of Interest
The authors declare that there is no conflict of interest for this study.

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