European Journal of Molecular & Clinical Medicine
ISSN 2515-8260 Volume 07, Issue 01, 2020

CARIES RISK ASSESSMENT USING CARIOGRAM PROFILE AMONG 18-20 YEAR OLD PATIENTS ATTENDING PRIVATE DENTAL COLLEGE, CHENNAI: A HOSPITAL BASED CROSS-SECTIONAL STUDY

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ABSTRACT

Dental caries are reversible dynamic biochemical events, and remain a public health problem due to its characteristics, cost of treatment and effectiveness of quality of life.Dental caries has a highest and longest association with dental profession. Dental caries do not undergo any termination or diminution if untreated and required expertise and professional treatment. But the risk factors should be studied and modified so that dental caries can be prevented. Despite the fact that various successful treatment goals have been developed the disease is still prevalent. In olden days dental caries detection was considered as a boon.To assess the caries risk of 18 to 20 year old patients using cariogram visiting private dental College in Chennai city. A total of 170 patient records taken who visited college from the period of June 2019 to March 2020. Cariogram images taken and analysed individually. Data were tabulated and statistically analysed using SPSS software. Descriptive statistics were expressed by means of frequency and percentage. Chi-square test was used to find the association of cariogram variables with age and gender. Out of 170 samples 32.4% of them were females, 67.6% males. Based on age group 23.5% of them were 18 years, 19 years - 38.8% of age and 37.6% of the population were 20 years of age. The significant association was observed between gender and fluoride, with more usage of fluoride measures by the males when compared to the females.

Keywords: Caries experience, Cariogram, Dental caries, Diet content, Diet frequency, Fluoride, Plaque amount.

INTRODUCTION:

Dental caries is a multifactorial microbial infectious disease characterised by demineralisation of inorganic and destruction of organic substances of the tooth(Carounanidy and Sathyanarayanan, 2009; Mohapatra et al., 2019). Aetiology of dental caries is uncertain till date. Dental caries publicly possess a health problem due to its affected rate, cost of treatment and also hinders quality of life(Prabakar et al., 2016; Tagliaferro et al., 2008).

Dental caries require expertise demands and is a time consuming treatment(Bagramian et al., 2009). Although there has been a change in the prevalence of dental caries still there are nearly 70% of the population affected by dental caries throughout the world(Mitha et al., 2016). The pattern of caries distribution has been changed throughout the years among the people representing high-risk with the people belonging to lower risk(Gauba et al., 2016). Therefore it is difficult to maintain proper oral hygiene of high-risk people when compared to their lower counterparts(Lagerweij and van Loveren, 2015). Risk factor assessment plays an important role in inhibition of these factors. Caries risk assessment(Prabakar, John, I Arumugham, Kumar and Srisakthi, 2018) refers to the determination of the possibility of disease incidence developing in a given period of time. One among the high-risk regions for caries development given by WHO is India especially in South and South East regions when compared to other regions of the world. It becomes a difficult task to give individualised care due to a massive proportion of the disease. Recent studies have observed factors such as culture, environmental disturbances(Pavithra et al., 2019) and behavioural differences are associated with oral diseases among Indian population(Jain et al., 2015; Mathur et al., 2014). These factors play a critical role in differentiating the risk among Indian population from the rest of the world.

Various literatures have reported cross-sectional and longitudinal studies regarding the caries risk assessment(Azrak et al., 2008; Hebbal et al., 2012). These tests have evaluated the accuracy of many different caries activity tests(Zhang et al., 2007). But not one single variable proven is predicting caries development(Wigen and Wang, 2010). Multifactorial caries aetiology(Neralla et al., 2019) requires development of new caries risk assessment models which must include different or various other parameters. In an attempt, two models were described as the risk model and the prediction model(Beck, 1998).

Essential component in decision making for prevention and management of dental caries is the risk assessment(Prabakar, John, IM Arumugham, et al., 2018). Multiple factors and indicators have been proposed past decline of dental caries incidence past 30 years as targets(Hugoson et al., 2007).

For practical application of caries risk assessment, a computer based model, Cariogram was developed and predictive ability was somewhat acceptable(Petersson et al., 2002). Two of the studies with school children and elderly has been proved with increased significance(Hänsel Petersson et al., 2003; Twetman et al., 1994). Cariogram demonstrates multifactorial background of dental caries by illustrating the interaction of nine factors, which are diet, plaque, caries experience, fluoride(Prabakar, John, I Arumugham, Kumar and Sakthi, 2018), saliva secretion, buffer capacity, clinical judgment projected using pie-chart. Therefore the aim of this study is to assess the caries risk assessment of patients attending private dental college using cariogram.

MATERIALS AND METHODS:

This present study is a descriptive, record based study conducted in a university setting at Saveetha dental college, Chennai . The Case sheets of all the patients in OP Department of Saveetha dental college and the final sample size of 170 was obtained from the data of 86,000 patients visited Saveetha dental college during the time period of June 2019 to March 2020.

The approval was obtained from the Institutional ethics committee, Saveetha University with the ethical approval number SDC/SIHEC/2020/DIASDATA/0619-0320. Type III examination procedures were included and 170 case sheets were reviewed. Cross verification of data for error identification was done. Simple random technique followed to minimise sampling bias.

Data entered in Microsoft excel sheet and then transported to SPSS software. Variable definition process was done using table and graphical illustration.

Inclusion criteria

- Age group- 18-20 years
- Multiple caries
- Complete patient records

Exclusion criteria

- Systemic illness
- Immunocompromised individuals
- No active caries present

Cariogram is a software which assesses the caries risk factors of an individual and also provides preventive and therapeutic interventions. The variables assessed in cariogram are the plaque amount, diet content, diet frequency, related diseases, caries experience, fluoride, buffer capacity, streptococcus mutans, clinical judgment.

Statistical analysis

Descriptive statistics test and inferential tests where used.IBM SPSS software version 20.0 statistical software was used. Age and gender taken as independent variables, cariogram was dependent variable. Percentage ,mean, standard deviation and chi-square tests done. The data is then transferred to a host computer and processed through software.

RESULTS AND DISCUSSION:

Out of 170 sample cases viewed, 32.4% were females and 67.6% of them were males (figure 1). Distribution of subjects based on age – 18 years where 23.5%, 19 years 38.8% and 20 years 37.6% (figure 2). Based on plaque amount, 92 of them had good oral hygiene, 30 had extremely good oral hygiene but 48 less then good oral hygiene (figure 3). 68 of them had better status of caries experience, 24 were caries free, 64 normal and 14 worst status of caries experience (figure 4). Depending on diet frequency, 99 of them take 4 to 5 meals per day, 39 more than six meals, 31 only take maximum three meals per day. Only one person has less than two meals per day (figure 5).

Based on fluoride, 39 of them take fluoride paste and also adequate measures, 97 fluoride paste plus inadequate measures, 27 only fluoride-based and 7 not using fluoride paste at all (figure 6). According to figure 7, 23 of them take extremely good diet content, 121 appropriate diet content, 25 high sugar content and one person in appropriate diet content.

Association between the age and cariogram variables was done using chi-square tests. The plaque amount is more commonly (25.8%) observed in 19 years of age, with minimal good oral hygiene (12.5%) experienced in 18 years of age(figure 8). 20 years of age experienced worse status of caries activity(12.5%), while 19 years as caries free (15.5%) most commonly. Better status of caries activity(65%) was seen at 20 years of age(figure 9). Extremely good diet content was followed at 20 years of age(15.6%), high sugar content diet(22.5%) at 18 years and most appropriate diet(75.8%) at 19 years of age(figure 10). Maximum three meals (19.7%) was consumed at 19 years of age, 6-7 meals(28.1%) at the age 20(figure 11). 40% of the population at 18 years use fluoride paste and also required additional measures. 62.5% at 20years use fluoride paste and some inadequate measures. 6.2% of the population at the age of 20 don't use fluoride paste at al(figure 12).
Association between the gender and variables was done using chi-square test. Extremely good oral hygiene(18.3%) is observed among males(figure 13). Worse status of caries activity (10.9%) evident in females, 43.6% better status in females(figure 14). Extremely good diet consumed by males(15.7%), high sugar content diet- males(13.9%) and females 16.4%(figure 15). Maximum three meals taken by 20% of the males, 56.5% of males take 4-5 meals per day, 23.5% take 6-7 meals per day(figure 16). In males, 28.7% of them use fluoride paste along with adequate measures, 50.4% fluoride plus inadequate measures,

15.7% only fluoride paste and 5.2% not even use fluoride paste. Among females, 70.9% of them use fluoride paste along with inadequate measures, 16.4% of them only fluoride paste, 10.9% fluoride paste along with adequate measures and only 1.8% do not use fluoride paste(figure 17).

Decision-making in order for treatment protocol, recall appointments which are patient centred is the caries risk assessment(Twetman and Fontana, 2009). The ideal risk model must be easy to practice in day to day life and must make use of risk factors which are inexpensive and also high accuracy in a reliable way. The process must be fast and easily understood by the dentist and motivate the patient. It must identify the high risk as well as the low risk factors. Cariogram is one such model which satisfies and gives illustration of various factors. Despite so many advantages of giving a cariogram, a study done by Tweetman(Twetman and Fontana, 2009) has observed cariogram to be a difficult tool for risk assessment. It also stated that it was complex and requires time consuming and costly laboratory procedures. Till date literature shows very conservative evidence on caries risk assessment using the above tools. But none of the studies have shown the usage of caries risk assessment form given by the American dental Association. A review done by Harris(Harris et al., 2004) observed association between food cariogenicity and frequency of consumption of sugar as a significant risk indicator. Other factors determined were low fluoride intake, family constitution and income(Harini and Leelavathi, 2019). Another study also observed dental caries and sugar intake as good predictors of future caries activity among all age groups. Study done by Tagliaferro(Tagliaferro et al., 2008) states that caries experience in primary teeth, sugar consumption, diet habits were important factors for future caries activity(Limeback, 2012).

According to cariogram the presence of caries relates directly with the presence of disease which may show an impact in the weakness of the individual(Pratha and Prabakar, 2019). But according to the study, the population had no systemic conditions, they were apparently normal. This is in accordance with the study done by Hebbal(Hebbal et al., 2012) in Indian city. A study done by Peterson(Petersson et al., 2002) concluded cariogram as an important tool to avoid caries which is similar in the current study. The factors in this study are expressed in terms of caries risk, which the authors consider as a useful value and more precise tool, there is risk of susceptibility, circumstances, bacteria and diet, greater scope for analysis. Four variables when not used in this study, those are streptococcus mutans(Mathew et al., 2020), saliva secretion, buffer capacity, clinical judgement and related diseases. Usage of these variables would have increased the efficacy of study. Thus cariogram, are useful tools and effective with advantages and recommendations for preventive care procedures and also increases patient motivation. This model has been evaluated both in primary and adult population in a scientific manner(Samuel et al., 2020). It can be used as a tool by the dentist about the caries risk to the patients.

40% of them had better status of caries experience, 14% of them were caries free. Although not statistically significant, these are attributed to the fact that social factors education levels are related to caries experience(Slade et al., 1996). Economic status impact differs among different countries. Low income person belongs to a high risk group. This depends on oral hygiene measures, diet and fluoride intake factors already included in Cariogram(Ruiz Miravet et al., 2007). 15% of them consume high intake of sugar in their diet which also increases the susceptibility of caries. Differences are evident when comparing sugar consumption patterns with other studies, which can be attributed to geographical(Kannan et al., 2017) and sociocultural factors(Krasse, 1988).

Fluoride is one of the important protective factors preventing caries, which is the main cause of considerable fall in caries risk in western countries(Hebbal et al., 2012). Association of Age and fluoride was observed to be statistically significant(Kumar, Pradeep Kumar and Vijayalakshmi, 2017). This means that the fluoride measures related to age has an impact on the caries risk assessment. Proper fluoride measures(Khatri et al., 2019; Kumar, Pradeep Kumar and Preethi, 2017) must be taken at certain appropriate groups to prevent the caries risk in accordance with cariogram.

AUTHOR CONTRIBUTIONS:

Author 1(Subashri.A) carried out retrospective study by collecting data and drafted the manuscript after performing the necessary statistical analysis. Author 2(Dr.Jayashri) aided in the conception of the topic, participated in the study design, statistical analysis and supervised in preparation of the manuscript and helped in study design and coordinated in developing the manuscript. All the authors have equally contributed in developing the manuscript.

CONFLICT OF INTEREST:

There are no conflicts of interest.

CONCLUSION:

In current study, increased caries risk susceptibility was seen among males (67.6%) at 19 years of age group (39%).Preventive measures are always the least cost alternative in accordance to Cariogram mainly. Various programs can be implemented to minimise or eradicate the risk- Fluoride programs, mouthwash strategies will help accordingly.

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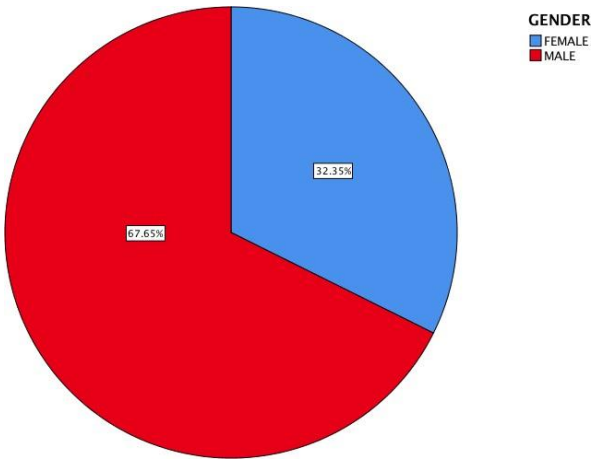

Figure 1: Pie diagram represents the percentage distribution of study subjects based on gender. 67.65% of the patients were males(red) and 32.35% of them were females(blue).

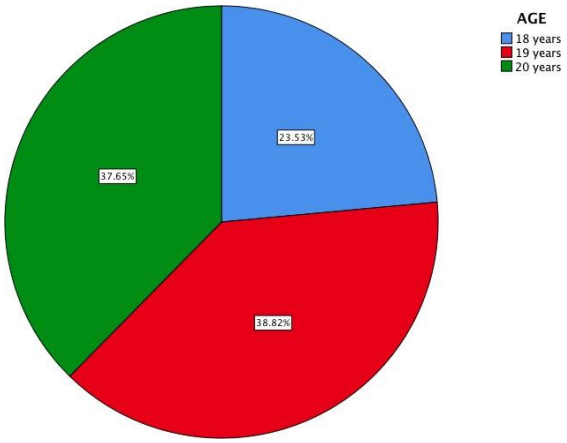

Figure 2: Pie diagram represents the percentage distribution of study subjects based on age. 23.53% of the study subjects were distributed in the age of 18 years(blue), 38.82% of the study subjects were distributed in the age of 19 years(red), 37.65% of the study subjects were distributed in the age of 20 years (green).

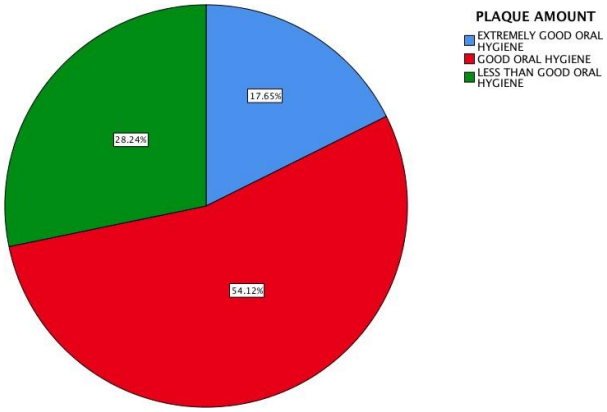

Figure 3: Pie diagram represents the distribution of study subjects based on plaque amount. 17.65% of the subjects had extremely good oral hygiene(blue), 54.12% had good oral hygiene(red) and 28.24% had less than good oral hygiene(green).

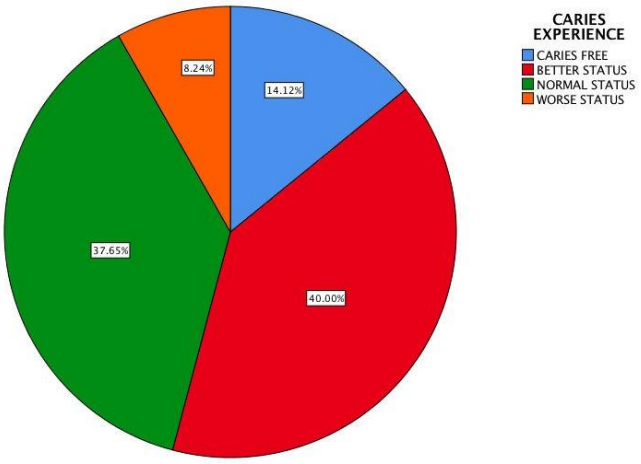

Figure 4: Pie diagram represents the distribution of study subjects based on caries experience, 14.12% of the study subjects were distributed as caries free(blue), 40% of the study subjects were distributed as better status(red), 37.65% of the study subjects were distributed as normal status(green) and 8.24% of the study subjects were distributed as worse status(orange).

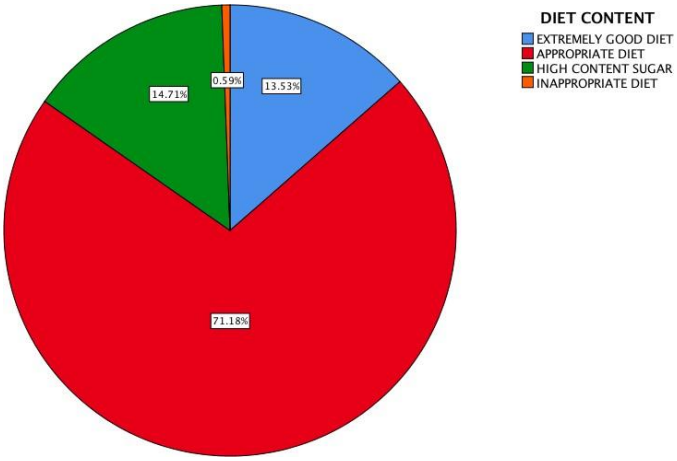

Figure 5: Pie diagram represents the distribution of study subjects based on diet content. 13.53% had extremely good diet (blue), 71.18% had appropriate diet (red) 14.71% consumed high content sugar diet (green) and 0.59% had inappropriate diet (orange).

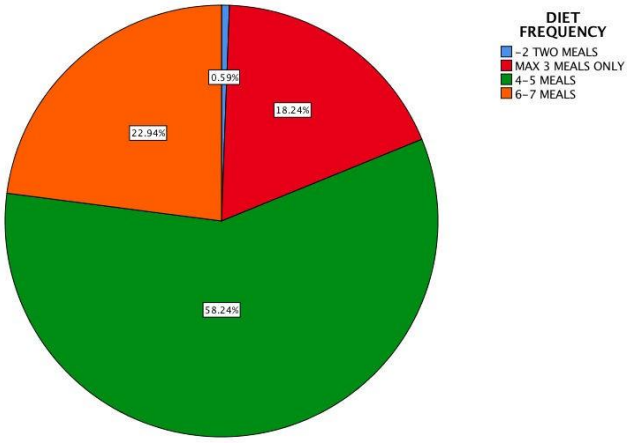

Figure 6: Pie diagram represents the distribution of study subjects based on diet frequency. 0.59% of them consumed less than 2 meals(blue), 18.24% of them consumed maximum 3 meals(red), 58.24% of them consumed 4-5 meals (green) and 22.94% of them consumed 6-7 meals(orange).

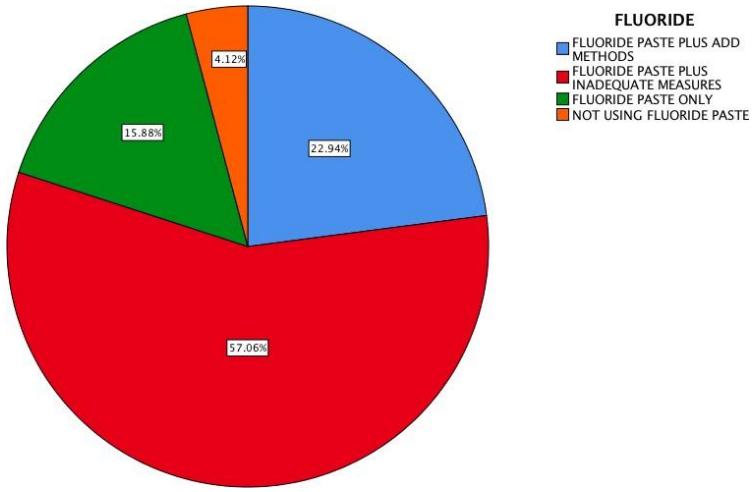

Figure 7: Pie diagram represents the distribution of study subjects based on use of fluoride measures. 22.94% of them use fluoride paste plus adequate methods(blue), 57.06% of them use fluoride paste plus inadequate methods(red), 15.88% of them use fluoride paste only (green) and 4.12% of them do not use of fluoride paste(orange).

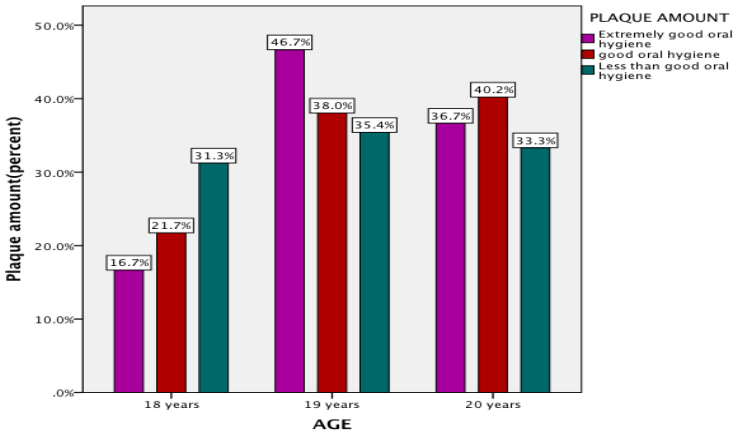

Figure 8: Bar graph depicting the association between the age and plaque amount. X-axis represents the Age of the patients and Y-axis represents the Plaque amount. Chi-square test was done and association between the age and plaque amount was found to be statistically insignificant. (Pearson Chi-Square:2.981; p-value-0.561). Even though it was found to be statistically not significant, 19 year old study participants were found to have extremely good oral hygiene(46.7%; magenta) than 18 year and 20 year old study subjects.

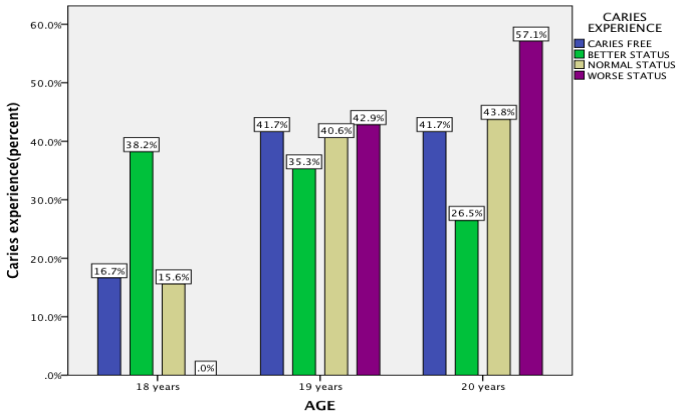

Figure 9: Bar graph depicting the association between the age and caries experience of the patients. X-axis represents the age of the patients and Y-axis represents the caries experience. Chi-square test was done and association between the age and caries experience was statistically significant. (Pearson Chi-Square:16.510; p-value-0.01). Better status of caries experience (38.2%) was observed among 18 years of age(green) and on the other hand, 20 year old study subjects had worse status of caries experience which was found to be 57.1% (magenta).

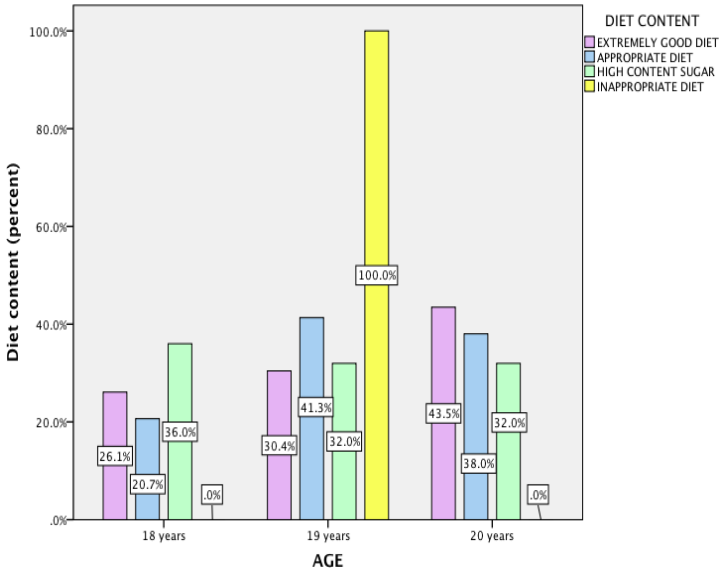

Figure 10: Bar graph depicting the relationship between the age and diet content. X-axis represents the age of the patients and Y-axis the diet content. Chi-square test was done and association between the age and diet content was statistically insignificant.(Pearson Chi-Square: 5.050; p-value-0.537). Inappropriate diet consumption (100%) was observed among 19 years of age(light blue) than 18years and 20 years of study subjects.

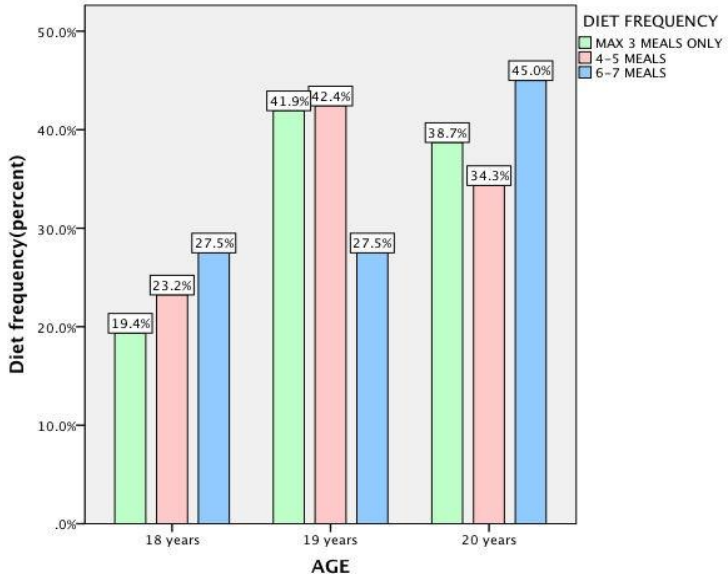

Figure 11: Bar graph depicting the relationship between the age and diet frequency. X-axis represents the Age of the patients and Y-axis the Diet frequency of patients. Chi-square test was done and association between the age and diet frequency was statistically insignificant.(Pearson Chi-Square: 5.371; p-value-0.497). Frequency of 6-7 meals consumption (45.0%)was observed among 20 years of age(blue) when compared to other age groups.

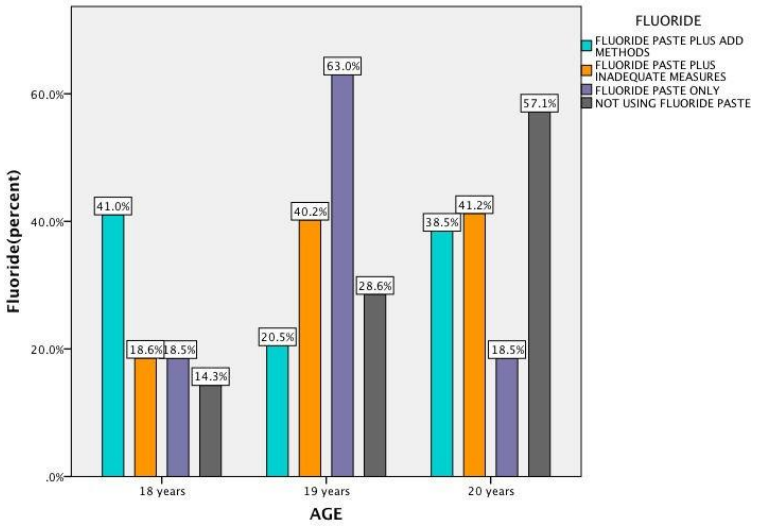

Figure 12: Bar graph depicting the relationship between the age and fluoride measures. X-axis represents the age of the patients and Y-axis represents the fluoride measures. Chi-square test was done and association between the age and fluoride measures was found to be statistically significant.(Pearson Chi-Square:17.963; p-value-0.006). Fluoridated toothpaste (63.0%) were more commonly used by the study subjects distributed at 19 years of age(purple) than 18 year and 20 year old study participants.

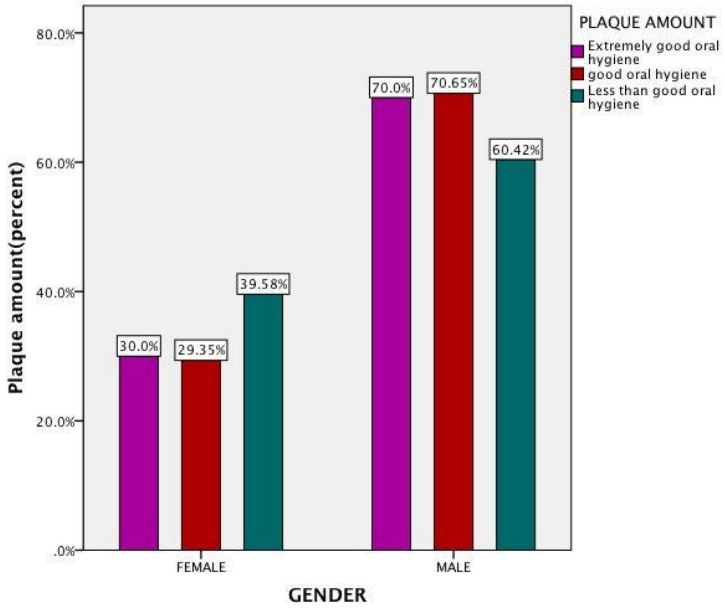

Figure 13: Bar graph depicting the relationship between the gender and plaque amount. X-axis represents the gender and Y-axis represents the plaque amount of the patients. Chi-square test was done and the association between the gender and plaque amount was statistically insignificant.(Pearson Chi-Square:1.602; p-value-0.449). Even though it was found to be statistically not significant, among the male study participants Extremely Good oral hygiene(purple) practices was observed (70.65%) than female (29.35%) study participants.

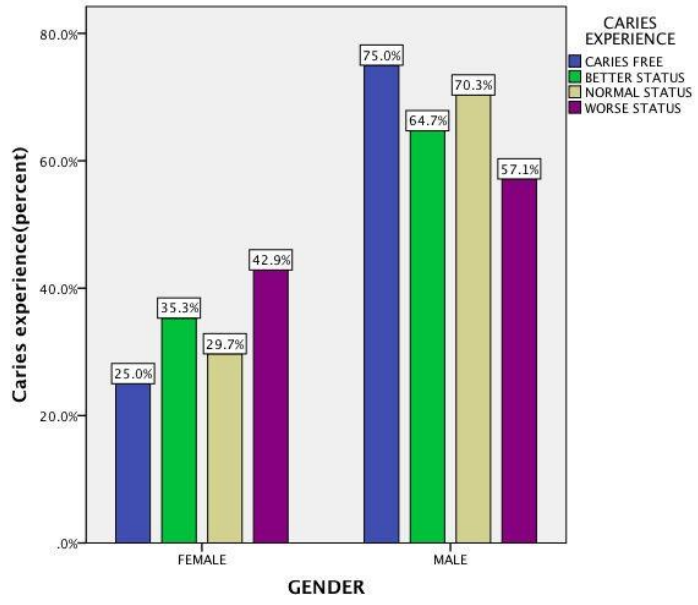

Figure 14: Bar graph depicting the relationship between the gender and caries experience of the patients. X-axis represents the gender of the patients and Y-axis the caries experience of patients. Chi-square test was done and association between the gender and caries experience was not statistically significant.(Pearson Chi-Square:1.775; p-value-0.620). 75% of the male population were caries free(blue) and 42.9% of female population had worse status of caries experience(purple).

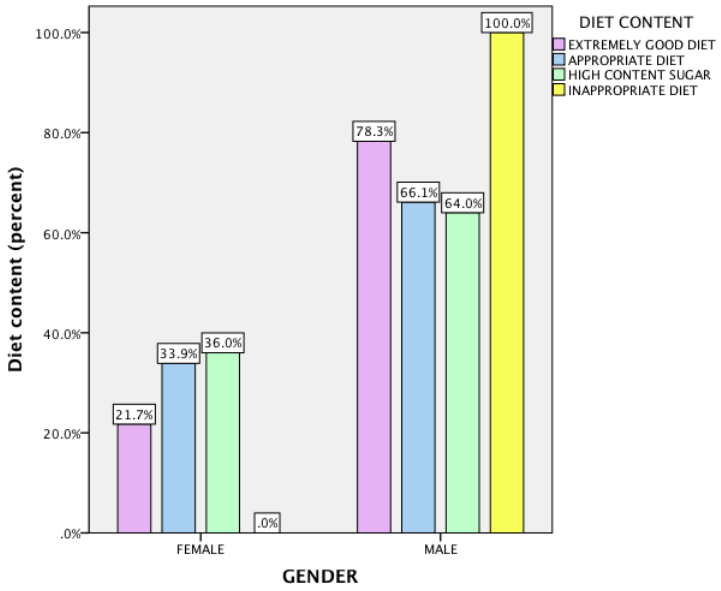

Figure 15: Bar graph depicting the relationship between the gender and diet content. X-axis represents the gender of the patients and Y-axis the diet content. Chi-square test was done and association between the gender and diet content was statistically insignificant.(Pearson Chi-Square:1.944; p-value-0.584). Inappropriate diet consumption(yellow) was observed greatly in males (100%) and high sugar content(green) consumption by female study participants(36.0%).

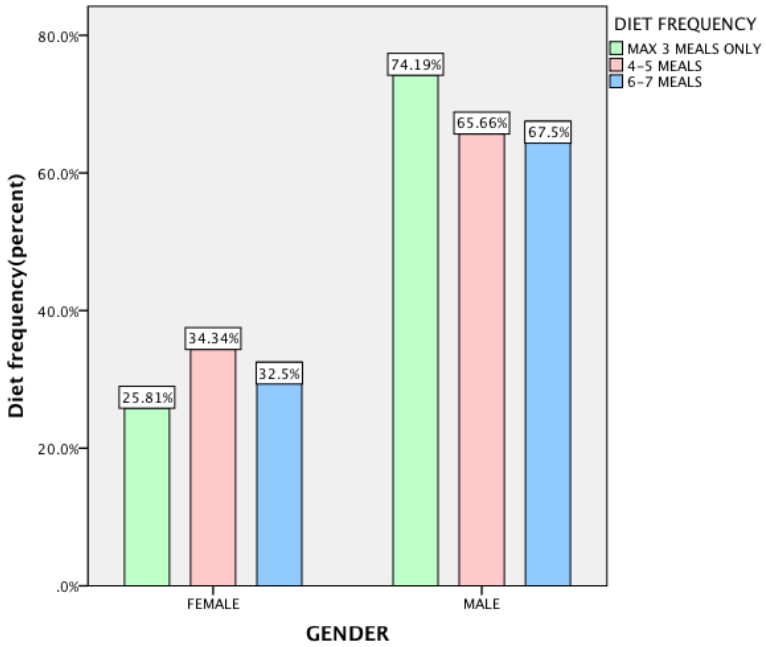

Figure 16: Bar graph depicting the relationship between the gender and diet frequency. X-axis represents the gender of the patients and Y-axis the diet frequency of patients. Chi-square test was done and association between the gender and diet frequency was statistically insignificant.(Pearson Chi-Square:2.922; p-value-0.404). Maximum of 3 meals (74.19%) (green) were taken by male study participants and 4-5 meals (34.34%) (pink) consumed by the female study participants.

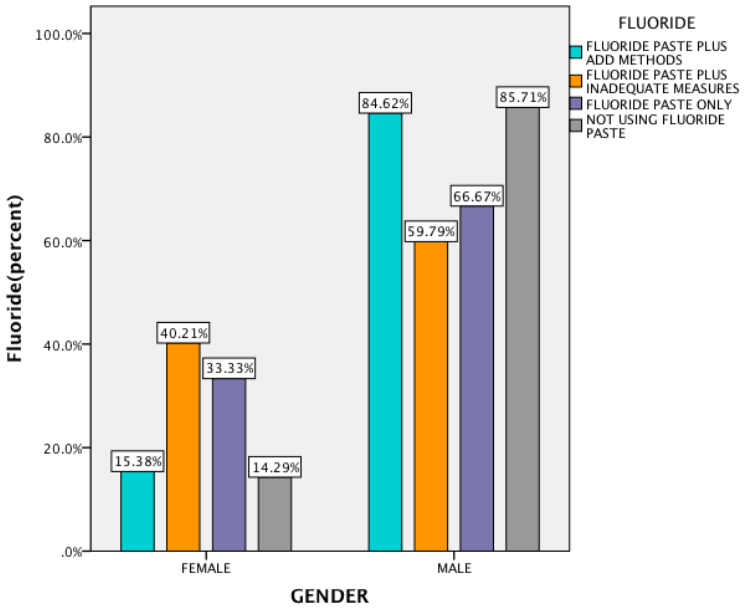

Figure 17: Bar graph depicting the relationship between the gender and fluoride measures. X-axis represents the gender of the patients and Y-axis the fluoride measures. Chi-square test was done and association between the gender and fluoride measures was statistically significant.(Pearson Chi-Square:8.920; p-value-0.030). A total of 85.7% of male study participants were found to be Not using Fluoride paste (Grey) than female study participants (14.29%).