**RESEARCH**
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# ASSOCIATION OF TOOTH LOSS WITH HYPERTENSION - A retrospective study

Type of study: Original Research
Running title: Association of tooth loss in hypertensive patients.

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**Abstract**

**Background:** Cardiovascular diseases (CVD) are one of the leading causes of premature deaths among noncommunicable diseases. Hypertension increases the risk of cardiovascular events. It may result from changes in dietary quality and nutrient intake. In addition to well-known risk factors for hypertension like obesity, lack of physical activity, studies have shown independent association between tooth loss and increased blood pressure and stroke. Therefore, a study was conducted to determine the epidemiological association between tooth loss and hypertension.

**Materials and method:** The study population was 600 Outpatients visiting University hospital from June 2019 to March 2021. Patients with missing tooth were selected for the study. Independent variables such as age, gender etc were recorded. The data collected were tabulated in excel. Descriptive statistics and relation between variables were determined using the chi-square test, where $p<0.05$ was considered statistically significant.

**Result;** In our study we found that the prevalence of hypertension is due to an increase in the amount of tooth loss. Out of 66 completely edentulous patients, about 58 (87.8%) of them were diagnosed with hypertension. Out of 469 patients with less than 10 teeth about 184 (39.2 %) patients were diagnosed with hypertension and out of 65 patients with more than 10 teeth about 33 (50.7%) of them were diagnosed with hypertension.

**Conclusion:** Significant tooth loss is associated with severe hypertension among chennai population. Prevention of tooth loss is important to the overall health of the population. Thus, our study concludes, suggesting that complete edentulousness is a risk indicator for hypertension for patients who visit private dental colleges in Chennai and highlights the importance of primary care practitioner involvement in oral health promotion.

## INTRODUCTION

Tooth loss has been related to a multiplied risk of cardiovascular diseases, which includes stroke, Coronary coronary heart disorder and coronary heart failure etc (1). Hypertension will increase the reasons of cardiovascular disorder. In addition to well-known threat factors for high blood pressure; obesity, loss of physical activity, smoking, low income, and low education level, numerous research have proven an unbiased association among teeth loss and hypertension and stroke. (2) However, the applicable literature isn't always conclusive about the association. (3) A research study concluded an inverse association between blood pressure, number of teeth, and high blood pressure amongst men however now no longer in women. The same authors in 2007 suggested an inverse relationship between teeth loss and left ventricular mass, a primary cardiac sequel to high blood pressure. (4) A multidisciplinary populace-primarily based totally observer advised an association among teeth loss and increased levels of systolic blood pressure (SBP) with inside the Brazilian populace. An author with inside the South African populace advised that complete edentulousness is a threat indicator for high blood pressure(5). In Malaysia, a positive association was concluded during a study between tooth loss and hypertension in postmenopausal women. However, most of the research has centered on the older populace and less research has focused Asian populace. Furthermore, there's a need for similar research on various populations to strengthen the proof for association among high blood pressure and teeth loss(6).Poor oral health may also intrude with blood pressure control in people diagnosed with high blood pressure the researchers say patients with the periodontal ailment may also warrant closer blood pressure monitoring, while those diagnosed with high blood pressure, or consistently elevated blood pressure, might benefit from a referral to a dentist.(7). Periodontal ailment as a risk factor and a condition marked by

gingival infection, gingival infection and teeth damage which seems to get worse blood pressure and interferes with Hypertension treatment(8)

The speculation that indicates a correlation between tooth loss and the risk of high blood pressure is chronic immune dysfunction. Oral diseases like generalized periodontitis lead to a hyperactive immune system. The endothelial cells lining the blood vessels are the first target of hyperactive immune reaction cells resulting in a procoagulatory state. In health, endothelial cells maintain an antithrombotic, vasodilator, and anti-inflammatory state. Periodontitis, one of the major causes of tooth loss, causes low-grade infection and might lead to hypertension. However, the epidemiological data do not show any strong causal association.(9,10)

The number of remaining teeth is an important factor for good oral health. According to the 2005 Chinese National Oral Health Survey, 4.5% of elderly Chinese were edentulous and people aged 65–74 years had lost a mean of 10 teeth. Many studies concluded that periodontitis and loss of tooth caused by oral inflammation is significantly associated with hypertension, excluding other risk factors. (11)Numerous studies on tooth loss and hypertension are administered round the world. This research found a considerable association between high blood pressure or increased systolic blood pressure and periodontal disease or tooth loss. (12)

Cardiovascular disease accounted for 28% of the deaths in India. Ischaemic heart disease was ranked sixth in terms of DALY (Disability-adjusted life year) in 1990; however, it became the leading causen 2016. Similarly, from 1990 to 2016 DALY due to stroke rose from twelfth place to fifth place. High systolic BP was the fourth leading risk factor contributing to DALY in India in 2016.Although there's ample data on the burden of risk factors like hypertension in the Indian population, there are few cohort studies which explored the relationship between the risk factors such as hypertension and Cardiovascular disease among Indians. Tamil Nadu is one of the southern states in India at an advanced level of epidemiological transition.(13) CVDs accounted for 40%

This study aimed to investigate the relationship between tooth loss with hypertensive patients with the hypothesis that tooth loss is associated with the increase of hypertension.

**Materials and Methods**:

Study setting.

This was a university dental hospital-based retrospective, cross sectional study conducted among patients visiting a university dental hospital in Chennai. Since this was a university hospital setting, distribution of population contributes to a major advantage for this study. Data collected was reliable and with evidence. This study was approved by the Institutional Review Board.

The study population was 600 Outpatients visiting University hospital from June 2019 to March 2021 was considered.

Inclusion criteria: Patients with missing teeth were selected randomly and segregated with independent variables - demographics such as age, gender etc. Patient who did not have any tooth loss and patients with other systemic problems like Diabetes or any other medical conditions, and personal habits such as smoking, alcohol, Pan, gutka chewing were excluded from the study.

The data collected were tabulated in excel.

Data Analysis: Microsoft Excel was used for tabulation of the parameters and then the data was exported to the SPSS software version 20.0 Descriptive statistics and relation between variables was determined using the chi-square test, where $p<0.05$ was considered statistically significant.

**RESULT**

A total of 600 outpatients were assessed for tooth loss. Among the total study of 600 sample, 52.8% of them were male and 47.2% of them were female (Figure 1). 10% of patients were between the age group of 20-29, 28.8% of the patient were between age of 30-39, 20% of the patient were between age of 40-49, 20% of the patient were between age of 50-59, 14.5% of the patient were between age of 60-69, 4.7% of the patient were between age of 70-79 (Figure 2). Considering the number of teeth present, about 11% of the patients were completely edentulous, 78.2% of the patients had less than 10 teeth and 10% of the patients had more than 10 teeth. (Figure 4) In our study out of the total-sample, 45.8% of them had hypertension and 54% of them did not have hypertension. (Figure 3)(14)

Among the patients who had hypertension, 58 (21%) of them were completely edentulous, 184 (66.9%) of them had less than 10 teeth and 12% of them had more than 10 teeth and among the patients who did not have hypertension, 8 (2%) of them were completely edentulous, 285 (87.6%) of them had less than 10 teeth and 9.8% of them had more than 10 teeth

Therefore, from our study we conclude that patients with hypertension had increased tooth loss than patients without hypertension.

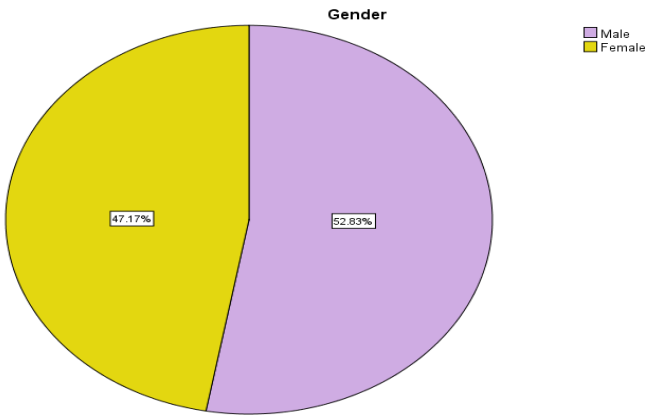

**Figure 1:** Pie chart showing the gender distribution among patients. yellow colour denotes Male patients and light purple colour denotes female patients. 52.83% patients were male, 47.17% were female.

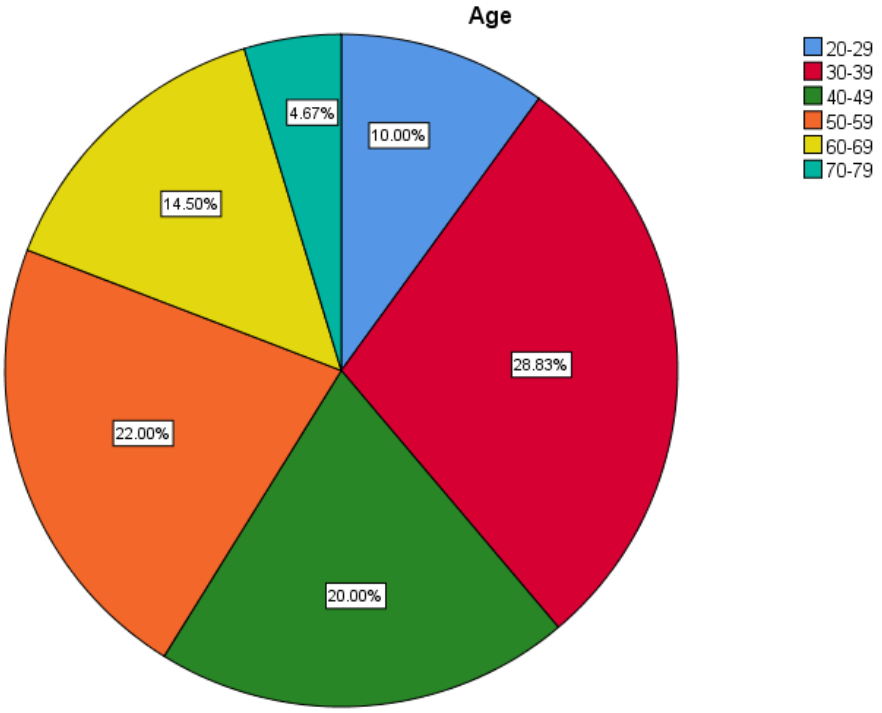


**Figure 2:** Pie chart showing the Age distribution among the patients. Blue colour denotes patients of age 20 - 29 years, Red colour denotes patients of age 30-39 years, green colour denotes patients of age above 40-49 years. Orange colour denotes patients of age 50-59years, yellow colour denotes patients of age 60-69 years and sky blue colour denotes patients of age 70-79 years 10% of patients belonged to the group of 20 - 29 years, 28.83% of patients belonged to the group 30-39 years of age, 20% of patients belonged to the group 40-49% years of age, 22% of patients belonged to the group 50-59% , 14.50% of patients belonged to the group of 60-69 years of age and 4.67% of patients belonged to the group 70-79 years of age.

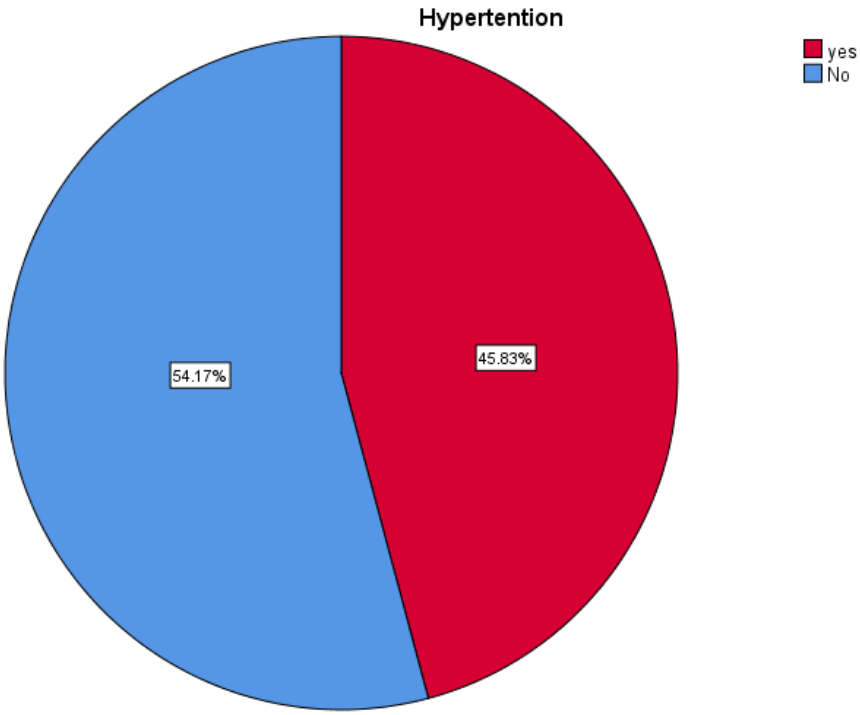


**Figure 3:** Pie chart showing patients who have hypertension and patients who did not have hypertension Red colour denotes patient who have hypertension and Blue colour denotes patient who did not have hypertension.45.83% of them have hypertension, 54.17% do not have hypertention

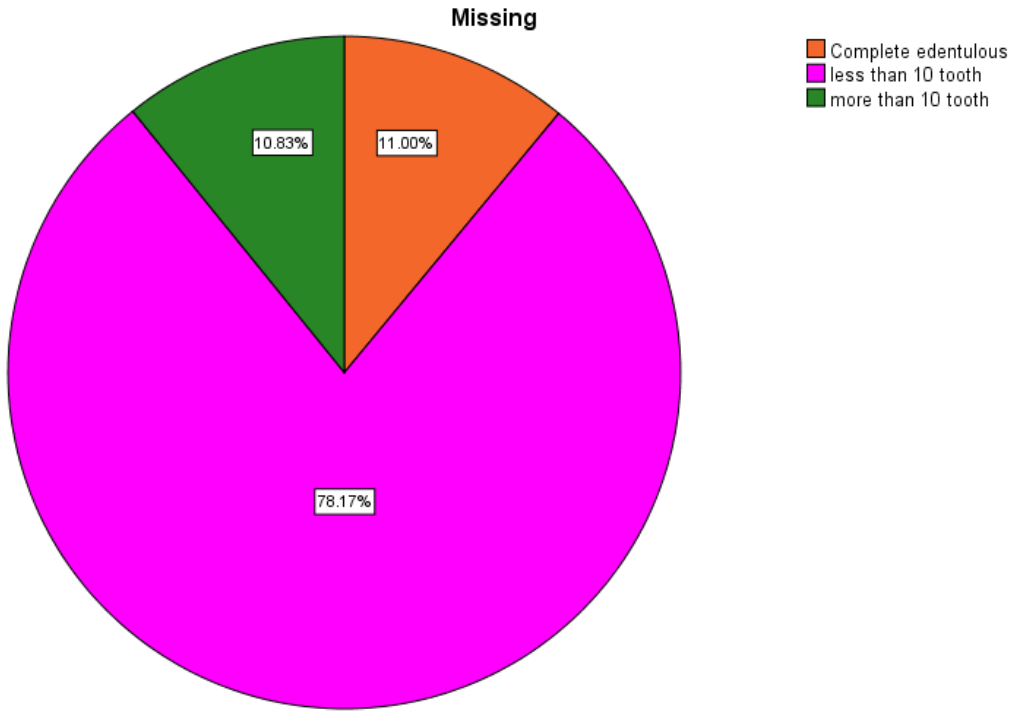


**Figure 4:** Pie chart showing the amount of tooth loss present in a patient, orange colour denotes complete edentulous, pink colour denotes that amount of tooth present is less than 10 tooth, green colour denotes that the amount of tooth present is more than 10 tooth, 11% of them are completely edentulous, 78.17% of them has less than 10 tooth and 10.83% of them has more than 10 tooth

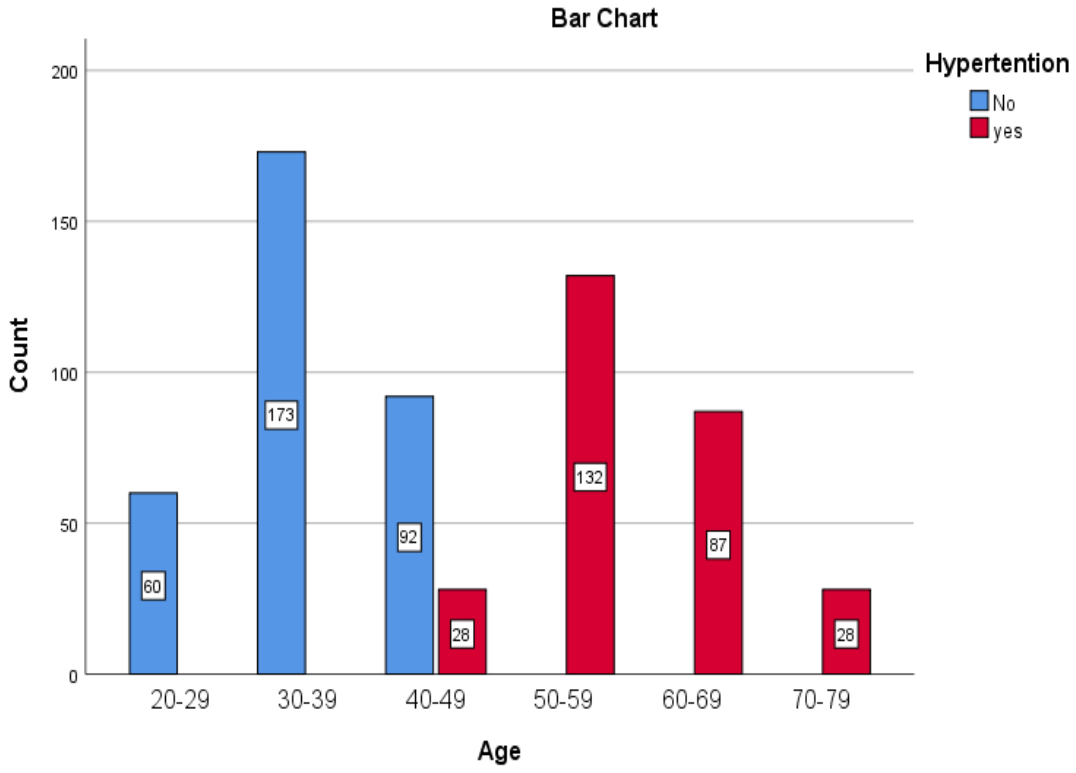


**Figure 5:** Bar chart depicts the association between patients with or without hypertension in different age groups. X axis represents age distribution, Y axis represents number of patients with or without hypertension. Patients who had hypertension were above 40 years of age. Chi Square test was done and was found to be statistically significant (Pearson Chi square=513.533, P

value=0.000(>0.05).

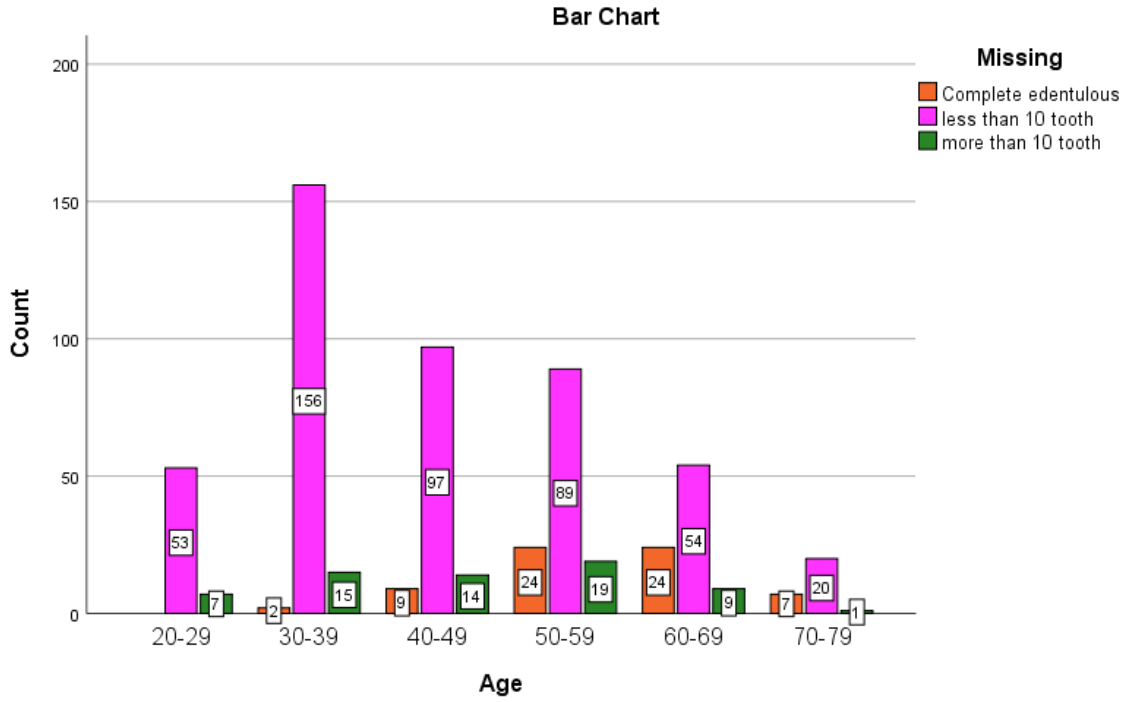


**Figure 6 :** Bar chart depicts the association between the amount of tooth loss in patients in different age groups.X axis represents age distribution, Y axis represents amount of missing tooth present in patients. Patients with less than 10 teeth are seen higher in all age groups of 30 to 39, patients with more than 10 teeth are seen higher in the age group of 50 to 59 and patients with complete edentulous area are seen in the age group of 50 to 59. Chi Square test was done and was found to be statistically significant (Pearson Chi square=68.991, P value=0.000(>0.05).

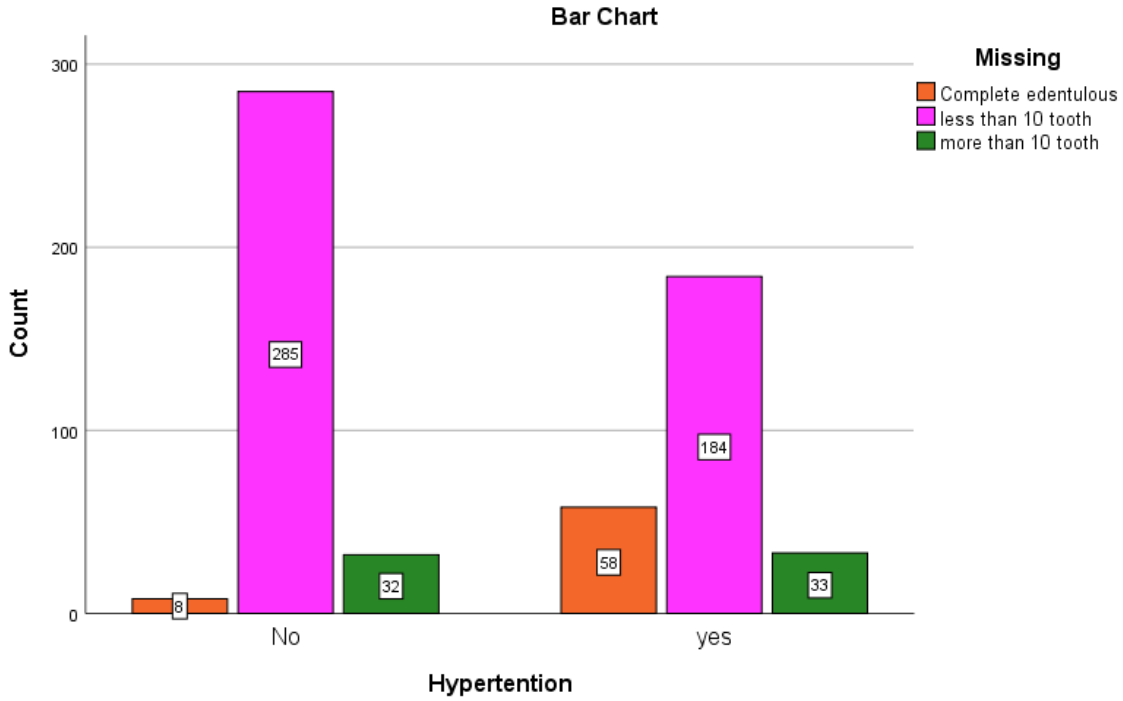


**Figure 7:** Bar chart depicts the association between the patient with hypertension and the amount of tooth loss seen in patients . Y Axis represents no.of patients with hypertension, X axis represents amount of missing tooth present in patients. Majority of the patients who had hypertension were completely edentulous when compared to patients who did not have hypertension . Chi Square test was done and was found to be statistically significant (Pearson Chi square=55.866, P value=0.000(>0.05).

## DISCUSSION

The data for this study supported residents of Chennai seeking treatment at a personal dental college in Chennai. Currently there are very few existing studies investigating the association between tooth loss and hypertension.It has shown that total tooth loss or complete edentulousness, but not partial edentulousness, is a risk factor for developing hypertension. This finding could even be thanks to dietary changes that might be associated with

being completely edentulous,which may end in an increased risk of vascular disease.

Our study did now no longer show the mechanism underlying the association among new-onset high blood pressure and the variety of lost tooth and whether or not tooth loss changed into a right away threat element for the improvement of high blood pressure and people with one of a kind oral illnesses or terrible oral hygiene have been greater vulnerable to high blood pressure. However, numerous hypotheses were recommended to provide an explanation for the link. Tooth loss might also additionally cause changes of nutritional patterns, which includes low consumption of citrus fruit, beta carotene, folate, diet C, and fiber.(4) These unwanted ingesting habits are intently associated with the improvement of high blood pressure Our look at confirmed that the lack of 10 or greater tooth changed into related to high blood pressure. Having an entire edentulous lead to masticatory dysfunction. (15) Tooth loss is related to a lesser consumption of nutrients and fiber and a better consumption of cholesterol, mainly to an accelerated threat of high blood pressure. Therefore, the association among enamel loss and high blood pressure can be defined with the aid of using dietary consumption. In addition, tooth loss and infection of periodontal wallet because of removed tooth might also additionally cause continual systemic infection and increase the threat of high blood pressure(16)

The speculation that indicates a correlation between tooth loss and the risk of high blood pressure is chronic immune dysfunction. Oral diseases like generalised periodontitis lead to a hyperactive immune system. The endothelial cells lining the blood vessels are the first target of hyperactive immune reaction cells resulting in a procoagulatory state. In health, endothelial cells maintain an antithrombotic, vasodilator, and anti-inflammatory state. Periodontitis, one of the major causes of tooth loss, causes low-grade infection and might lead to hypertension. However, the epidemiological data do not show any strong causal association.(10)

Some of the other observational studies have followed, such as studies have reported that tooth loss is associated with higher SBP and peripheral arterial disease among men the cross-sectional study of Peres et al. suggested that edentulous people have an 8.3 mmHg higher SBP compared to individuals with quite 10 teeth in both arches after adjustment.(17) T the many association between missing teeth (> 10 missing) and hypertension was also observed among a subset of < 65 years old in a French cohort study with Odds ratio = 1.17(37), A cross-sectional study in Indian adults indicated that participants with partial tooth loss had 1.62 times higher odds ratio of developing hypertension after adjusting for all confounders(38) , compared to those with no tooth loss

In our study, we found that patients with hypertension had more tooth loss when compared to patients who did not have hypertension. A similar study was conducted in South Africa which showed complete edentulousness. It is sought that it is a risk indicator for hypertension and highlights the importance of primary care practitioner involvement in oral health promotion.(18). However, a cross sectional study from Sweden by frisk et al reported no such relation between dental infections and cardiovascular diseases.

Our study concluded that an increase in tooth loss causes hypertension due to nutrient insufficiency,a similar study in South Korea was to investigate the link between tooth loss and the risk of hypertension. From the national health insurance system-health screening cohort, 19,680 participants, there was a positive association between the number of lost teeth and therefore the risk of hypertension during longitudinal research.(19) Their study was conducted in a multidisciplinary population in Brazil. However, our study followed an identical protocol to the above-mentioned study, but our results differed from their study. It might be thanks to the very fact that our study was conducted in a clinical setting during a multi-ethnic Asian population.

In a study in China Among them, participants with hypertension had lost an average of 10.88 teeth, significantly higher than those without hypertension (8.95) ($p < 0.0001$). Significant tooth loss could also be related to severe hypertension among older Chinese adults. Prevention of tooth loss is important to the overall health of this population (20). In our study, From the complete edentulous patients, 87.8% of them have hypertension and 12.1% of them do not have hypertension.

## CONCLUSION

Most of the patients who were completely edentulous were diagnosed with hypertension compared to patients who had a certain number of teeth present in the oral cavity. While studies are yet exploring the relationship between tooth loss and hypertension, it is essential that these findings need to be discussed with primary care providers. Further studies on interprofessional practice among dentists and physicians in the management of noncommunicable disease and hypertension are required.

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