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CARIES RISK ASSESSMENT USING CARIOGRAM IN INDIVIDUALS VISITING DENTAL INSTITUTION: RETROSPECTIVE STUDY

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ABSTRACT:

Dental caries is a multifactorial disease. Caries risk assessment is a process of establishing probability for an individual towards the risk of caries development in future. The models for caries risk assessment contain a combination of factors such as diet, fluoride exposure,a susceptible host, microflora that interact with the variety of social, cultural and behavioural factors. The aim of the study is to evaluate the caries risk assessment using cariogram in patients visiting dental institutions. This was a retrospective institutional study. Samples were collected from June 2019 to March 2020 from patient records who visited a private dental hospital. Sample size was 135. Details on plaque score and cariogram factors were collected from patient records and tabulated in microsoft excel tabulation and analyzed using SPSS. $p<0.05$ was considered significant. Statistically significant correlations were found between the DMFT and diet frequency $p=0.00$. The mean DMFT score was found to be 7.62 in male and 7.91 in females, mean percentage of avoiding new cavities was found to be 46.2400 in male and 41.0333 in female, mean of circumstances was found to be 11.2933 in males and 12.8833 in females, mean of bacteria was found to be 15.9867 in males and 16.4167 in females, mean of susceptibility was found to be 17.9200 in males and 19.8833 in

females, mean of diet was found to be 8.5733 in males, 9.7167 in females. There was no association between gender and DMFT score p>0.05, cariogram categories(p>0.05). Statistical significance was seen in correlation between DMFT and diet (p=0.001) while there was no correlation between the remaining cariogram parameters and DMFT. Within the limitations of the present study, we can conclude that, in our population the most important risk factor for caries development was diet frequency.

INTRODUCTION

Dental caries is a global disease[(1)] . caries continues to affect most of the children and adults in this world. It is a disease of mineralised dental tissue with a multifactorial etiology[(2)]. Dental caries often involve pain and affect aesthetics [(3)]. Treatment is costly and it is time consuming[(4)]. Dental caries remain a public health problem due to its characteristics, cost of treatment and its effects on the quality of life. Preventive measures should be taken in order to prevent dental caries. A key factor for planning preventive programs is to assess a person's risk of developing a disease[(5)].

Caries risk assessment is the clinical process of establishing probability of an individual to develop caries in the future, hence it is an essential process for adequate prevention and management of dental caries [(6),(7)]. There are many caries risk prediction and evaluation models present nowadays. They are all designed to evaluate the probability of caries risk as accurately as possible but none has predominated over the other model. Estimation of caries is reported to be not 100% successful. Cariogram is an algorithm based on different caries related risk factors[(8)]. It is a graphical picture illustrating in an interactive way. It emphasizes the fact that caries can be controlled by various factors[(8)]. The pie diagram shows five sectors.Green,darkblue,red,light blue and yellow indicating different groups of factors related to dental caries[(9)]. Green sector shows an actual Chance to avoid new caries. Dark blue sector "Diet" is based on a combination of diet contents and diet frequency. Red sector bacteria is based on a combination of plaque and mutans streptococci. light blue sector"susceptibility" is based on fluoride program.Saliva secretion and saliva buffer capacity and yellow sector "circumstances" is based on combination of past caries experience and related disease. The cariogram does not specify a particular number of caries that will occur in the future[(9)]. Cariogram has been used in several countries and has provided fairly high efficacy and good reliability.

Limited studies have been done in India. It is very important to evaluate the caries risk profile in countries like India to develop the preventive measures that can be directed to that group.

Previously our team had conducted various clinical trials [(10),(11),(12),(13)] in vitro studies [(14),(15)] in vivo studies[(16)] and other studies [(17),(18),(19),(20),(21),(22),(23),(24)]. Now we are focussed on retrospective studies. The purpose of this study was to evaluate the relationship between DMFT and the different variables of cariogram in an adult population and evaluate the most important risk factor for dental caries using a cariogram model.

MATERIALS AND METHODS

Study design

This is a retrospective study conducted in a private dental institution. The patient case records were reviewed for the necessary information by a trained examiner. The advantage of conducting the study in an institutional set up provides easy access to patient records. Among patients who have visited the dental clinic of the institution, the case records of 135 patients were reviewed. A wide age range is selected for the study. The institutional ethical committee provided approval for the study (SDC/SIHEC/2020/DIASDATA/0619-0320).

Inclusion criteria

1. Patients who had caries
2. Patients from< 30 years to >51 years of age

Exclusion criteria

1. Incomplete patient data
2. Duplicate patient data

Sampling

A total of 135 records of patients who visited the institution for dental check up from June 2019 to March 2020 were reviewed and the dental data regarding DMFT and Cariogram risk assessment were retrieved. Convenient sampling method was used to select the patients for the study. The data obtained from the case records were cross verified with photographs.

Data collection

All the data after thorough checking for duplicates, incomplete entries and cross verification with photographs were entered in Microsoft excel spread sheet in order to organise the data. The variables obtained from the data included DMFT score and the parameters of cariogram such as avoid new caries, susceptibility, circumstances, bacteria and diet. Green sector shows an actual Chance to avoid new caries. Dark blue sector "Diet" is based on a combination of diet contents and diet frequency. Red sector bacteria is based on a combination of plaque and mutans streptococci. light blue sector"susceptibility" is based on fluoride program.Saliva secretion and saliva buffer capacity and yellow sector "circumstances" is based on combination of past caries experience and related disease. Here the parameters of cariogram such as avoid new caries, susceptibility, circumstances, bacteria and diet are the independent variables and the DMFT score is the dependent variable.

Statistics

The statistical analysis of the obtained data was performed by the SPSS software version 23.0. The data from the excel spreadsheet was transferred to SPSS software for analysis. Chi square tests were employed in order to find the association between different variables. The p value less than 5% was considered statistically significant. G graph was done. The final results are presented in the form of graphs for further interpretation and discussion.

RESULTS AND DISCUSSION

Early diagnosis of caries and prevention is the main aim for maintaining good oral health status[25]. Caries risk assessment plays an important role in the decision making process for treatment, diagnostic procedures and small appointments[6]. Ideal models should be understandable, outcome should be easy to illustrate[26]. Cariogram is considered as the most reliable caries risk assessment models due to its comprehensive and objective method[27].

Among 135 patients, the DMFT score and their cariogram details were collected. Out of 135 samples, 75 were male and 60 were females. The mean DMFT score was found to be 7.6267 in males and 7.9167 in females, mean avoid caries percentage was found to be 46.2400 in males and 41. 0333 in females, mean susceptibility was found to be 17.9200 in males and 19.8833 in females, mean circumstances were found to be 11.2933 in males and 12.8833 in females, mean bacteria was found to be 15.9867 in males and 16.4167 in females, mean diet was found to be 8.5733 in males and 9.7167 in females (table 1). There was no statistical significance between gender and DMFT, gender and cariogram parameters. Karabekiroglu et al stated in his study that there was no statistical difference between gender and cariogram parameters [28].

Early detection of caries and prevention is one of the main aims for maintaining good oral habits[25]. Caries risk assessment is important for dentists for the decision making process concerning dentists[6]. Several risk assessment models have been developed to assess the risk of caries. The ideal risk assessment model should be easy to use and should not be time consuming. Cariogram is one of the reliable models which is used to assess caries using parameters such as avoid new caries, bacteria, circumstances, diet frequency and susceptibility[29]. Cariogram has been used recently in several studies.

In this present study the correlation between DMFT score and mean diet showed Pearson correlation : 0.302, p= 0.00 (statistically significant) (Figure 5). There was no statistical significance between DMFT and the other parameters as shown (figure 1,2,3,4).A study done by Celik et al showed that there were no significant differences between caries scores and different variables such as saliva, diet contents, past caries experience[5]. Same study showed that there was a significant difference among the different categories of diet frequency. IlkayPeker et al stated in their study that there was a statistical significance between overall varies risk, DMFT score, fluoride program, Streptococcus Mutans and Lactobacillus. Hwe et al stated that the fluoride program was the most important factor in caries risk[30]. While this study stated that diet was the most important factor for caries risk.A study by Jain sk et al [1] stated that 47.15% of disabled children in his study had moderate risk of getting new caries. A study by Pekerl et al [30] showed statistical correlation between overall caries and DMFT ,DMFS indices, fluoride program ,and streptococcus mutans and lactobacillus count. Caries risk assessment models have been used for various target groups.

Limitations of this study include small sample size. Since it was a retrospective study, possible manual errors could have occurred during data entry by residents during patients examination, subjective bias was another

limitation of this study. Future study can be done with a wide range of population.

CONCLUSION

Within the limitations of this present study, we conclude that there is a correlation between DMFT and cause of new caries mainly due to the diet frequency. However, cariogram should be used just as an adjunct and not as a substitute for clinical evaluation of an individuals oral health status. Future studies are required with a larger population to ascertain the findings of our study

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CONFLICT OF INTEREST

The authors declare no conflicts of interest.

Table 1: shows the mean, Std. deviation and p value of DMFT, avoid caries, susceptibility, circumstances, bacteria and diet. There was no significant difference between the gender and parameters ($p>0.05$)

PARAMETERS	SEX	N	MEAN	STD. DEVIATION	P VALUE
DMFT	MALE	75	7.6267	4.21636	0.700
	FEMALE	60	7.9167	4.46945	
AVOID CARIES	MALE	75	46.2400	24.54992	0.254
	FEMALE	60	41.0333	28.23207	
SUSCEPTIBILITY	MALE	75	17.9200	13.33940	0.388
	FEMALE	60	19.8833	12.76528	
CIRCUMSTANCES	MALE	75	11.2933	6.81567	0.250
	FEMALE	60	12.8833	9.16532	
BACTERIA	MALE	75	15.9867	8.36093	0.767
	FEMALE	60	16.4167	8.37934	
DIET	MALE	75	8.5733	6.05420	0.287
	FEMALE	60	9.7167	6.31944	

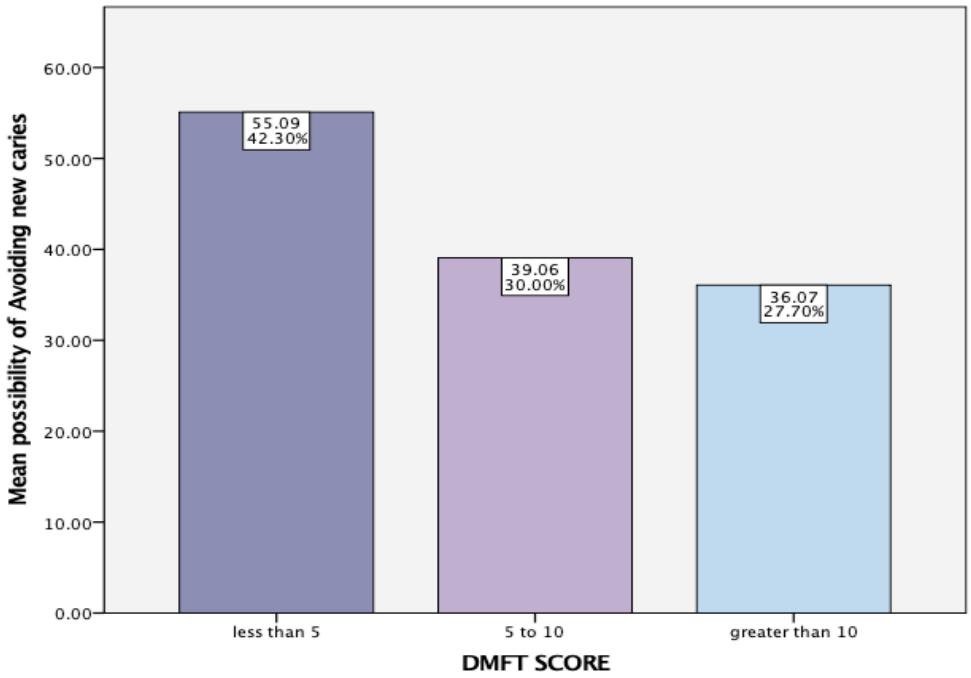

Figure 1: depicts the association between DMFT scores and the chance of avoiding new cavities in the cariogram. X axis represents DMFT score and Y axis represents the mean possibility of avoiding new caries. From the present graph it can be inferred that there DMFT score of less than 5 had a higher possibility of avoiding new caries, however it was not significantly different from DMFT score 5-10, >10 (p value=0.052).

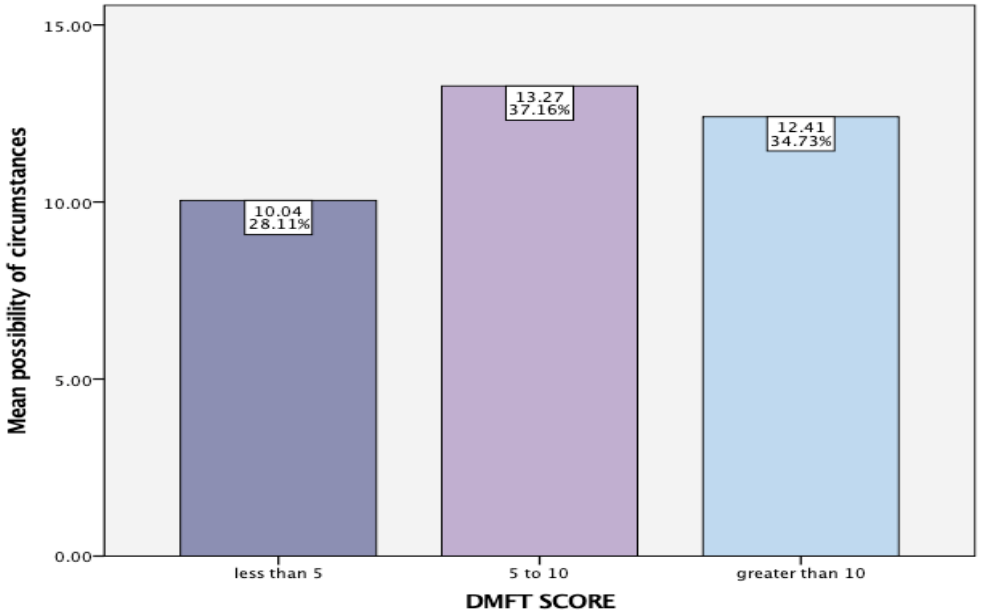

Figure 2: depicts the association between DMFT scores and the mean possibility of circumstances to cause caries in cariogram. X axis represents DMFT score and Y axis represents the mean possibility of circumstances to cause caries in the cariogram. From the present graph it can be inferred that the DMFT score of 5 to 10 has a higher possibility of avoiding new caries, however it was not statistically significantly different from DMFT score less than 5 and greater than 10 (p value=0.502).

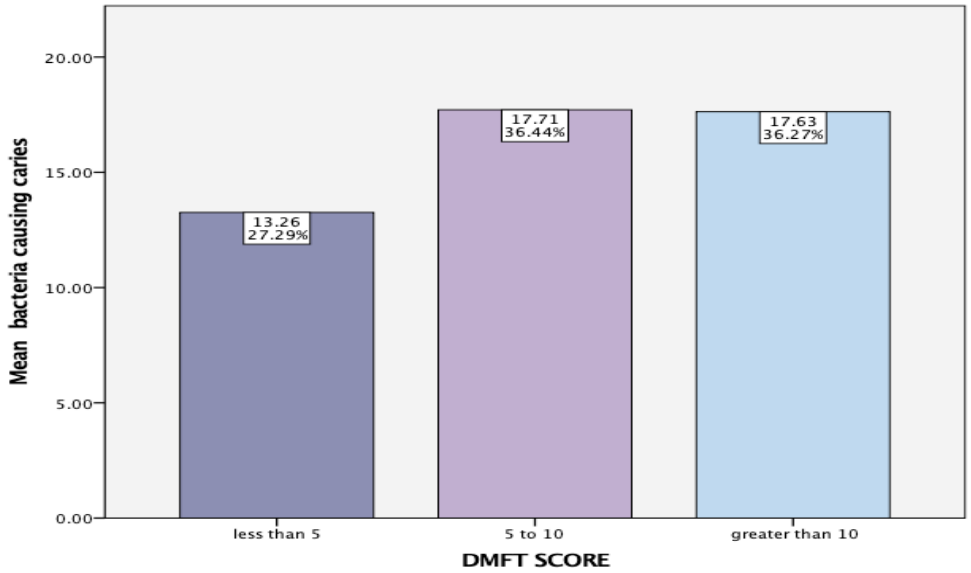

Figure 3: depicts the association between DMFT scores and the mean possibility of bacteria causing new caries. X axis represents DMFT score and Y axis represents the mean possibility of bacteria causing new caries. From the present graph it can be inferred that the DMFT score of 5 to 10 has a higher possibility of avoiding new caries, however it was not statistically significantly different from DMFT score less than 5 and greater than 10 (p value=0.071).

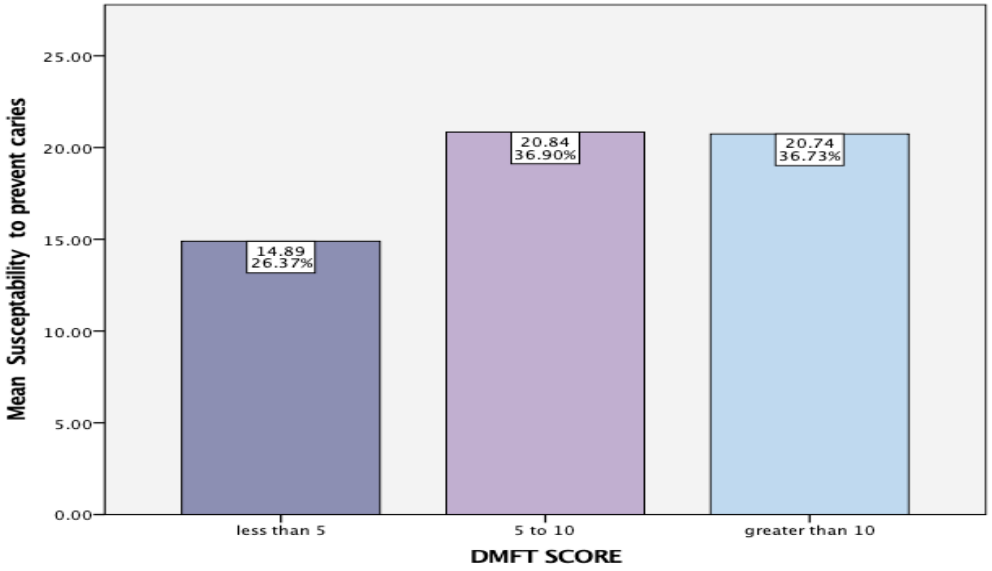

Figure 4: depicts the association between DMFT scores and the mean susceptibility preventing caries. X axis represents DMFT score and Y axis represents the mean possibility of bacteria causing new caries. From the present graph it can be inferred that the DMFT score of 5 to 10 has a higher possibility of avoiding new caries, however it was not statistically significantly different from DMFT score less than 5 and greater than 10 (p value=0.498).

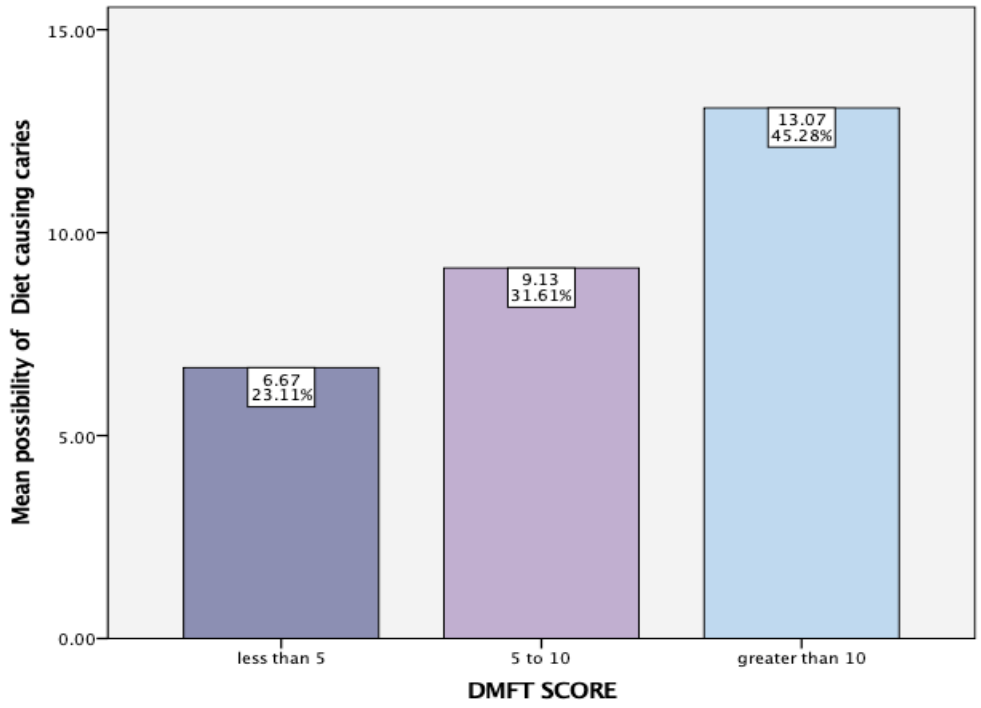

Figure 5: depicts the association between DMFT scores and the mean possibility of diet to cause caries in cariogram. X axis represents DMFT score

and Y axis represents the mean possibility of diet to cause caries in the cariogram. From the present graph it can be inferred that, as the diet frequency increases, the DMFT score increases correspondingly and this association is significant. (p value=0.001).

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