Association of Tooth Loss in Chronic Periodontitis Patients with And Without Mellitus

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Abstract: Tooth loss is a negative public health outcome that substantially affects not only the general and oral health status of people, but also their quality of life. Diabetes mellitus is one of the most widespread epidemics experienced worldwide; hence the aim of this study is to find the association of tooth loss in chronic periodontitis patients with and without diabetes mellitus. This cross sectional study consisted of a sample size of 547 patients of which 270 were diabetic patients and 277 were non diabetic patients and were distributed into two groups. After collection of data, it was tabulated with parameters such as name of the patient, age, gender, systemic condition, type of periodontal disease and tooth loss. The cast sheets of patients were obtained from the patient management software. The data of each patient was obtained and tabulated. The most common missing teeth were found to be upper anteriors and it had a higher prevalence of tooth loss in the non-diabetic group (26.82%) than in the diabetic group (18.43%). Association between tooth loss and systemic conditions was done using Chi square test p value- 0.008 and was found to be statistically significant. Tooth loss was higher in the age group of 61-70 years for the diabetic group and in the age group of 50-60 years for the non-diabetic group. The association between diabetes mellitus and periodontal disease is a well known fact. Therefore oral health education programs should be promoted in patients, which aids in early diagnosis and prevention of severe periodontal diseases.

Keywords: Adults; Diabetes; Gender; Periodontitis; Tooth loss, innovative

INTRODUCTION

Tooth loss and edentulism both are considered poor health outcomes that have a negative impact on a person's quality of life (Gerritsen et al., 2010). The prevalence of tooth loss increases with age and is a major problem for people 60 years and older. Adverse consequences of tooth loss include difficulty in chewing and speaking, esthetic dissatisfaction, and social stigma (Beltrán-Aguilar et al., 2005). Partial or total loss of permanent teeth is the result of a multifactorial process involving biological developments such as caries, periodontal disease, pulp pathology, trauma, and oral cancer, non-biological factors related to dental procedures, and sociodemographic and socioeconomic factors (Isabel Jimenez-Gayosso, 2015). The World Health Organization considers tooth loss a negative public health outcome that substantially affects not only the general and oral health status of people but also their quality of life. However, despite its predominance as part of the dental component of public health, tooth loss is often neglected (Steele et al., 2004). Researchers across the world have systematically reported the relevance of certain conditions, such as caries and periodontal disease, as major causes of tooth loss (Medina-Solis et al., 2013) (Kassebaum et al., 2014).

Oral health status plays an important role in the nutrition of children, adults, and older adults, with tooth loss linked to changes in taste, food preferences, and nutritional deficiency (Johnson, 2005) Salient among the negative effects of tooth loss are reduced chewing performance, limited food selection, weight loss, deficient communication, low self-esteem, and diminished well-being (Yoshida et al., 2005). Most dental problems share several risk factors, particularly unhealthy diets, and tobacco consumption, alcohol consumption, orally with other noncommunicable diseases, such as cardiovascular conditions, cancer, diabetes, and respiratory disorders (Marcenes et al., 2003). In 2010, the World Health Organization stated that this generated similar patterns of inequality among different population groups concerning oral and systemic illnesses. Those with diabetes

prevalence of the periodontal disease among patients with diabetes ranges from 22% through 68% for gingivitis and from 25% through 98% for periodontitis, and the prevalence rates of gingivitis and periodontitis in those without diabetes are markedly lower (Lee et al., 2015). Patients with type 2 diabetes are as much as 2.6 times more at risk of developing periodontal disease than those without diabetes. This appears to indicate that diabetes is an important modulator of periodontal inflammation and a leading cause of tooth loss. In a literature review, researchers established a strong association between periodontal disease and diabetes (Lewis et al., 2016). Increased life expectancy without a concomitant improvement in the quality of life directly affects health expenditure and is becoming an urgent public health problem throughout the world (Minaya-Sánchez et al., 2017).

Periodontitis is a multifactorial disease, with the primary etiological agent being plaque microflora. Research has also shown that periodontal microflora is similar to that found in atheromatous plaques (Priyanka et al., 2017). Cytokines play an important role in the pathogenesis and progression of periodontitis and the levels of TNFα, endothelins, IL - 21 and varies in chronic and aggressive periodontitis (Khalid et al., 2016, 2017; Mootha et al., 2016; Varghese et al., 2015). Periodontal disease can be a risk factor for cardiac disease and COPD (Mootha et al., 2016; Priyanka et al., 2017; Ramesh et al., 2019; Ramesh, Sheeja S. Varghese, et al., 2016) and it is important to manage the periodontal disease effectively and treat osseous defects for implant treatment (Ramesh et al., 2017). Platelet-rich fibrin and growth factors offer an advantage over other forms of treatment (Panda et al., 2014; Ravi et al., 2017). Researchers have attempted various regenerative methods (Avinash et al., 2017; Kavarthapu and Thamaraiselvan, 2018; Panda et al., 2014; Ravi et al., 2017) like PRF, growth factors and stem cells to salvage the destruction of periodontal tissues in chronic as well as aggressive forms of periodontitis (Thamaraiselvan et al., 2015). The treatment modalities such as antimicrobial therapy has provided added advantage in treating periodontitis cases. (Ramesh, Sheeja Saji Varghese, et al., 2016) (Ramamurthy and Mg, 2018). Our department is passionate about research we have published numerous high quality articles in this domain over the past years ((Kavitha et al., 2014) , (Praveen et al., 2001),(Devi and Gnanavel, 2014), (Putchala et al., 2013), (Vijayakumar et al., 2010), (Lekha et al., 2014a, 2014b) (Danda, 2010) (Danda, 2010) (Parthasarathy et al., 2016) (Gopalakannan et al., 2012), (Rajendran et al., 2019), (Govindaraju et al., 2017), (P. Neelakantan et al., 2015), (PradeepKumar et al., 2016), (Sajan et al., 2011), (Lekha et al., 2014a), (Neelakantan et al., 2013), (Patil et al., 2017), (Jeevanandan and Govindaraju, 2018), (Abdul Wahab et al., 2017), (Eapen et al., 2017), (Menon et al., 2018), (Wahab et al., 2018), (Vishnu Prasad et al., 2018), (Uthrakumar et al., 2010), (Ashok et al., 2017), (Prasanna Neelakantan et al., 2015). The aim of our study was to find the association of tooth loss in chronic periodontitis patients with and without diabetes mellitus reported to a private dental college.

MATERIALS AND METHOD
Study Setting
This was a cross sectional study of patients who had periodontitis and undergone tooth loss. It revolved around a university setting having patients visiting the Department of Periodontics of Saveetha Dental College and Hospital, Chennai, Tamil Nadu in between June 2019-April 2020. The approval for this study was obtained from the Institutional Ethical Committee (SDC/SIHEC/2020/DIASDATA/0619-0320).

Data Collection & Tabulation
The sample size consisted of 547 patients of which 270 were diabetic patients and 277 were non diabetic patients and were distributed into two groups. After collection of data, it was tabulated with parameters – name of the patient, age, gender, systemic condition, type of periodontal disease and tooth loss.

Statistical Analysis
After further verification of data by an external reviewer, it was imported to SPSS software developed by IBM for statistical analysis. Frequency, percentage of parameters was employed in the analysis. Chi square test was used to detect the association between gender, age, region of tooth loss. p value less than 0.05 was considered statistically significant.

RESULTS AND DISCUSSION
In this study, we conclude that there is a higher prevalence of tooth loss in chronic periodontitis patients in both the diabetic and non-diabetic groups. Tooth loss was higher in the age group of 61-70 years for the diabetic group and in the age group of 50-60 years for the non-diabetic group.

Graph 1 shows association of tooth loss with the systemic condition, upper anteriors had a higher prevalence of tooth loss in the non diabetic (26.82%) when compared to diabetic group (18.43%). Association was done using Chi square test p value- 0.008 and hence the two parameters, tooth loss and systemic conditions were found to be statistically significant. From graph 1 we infer that in the diabetic group, the highest incidence of tooth loss was seen in upper anteriors (18.43%) followed by upper molars (10.22%), lower anteriors (10.04%), lower molars

(6.20%), upper premolars (3.28%) and lower premolars (1.28%). In the non-diabetic group, the highest incidence of tooth loss was seen in upper anteriors (26.82%) followed by lower anteriors (8.03%), upper molars (7.85%), lower molars (4.01%), upper premolars (3.28%) and lower premolars (0.55%).

Graph 2 shows association of ages and tooth loss among diabetic patients, upper anteriors had a higher prevalence of tooth loss in the age group of 61-70 years (17.04%). Association was done using Chi square test p value- 0.003 and hence the two parameters, age groups and tooth loss were found to be statistically significant.

Graph 3 shows association of gender and tooth loss among diabetic patients, upper anteriors had a higher prevalence of tooth loss in male population (23.33%) when compared with the female population (14.07%). Association was done using Chi square test p value- 0.323 and hence the two parameters, gender and tooth loss were found to be not statistically significant.

Graph 4 shows association of types of periodontal disease and tooth loss among diabetic patients, upper anteriors had a higher prevalence of tooth loss in generalised chronic periodontitis (34.81%) when compared with localised chronic periodontitis (2.59%). Association was done using Chi square test p value- 0.133 and hence the two parameters, type of periodontal disease and tooth loss were found to be not statistically significant.

Graph 5 shows association of age groups and tooth loss among non-diabetic patients, upper anteriors had a higher prevalence of tooth loss in the age group 50-60 years (41.52%). Association was done using chi square test p value- 0.076 and hence the two parameters, age groups and tooth loss were not found to be statistically significant.

Graph 6 shows the association between gender and tooth loss among non-diabetic patients, upper anteriors had a higher prevalence of tooth loss in male population (31.41%) when compared with the female population (21.66%). Association was done using chi square test p value- 0.607 and hence the two parameters, gender and tooth loss were not found to be statistically significant.

Graph 7 shows the association between type of periodontal disease and tooth loss among non-diabetic patients, upper anteriors had a higher prevalence of tooth loss in generalised chronic periodontitis (44.4%) when compared with localised chronic periodontitis (8.66%). Association was done using chi square test p value- 0.353 and hence the two parameters, type of periodontal disease and tooth loss were not found to be statistically significant.

We undertook this study to ascertain whether a relationship existed between tooth loss and diabetes while adjusting for other variables. In this sample of Chennai adults, we observed a connection not only between tooth loss and diabetes but also between tooth loss and other kinds of variables such as age and gender. It has been observed that chronic diseases, such as diabetes, are associated with oral diseases. Researchers have also reported that tooth loss among middle-aged adults with chronic diseases is higher compared with the systemically healthy population, heightened risk of developing periodontitis among people with diabetes, which, along with cavities, is a risk factor for tooth loss and the most common reason for tooth extraction in the population (Mealey, 2006). This may be a result of the heightened risk is seen as closely linked to glycemic control and severity of the periodontal disease.

The study results by López et al showed that diabetes is associated independently with both edentulism and tooth loss in the U.S. population (Medina-Solís et al., 2006). The findings are consistent with the results of two other large studies conducted in the United States and Mexico in which investigators also reported greater tooth loss among people with diabetes. The researchers in the U.S. study used self-reported data regarding tooth loss and diabetes from the CDC's Behavioral Risk Factor Surveillance System to explore the association between diabetes and tooth loss among people 18 years and older (Kapp et al., 2007).

The global prevalence of diabetes in adults (> 18 years) increased from 4.7% in 1980 to 8.5% in 2014, and the World Health Organization predicts that it will reach 439 million people, nearly 10% of adults, in 2030. The results of this and our study and other research efforts in the United States and throughout the world indicate an association between diabetes and tooth loss; people with diabetes are more likely to lose more teeth than people without diabetes. The impact of diabetes on oral health has therefore acquired particular relevance for dental clinical practice,45-48 bringing to light the need to better understand the mechanisms underlying the oral health implications of diabetes and to implement comprehensive treatment strategies for the prevention of possible complications (D'Aiuto et al., 2017).

Periodontitis is the second-largest health problem and the advanced periodontal disease affects 10 to 15% of the population worldwide (Silva et al., 2010). Recognition of the mounting evidence on the relationship between oral and systemic health will confront dentists, physicians, and other healthcare workers with the importance of working together. Nowhere is this more important than in the early identification of individuals with undiagnosed diabetes and the co-management of oral and overall health in patients with diabetes. There is sufficient evidence of the bidirectional relationship between diabetes and periodontal disease to formulate guidelines for screening undiagnosed diabetes and the co-management of patients with diabetes in the clinical practice of dentistry and dental hygiene. There is also sufficient evidence regarding the role periodontal disease plays in increasing systemic inflammation to suggest that non-dental healthcare providers should screen patients for periodontal disease.

For dental and non-dental practitioners who embrace the chance to become more actively involved in this vital area of healthcare, this new and exciting level of clinical follow is definite to benefit patients and be professionally pleasing and rewarding. Drumond-Santana *et al.* (2007) found a 49.1% prevalence of periodontitis, in a population of diabetic individuals in a public hospital, which is higher than the value found in the previous literature (de Pinho et al., 2012). The reason may be due to the sample assessed being restricted to a general hospital, which may reflect lesser proximity to the actual situation of the periodontal health of the diabetic population.

In the present study, tooth loss was more common in male diabetic patients and non diabetic patients when compared with females. 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. Our study has limitations that must be taken into account for an adequate interpretation of its results such as geographic limitation, confounding factors, and does not represent all the ethnic groups or populations from around the world. Future scope of the study includes extensive research to find the role of systemic diseases in the prevalence of periodontitis in diverse populations which can help in further diagnosis and treatment planning.

CONCLUSION

Within the limitations of the study, we conclude that the most common missing teeth were found to be upper anteriors and it had a higher prevalence of tooth loss in the non-diabetic group (26.82%) than in the diabetic group (18.43%). Tooth loss was higher in the age group of 61-70 years for the diabetic group and in the age group of 50-60 years for the non-diabetic group. The association between diabetes mellitus and periodontal disease is a well known fact. Therefore oral health education programs should be promoted in patients, which aids in early diagnosis and prevention of severe periodontal diseases.

Author Contributions

First author (Pavithra H Dave) performed the analysis, interpretation and wrote the manuscript. Second author (Dr.Balaji Ganesh S) contributed to conception, data design, analysis, interpretation and critically revised the manuscript. Third author (Dr.Mahesh) participated in the study and revised the manuscript. All the three authors have discussed the results and contributed to the final manuscript.

Conflicts of Interest

The authors declare no conflicts of interest.

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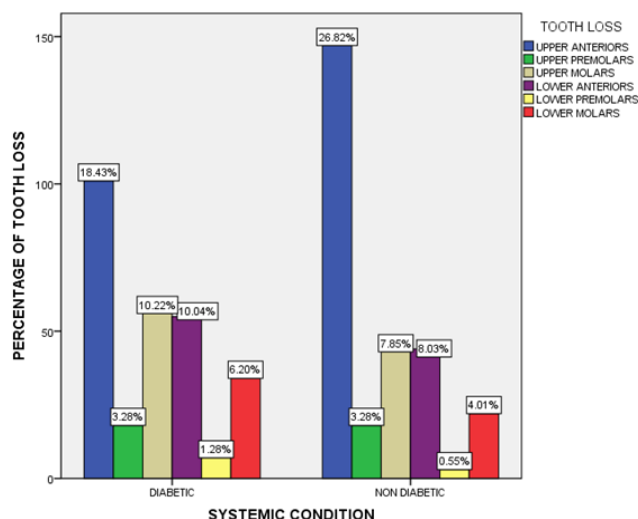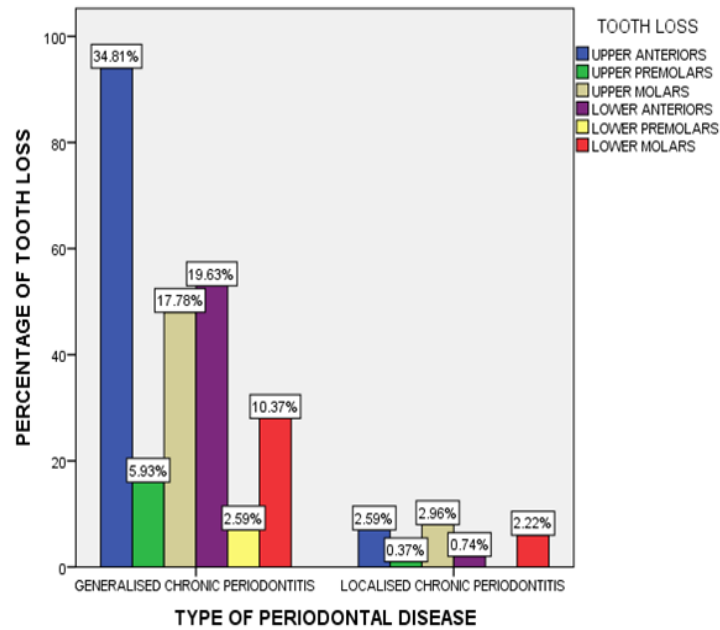
Graph 1: Bar graph reveals the association between tooth loss and systemic conditions. X- axis represents the systemic condition and Y- axis represents percentage of tooth loss. It was found that upper anteriors had a higher prevalence of tooth loss in the non diabetic (26.82%) and diabetic group (18.43%). Pearson chi square value- 15.569, p value- 0.008 <0.05 and hence the two parameters tooth loss and systemic conditions were found to be statistically significant, with significant increase in loss of upper anteriors among the non diabetic group.
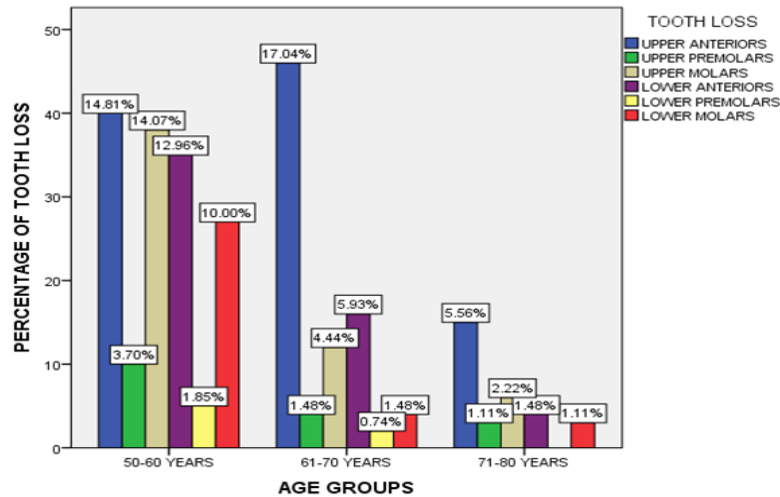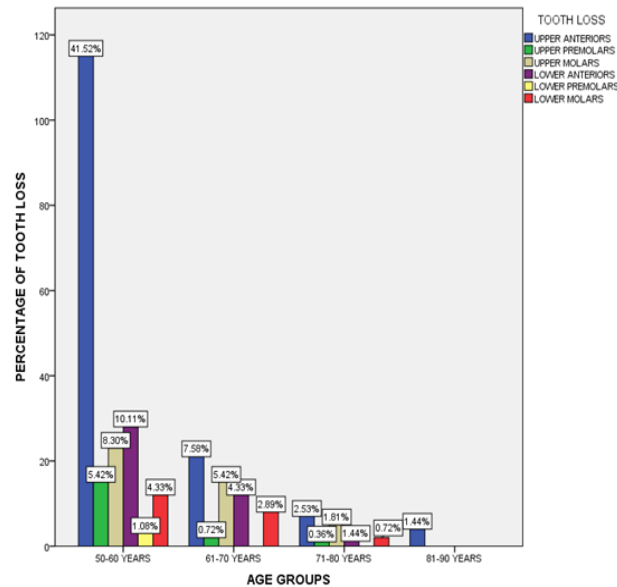
Graph 2: Bar graph reveals the association between age groups and tooth loss among diabetic patients. X- axis represents the age groups and Y- axis represents percentage of tooth loss. It was found that upper anteriors had a higher prevalence of tooth loss in the age group 61-70 years (17.04%). Pearson chi square value- 26.521, p value- 0.003 <0.05 and hence the two parameters, age groups and tooth loss were found to be statistically significant.
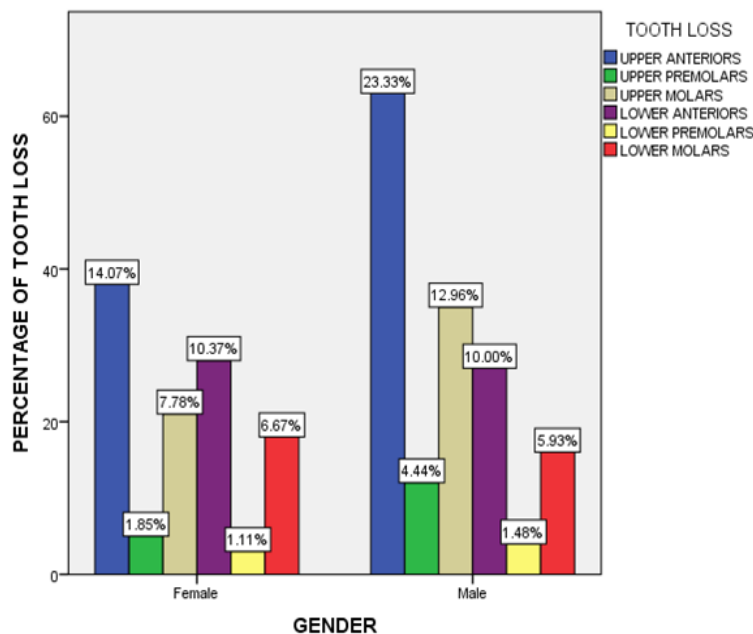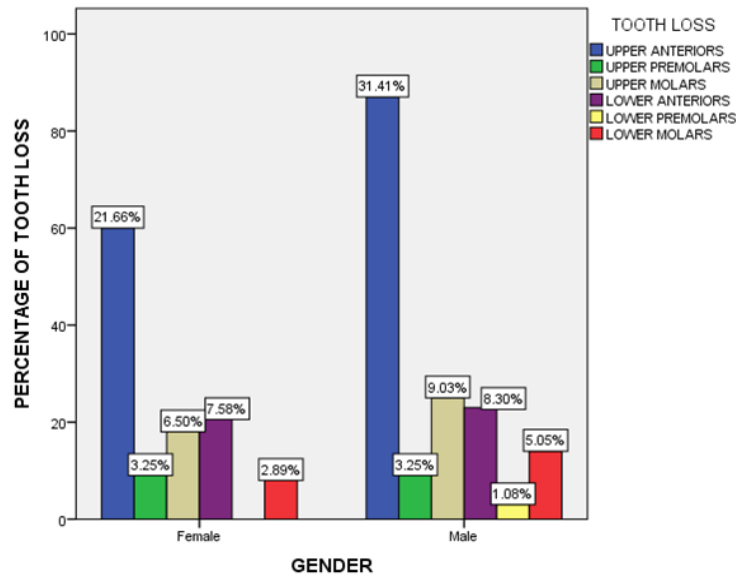

Graph 3: Bar graph reveals the association between gender and tooth loss among diabetic patients. X- axis represents the gender and Y- axis represents percentage of tooth loss. It was found that upper anteriors had a higher prevalence of tooth loss in male population (23.33%) when compared with the female population (14.07%). Pearson chi square value- 5.834, p value- 0.323 >0.05 and hence the two parameters, gender and tooth loss were not found to be statistically significant.
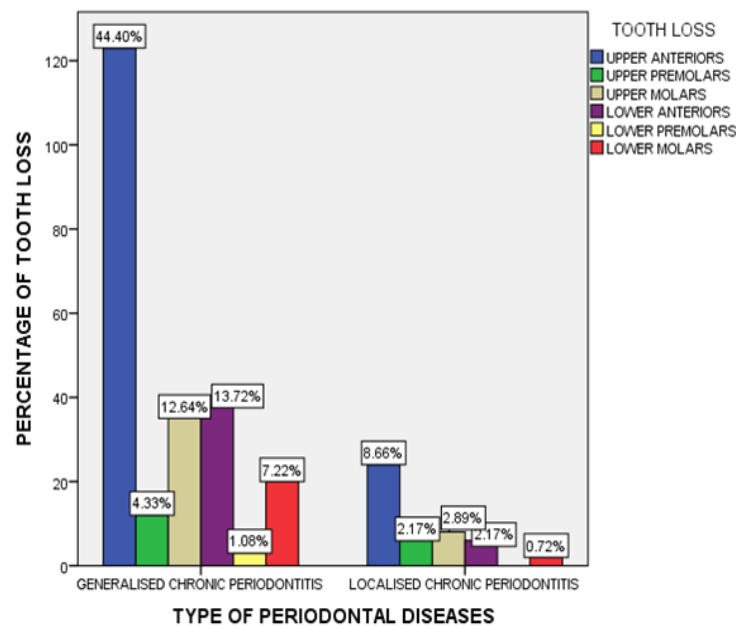
Graph 4: Bar graph reveals the association between type of periodontal disease and tooth loss among diabetic patients. X- axis represents the type of periodontal disease and Y- axis represents percentage of tooth loss. It was found that upper anteriors had a higher prevalence of tooth loss in generalised chronic periodontitis (34.81%) when compared with localised chronic periodontitis (2.59%). Pearson chi square value- 8.459, p value- 0.133 >0.05 and hence the two parameters, type of periodontal disease and tooth loss were not found to be statistically significant.

Graph 5: Bar graph reveals the association between age groups and tooth loss among non-diabetic patients. X- axis represents the age groups and Y- axis represents percentage of tooth loss. It was found that upper anteriors had a higher prevalence of tooth loss in the age group 50-60 years (41.52%). Pearson chi square value- 23.408, p value- 0.076 >0.05 and hence the two parameters, age groups and tooth loss were not found to be statistically significant.

Graph 6: Bar graph reveals the association between gender and tooth loss among non-diabetic patients. X- axis represents the gender and Y- axis represents percentage of tooth loss. It was found that upper anteriors had a higher prevalence of tooth loss in male population (31.41%) when compared with the female population (21.66%). Pearson chi square value- 3.611, p value- 0.607 >0.05 and hence the two parameters, gender and tooth loss were not found to be statistically significant.

Graph 7: Bar graph reveals the association between type of periodontal disease and tooth loss among non-diabetic patients. X- axis represents the type of periodontal disease and Y- axis represents percentage of tooth loss. It was found that upper anteriors had a higher prevalence of tooth loss in generalised chronic periodontitis (44.4%) when compared with localised chronic periodontitis (8.66%). Pearson chi square value- 5.544, p value- 0.353 >0.05 and hence the two parameters, type of periodontal disease and tooth loss were not found to be statistically significant.