CARIES RISK PROFILE AMONG ADULT POPULATION WITH SYSTEMIC DISEASE ATTENDING A PRIVATE DENTAL COLLEGE IN CHENNAI

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ABSTRACT

Systemic diseases have higher risk of compromised oral health like tooth loss, higher lifetime caries experience thus emphasising the significant relationship between systemic disease and oral conditions. Dental caries is considered a serious public health problem affecting the long term prognosis of teeth and contributes to a major global burden of oral diseases among adults. Hence, this study aims to assess the caries risk profile among adults with systemic disease. A retrospective study was conducted among 61 participants aged 35 years and above. Data was collected using the electronic patient records, between the time period of August 2019 - January 2020, yielding a total of 61 participants with complete data. Plaque accumulation score using Loe and Silness Index, dental caries experience, salivary flow rate, fluoride exposure were recorded and entered into Cariogram application, to generate a pie chart in order to categorise patients into different caries risk groups. Descriptive statistics and Chi square were performed to analyze the data. The mean age of the participants was 55.2±10.9 years. Among all participants, 40.9% had diabetes. When categories into different caries risk groups, 37.1% were categorised into "high medium risk" group. Statistical significant value of $p < 0.05$ was found between cariogram score and systemic disease. Systemic diseases have a significant effect on the deterioration of oral health, especially in terms of carious lesions. Caries risk assessment should be carried out compulsorily for patients with systemic diseases to reduce the burden of dental caries, as an early assessment will lead to better prognosis and better quality of life.

KEYWORDS: Cariogram, Cariostatic agents, Dental caries susceptibility, Elderly, systemic conditions

INTRODUCTION

Dental caries is a relatively complex, multifactorial (Prabakar et al., 2018a) disease characterized by progressive loss of tooth mineral followed by invasion into demineralised teeth, it can also be the focal infection of another disease in any other part of the body. Dental caries leads to a break in the balance between demineralization and remineralization (Prabakar et al., 2018) (Prabakar, et al., 2018b) . In its initial stages it appears as white, chalky lesion. In Spite of scientific advances, and it's preventable nature,

dental caries continues to contribute to a major portion of global burden of disease (Prabakar et al., 2016) According to the National Oral Health Survey, the prevalence of dental caries among adult population in India was reported to be around 78-84% (Mathur *et al.*, 2004) thus making dental caries is a major public health problem in developing countries Three main factors responsible for initiation of dental caries are diet, microflora susceptible tooth, but apart from that general factors like age, sex, race, geographical location, local factors like arrangement of teeth, salivary flow, oral hygiene including plaque accumulation (Mathew *et al.*, 2020), deleterious habits like smoking are also responsible for dental caries (Leelavathi et al., 2019). Systemic diseases are associated with increased incidence and prevalence of periodontal disease, salivary gland dysfunction,malnutrition in debilitating cases (Neralla *et al.*, 2019) taste disturbances, increased risk of oral malignancies , dental caries. Dental caries can affect a person's overall health as it interferes with mastication, thereby affecting digestion (Jepsen *et al.*, 2017), speech, daily activities, eventually untreated decay, pain (Samuel et al., 2020) can become so severe that the tooth might have to be removed, which will ultimately affect the overall quality of life (Bin and Gheena, 2018)and increases financial burden as well (Shah and Jeevanandan, 2018) as the treatments vary from fluoride application (Khatri *et al.*, 2019) (Kumar and Vijayalakshmi, 2017) (Kumar and Preethi, 2017) restorative procedures and now the research area for natural herbal preventive measures (Pavithra and Jayashri, 2019) has been evolving . Diabetes plays a significant role in aggravating oral conditions, as it reduced response to infections, impaired connective tissue metabolism, and various microvascular changes, a very high and appalling prevalence of dental caries is found in diabetic patients compared to non diabetics (Singh *et al.*, 2016) . To assess the risk of caries, programs have been developed, out of which "Cariogram" is the most widely used, which aims to illustrate the interaction of caries related factors (Bratthall and Petersson, 2005) but they are hardly used by clinicians. As dental caries occur due to multiple factors, therefore a variety of measures should be aimed at decreasing its prevalence. Previously, our team has conducted various questionnaire based studies (Kannan *et al.*, 2017), in vitro studies (Mohapatra *et al.*, 2019), clinical trials (Prabakar et al., 2018) in the field of dental caries. Studies assessing the risk of caries are very limited, and what has been done is among children, this study is a first of its kind that is aiming to assess the caries risk profile among the adult population with systemic diseases.

MATERIALS AND METHOD

Study setting: Retrospective study.

Sample Size: The sample size consisted of case records of 61 participants aged 35 years and above.

Study period: August 2019 - January 2020

Ethical clearance: Ethical approval number (SDC/SIHEC/2020/DIASDATA/0619-0320) was obtained from Scientific Review Board, Saveetha Dental College, SIMATS University.

Inclusion criteria: 1) Patients aged above 35 years and above 2) Patients with systemic disease 3)Patients willing for the procedure.

Exclusion criteria: 1) Incomplete patient records and 2) Records with no treatment done or follow up

Data Collection: Data was collected through case records of patients fulfilling the inclusion criterias. Plaque accumulation was recorded according to Loe and Silness criteria, the dental caries experience, salivary flow rate, fluoride exposure, diet frequency, clinical judgement was recorded and entered as a part of health education intervention.

Study instrument: Cariogram is a computer program which aims to illustrate the interaction of caries related factors, the chance to avoid caries. It consists of the following parameters: caries experience, related disease, salivary secretion rate, salivary buffer capacity, amount of plaque, diet frequency, diet count, fluoride use and clinical judgement. Since the salivary buffer rate couldn't be estimated due to lack of proper equipment, the clinical judgement score was given a score of 1, which means the risk was evaluated according to other values entered. The caries risk profile for each participant was obtained as a

pie chart with five coloured sectors, which showed the chance of avoiding caries as a percentage. According to these percentage values, individuals were scored into five groups from the highest to lowest predicted risk group.

Statistical Analysis: Data was computerized into SPSS version 23.0. Descriptive statistics were used. Chi square was used to compare parametersStatistical significance was set at <0.05

RESULT AND DISCUSSION

A total of 61 participants were examined, out of which 52.5% were males and 47.5 were females (Figure 1). The mean age of the participants was 55.2±10.9. As seen in Figure 2, the participants were distributed according to systemic diseases, among which prevalence of diabetes was highest at 40.9%, followed by hypertension at 36.0%, 19.6% of the participants had both diabetes and hypertension. Among the participants, 1.6% had cardiovascular disease and 1.6% had respiratory disease. The participants were categorised based on the caries risk group as well (Figure 3). Around 37.1% of the participants were in the "High Medium Risk" group, followed by 29.0% in "High Risk" group, 17.4% in the "Moderate Risk" group, 11.2% in the "Low Medium Risk" group and 4.8% in "Low Risk" group. According to the distribution of the plaque scores (Figure 4), 41.9% had scoring of "Fair", 32.2% had scoring of "Good", 19.2% had "Poor" scoring, and 6.4% of the participants had "Excellent" scores. There was statistical significance between systemic disease and cariogram score (p=0.03) as shown in Figure 5. There was no gender based difference when compared with caries risk groups and plaque score as shown in Figure 6 and Figure 7, respectively.

Caries risk assessment using cariogram is a valid, extensively studied computer based program in which risk profile is generated based on clinical and history data of the patient. Assessment of carious lesions early, not only reduces the burden of disease but also would enable targeted preventive measures to be taken which in turn could reduce the economic burden on patients (Hänsel Petersson *et al.*, 2016) . In this study, we estimated the effect of systemic disease on caries risk profile for adult population, since systemic disease has a huge effect on oral health. Studies have proved that systemic conditions alter the salivary secretion rate (Pratha and Prabakar, 2019), hypofunction leads to dry oral mucosa, decreased lubrication and increased caries activity. The elderly population are more often affected by xerostomia because of a higher prevalence of systemic disease and increased use of prescription drugs. That's why caries risk assessment for patients with systemic disease is an important aspect of treatment planning. In the current study, the prevalence of diabetes was highest among the participants, the findings coincide with reporting of studies where high prevalence of diabetes was seen in economically and epidemiologically advanced states like Tamil Nadu (Atre, 2019) .Also in study the prevalence of diabetes was found to be 33.3% which was closer to the findings of our study at 40.9% (Lai *et al.*, 2017). The distribution of subjects according to risk groups showed that majority of the participants belonged to high medium risk group which was similar to the study by (Raju *et al.*, 2016) but again the findings of another study done in young adults (Celik et al., 2012) showed only 26% of the participants were in high medium risk, the difference can be attributed to the age difference in the two populations and also geographical variations plays a part in caries development as we know. There was a statistically significant value between systemic disease and caries risk suggesting patients with systemic disease have higher chances of caries risk which was similar to the findings of (Raju *et al.*, 2016) but opposing findings were recorded in the study done by (Giacaman at al., 2013), that caries risk and disease risk are not statistically significant , as the study was done among adolescents. Other than cariogram, a smartphone based application, "cariometer" had been used in a certain study (Panchal et al., 2017) which aims towards prevention of caries but has limitations as it doesn't consider the multifactorial approach of Cariogram. The plaque scores were slightly higher in males than females, but did not show any statistical significance in the current study similar to another study (Mamai-Homata et al., 2016) but were contrasting to other studies

(Sanadi *et al.*, 2017) (Furuta *et al.*, 2011)). The current study has certain limitations as it consists of a small sample size thus the findings cannot be generalized. More longitudinal studies should be performed to endorse the risk of caries severity on systemic disease incidence. As dental professionals, more focus should be given to the association of systemic disease and oral health to limit the progression of oral health related problems.

CONCLUSION

The risk of caries was positively affected by the presence of systemic diseases, thus assessment of caries risk should be practised in clinical settings so as to estimate the future risk of development of carious lesions and take preventive measures.

AUTHOR CONTRIBUTIONS

All authors contributed to the design and implementation of the research, analysis of the results and to the writing of the manuscript.

CONFLICT OF INTEREST

Authors declare no potential conflict of interest.

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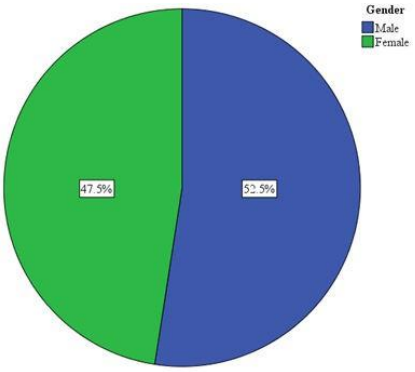

Figure 1: The pie chart represents the distribution of the study population based on Gender. Among the study population, 52.5% were males (denoted by colour blue) and 47.5% were females (denoted by colour green) in the chart, as observed almost an equal representation of both the genders were present in the study.

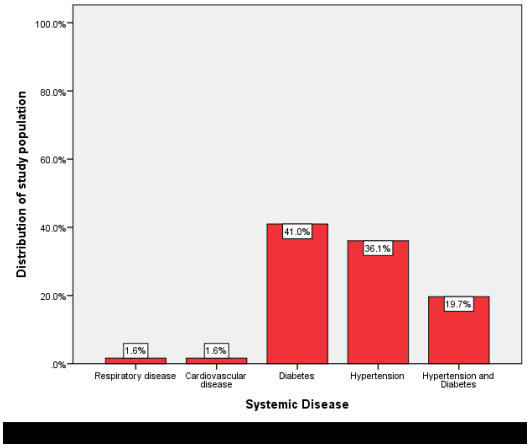

Figure 2: The bar chart represents the distribution of the study population based on systemic diseases. X axis represents the systemic disease and Y axis represents the distribution of study population. Among the study population, 41.0% had diabetes, making it the most common systemic condition in the study population.

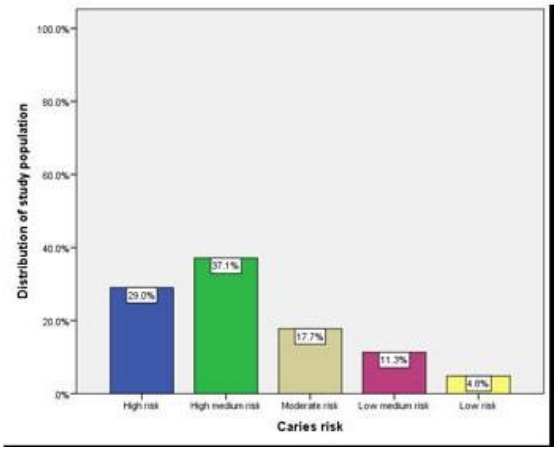

Figure 3: The bar chart represents distribution of study participants based on the caries risk group. X axis represents the caries risk groups and Y axis represents the distribution of the study participants. Among the study population, the majority of the participants (37.1%) were in high medium risk group (denoted by the colour green), followed by high risk 29.0% (denoted by colour blue).

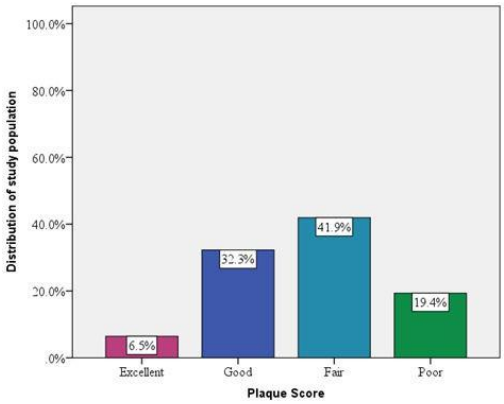

Figure 4: The bar chart represents the distribution of study population based on plaque score. X axis represents the scoring of plaque and Y axis represents the percentage distribution of the study population. Among the study population, the majority of participants (41.9%) had fair plaque scores.

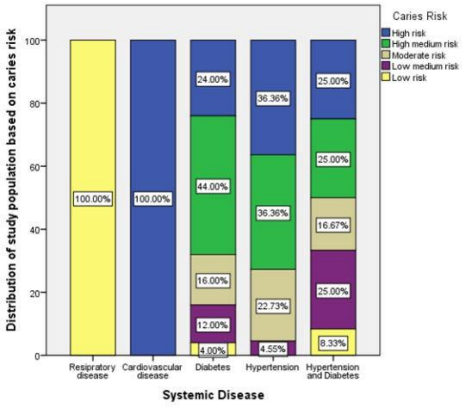

Figure 5: The stacked bar graph represents the association between systemic disease and caries risk. X axis represents the systemic diseases and Y axis represents the percentage of participants based on caries risk groups. Chi square test was done and the association was found to be statistically significant, as majority of the study participants having high caries risk (denoted by colour blue) were found to have hypertension (36.3%), diabetes (24.0%) and 25.0% of the study participants having high caries risk had both hypertension and diabetes. Pearson's chi square value (X^2) = 27.844, df = 16, p = 0.03(<0.05), hence statistically significant.

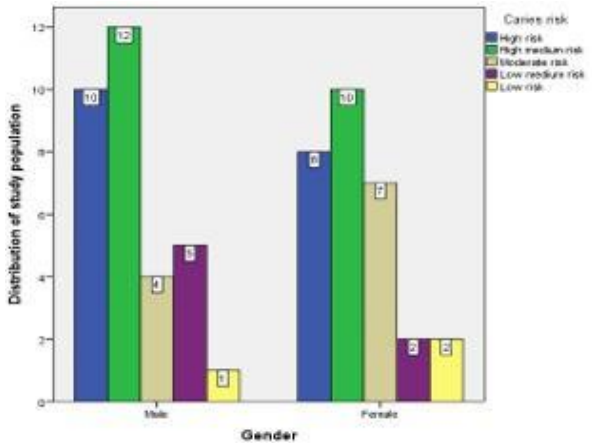

Figure 6: The bar graph represents the association between gender and caries risk. X axis represents the gender and Y axis represents the distribution of study population based on caries risk. Chi square test was done, males had a higher risk of caries development (31.3%) than females (27.6%) even though the association was found to be statistically not significant. Pearson's chi square value (X^2) = 2.700, df = 4, p value = 0.6, hence not statistically significant.

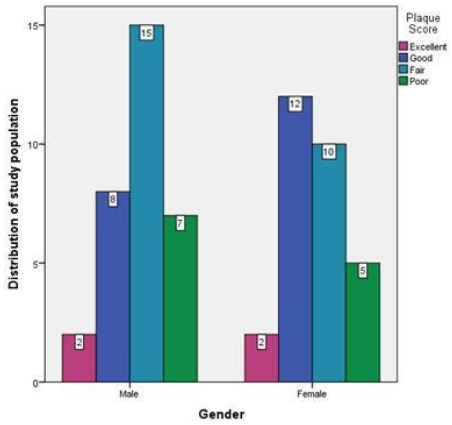

Figure 7: The bar graph represents the association between gender and plaque score. X axis represents the gender and Y axis represents the distribution of study population based on plaque score. Chi square test was done where it was observed that males had poor plaque scores (11.4%) compared to females (8.20%) even though the association was found to be statistically insignificant. Pearson chi square value (X^2) = 1.991, df = 3, p value = 0.5; hence not statistically significant.