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Association between Gender and Plaque Index- A Retrospective analysis of 86,000 patient records over nine months

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Abstract: Dental plaque is the community of microorganisms found on a tooth surface as a biofilm, embedded in a matrix of polymers of host and bacterial origin. If not removed regularly, the biofilm undergoes maturation and the resulting pathogenic bacterial complex can lead to dental caries, gingivitis and periodontitis. Dental plaque is seen in both genders and it depends on each individual's oral hygiene maintenance, which prevents progression of disease such as gingivitis and periodontitis. The aim of the study is to evaluate the association of gender with the amount of plaque. Retrospective study was conducted using patient records of University hospital. Consecutive case sheets with plaque index records were retrieved. Data was entered in excel and coded, then imported to SPSS. Descriptive statistics and Peasron's chi square association tests were done. The results were represented in the form of stacked bars. In this study, it was observed that out of 1152 patients, 51% were males and 49% were females. In relation to distribution of plaque index interpretation, out of 1152 patients, 41.44% had good plaque index scores, 33.45% had fair plaque index scores and 25.11% had poor plaque index scores.Plaque index was good for males (22.59%) than females (18.85%). There was no statistically significant association found between gender and amount of plaque (Chi square test=5.266,p= 0.621). Amount of plaque accumulation is more in females with no association between gender and plaque index.

Keywords: defense association, amount, gender, innovation, plaque

INTRODUCTION

Dental plaque is the community of microorganisms found on a tooth surface as a biofilm, embedded in a matrix of polymers of host and bacterial origin (Socransky and Haffajee, 2002) (Marsh, 2012). Of clinical relevance is the fact that biofilms are less susceptible to antimicrobial agents, while microbial communities can display enhanced pathogenicity (van Steenbergen, van Winkelhoff and de Graaff, 1984). The structure of the plaque biofilm might inhibit the penetration of antimicrobial agents. While this happens the bacteria growing on a surface grow slowly, which leads to reduced sensitivity to inhibitors (Gilbert et al., 2002). Plaque is natural and contributes to the normal development of the physiology and defenses of the host (Marsh, 2012). Microbial biofilms are complex communities of bacteria and are common in the human body and in the environment.

In recent years, bacterial plaque has been identified as a biofilm, and therefore the structure, microbiology and pathophysiology of dental biofilms were described. The nature of biofilm enhances the component bacteria's resistance to both the host's defense system and antimicrobials (Palaparthi et al., 2012). If not removed regularly, the biofilm undergoes maturation and the resulting pathogenic bacterial complex can cause cavities, gingivitis and periodontitis (Ababneh, Zafer Mohammad Faisal and Khader, 2012). In addition, subgingival plaque in patients with periodontitis is associated with numerous systemic diseases and disorders, including cardiovascular diseases, diabetes mellitus (DM), respiratory diseases and adverse pregnancy outcomes (Marsh, 2010)

Dental plaque is also implicated in occurrence of dental caries, which is related to shifts within the microbial balance of the biofilm leading to increased proportions of acid producing and acid tolerating bacteria, especially mutans streptococci and lactobacilli. The frequent intake of fermentable dietary sugars or impaired salivary flow, leads to persistent conditions of low salivary pH within the biofilm, which is favourable for these cariogenic bacteria (Solanki and Gupta, 2016). Clinicians should prevent this disruption to the natural microbial

balance of the biofilm rather than merely treating its consequences by restoring cavities. If dental plaque is not removed it hardens and becomes calculus which results in bleeding and receding gums, bad breath which can progress to attachment loss and ultimately resulting in tooth loss (Miyazaki et al., 1989).

Dental plaque is seen in both genders and it depends on each individual's oral hygiene maintenance, which prevents progression of disease such as gingivitis and periodontitis (Al-Omari and Hamasha, 2005) (Tada and Hanada, 2004) . An understanding of the nature and the pathophysiology of the dental biofilm is important in implementing proper management strategies. Although dental biofilm cannot be eliminated, it can be reduced and controlled through daily care. A daily regimen of thorough mechanical oral hygiene procedures, including toothbrushing and interdental cleansing is vital in controlling biofilm accumulation (Claydon, 2008). So there are literatures stating females have better oral hygiene than males and there are studies contradictory to these results also and there is a dilemma regarding this.

Previously our team had conducted numerous clinical trials (Prabakar, John and Srisakthi, 2016) (Kumar, Pradeep Kumar and Vijayalakshmi, 2017) (Kannan et al., 2017) (Kumar, Pradeep Kumar and Preethi, 2017) (Samuel, Acharya and Rao, 2020) (Pavithra, Preethi Pavithra and Jayashri, 2019) (Harini and Leelavathi, 2019) (Neralla et al., 2019)and in vitro studies (Prabhakar, Murthy and Sugandhan, 2011) (Prabakar, John, Arumugham, Kumar and Srisakthi, 2018) (Mathew et al., 2020) (Khatri et al., 2019) (Prabakar, John, Arumugham, Kumar and Sakthi, 2018) (Mohapatra et al., 2019) (Pratha, Ashwatha Pratha and Prabakar, 2019)over the past 5 years. Now we are focussing on epidemiological surveys. The idea for this survey stemmed from the current interest in the community.

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, Senthilvelan and Ranganathan, 2012), (Rajendran et al., 2019), (Govindaraju, Neelakantan and Gutmann, 2017), (P. Neelakantan et al., 2015), (PradeepKumar et al., 2016), (Sajan et al., 2011), (Lekha et al., 2014a), (Neelakantan, Grotra and Sharma, 2013), (Patil et al., 2017), (Jeevanandan and Govindaraju, 2018), (Abdul Wahab et al., 2017), (Eapen, Baig and Avinash, 2017), (Menon et al., 2018), (Wahab et al., 2018), (Vishnu Prasad et al., 2018), (Uthrakumar et al., 2010), (Ashok, Ajith and Sivanesan, 2017), (Prasanna Neelakantan et al., 2015). So this study is to evaluate the association of gender with amount of plaque so that patients can be educated accordingly regarding the adverse effects of improper oral hygiene maintenance, brushing frequency which results in better prognosis.

MATERIALS AND METHODS

Study setting and design

This retrospective study was conducted by reviewing 86,000 patient records of the authors University hospital for a period of nine months from June 2019 to March 2020.

Selection Criteria

A total of 1152 consecutive case records with signed informed consent with information on plaque index scores were retrieved and analysed.

Permission

Prior permission to utilize and to analyse the data from the case records of patients were obtained from the Institutional Review Board of the University

Data Collection

Information on age, gender and plaque scores were collected from patient's records. Plaque score was recorded according to Silness and Loe Plaque index (Loe, 1979). A score of 0 (No plaque). 1(Film of plaque), 2 (Moderate plaque) and 3 (Abundance of soft matter)on four surfaces (mesiobuccal, middle, disto buccal and palatal/lingual) of the index teeth (16,11,24,36,32,44) with a final score was entered. In case of any missing index teeth, all teeth in the oral cavity were scored. Interpretation of the final plaque index scores were described in terms of Excellent (0), Good (0.1-0.9), Fair (1.0-1.9) and Poor (2.0-3.0). The data were entered in excel and imported to SPSS. The variables were defined. Incomplete and censored data were excluded from the study.

Statistical Analysis

Statistical analysis was done using Statistical Package for the Social Sciences (SPSS) Version 23.0. Descriptive statistics was done to represent the gender distribution of the study population. Chi square association using crosstabs was done to find the association of gender with the amount of plaque. A p value <0.05 was considered to be significant.

RESULTS AND DISCUSSION

Final data set consisted of 1152 patients who underwent treatment in University hospital. In relation to gender distribution of the study population, it was seen that Out of 1152 patients, 51% were males and 49% were females [Figure 1]. In relation to frequency distribution of plaque index interpretation, it was found that out of 1152 patients, 41.44% had good plaque index scores, 33.45% had fair plaque index scores and 25.11% had poor plaque index scores [Figure 2]. In relation to association between gender and amount of plaque, it was seen that the Plaque index score was good for males (22.59%) when compared to females whose plaque index score was good, for only 18.85% of the population. This shows males had better oral hygiene than females. However this association of gender with amount of plaque was not statistically significant (Chi square test = 5.266, p = 0.621) [Figure 3].

Oral health constitutes a crucial part of general health. Caries and periodontal disease are the most common dental diseases globally (Glick et al., 2016). Gender is one important variable that contributes to oral health status globally. Other variables include race and ethnicity, socioeconomic status, attitude to dentistry, level of education and cultural values. There is an interplay between these variables and they can increase or diminish the effect gender has on oral health (Azodo and Etetafia, 2019).

In relation to the association of gender with amount of plaque, it was seen that males have better oral hygiene than females. This was in line with the literature by Sreenivasan et al (Sreenivasan, Prasad and Javali, 2016), but however wasn't statistically significant. Similarly plaque index was better for men compared to females, though it was not statistically significant ($p>0.05$) in the study by Mamai et al (Mamai-Homata, Koletsi-Kounari and Margaritis, 2016). This could be attributed to the fact that many families provide better nutrition for boys in the interest of maximising future productivity given that boys are generally seen as breadwinners. The unfortunate practice of son preference, which occurs worldwide in different levels of severity, often leads young girls to be neglected and therefore more likely to develop poor oral health, which is then left untreated (Lukacs, 2011). Also, females are at an increased risk to develop certain oral health complications (ulcers, swollen salivary glands, gingivitis and increased plaque accumulation) because of the hormonal changes they experience in their monthly menses, which attributes to poor oral health (Burakoff, 2003).

However, results in literature were found contradictory to our present study. Two studies stated that female's plaque index was better than males and were even statistically significant (Chelani et al., 2017); (Furuta et al., 2011). This could be attributed to the fact that good oral health has been associated with positive oral health beliefs and stability of beliefs (Glied and Neidell, 2008). Women tend to possess better and more stable oral health beliefs. This may contribute largely to why women have better oral health in modern society (Thorpe, 2003). Also the study discovered that young adult females had better knowledge of oral health, better attitude towards oral health, healthier lifestyles and better oral health behaviour than males (Gilbert et al., 1997). In particular, women brush their teeth twice, use additional cleaning devices and visit the dentist more frequently than their age-matched counterparts (Institute of Medicine, Board on Health Care Services and Committee on an Oral Health Initiative, 2012) . As a result of their knowledge, health and attitude, girls had lower dental plaque, calculus and gingivitis in the young adult stage. Further males also have smoking habits which predispose to poor oral hygiene.

The limitations of the study is that other contributing factors such flow of saliva, consistency of saliva, salivary pH to accumulation of plaque has not been taken into account. Further prospective longitudinal study including probable risk factors for plaque accumulation to be investigated to prove the hypothesis.

CONCLUSION

Within the limits of the study, males have better plaque scores than females with no association between gender and amount of plaque accumulation. Gender plays no role in plaque accumulation. Food habits and oral hygiene behavior may play a significant role in the amount of plaque accumulation.

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Author's Contribution

First author Vaishali.S performed data collection, analysis and interpretation and wrote the manuscript.

Second author Arthi Balasubramaniam contributed to conception, study design, analysis, interpretation and critically revised the manuscript.

Third author Revathi Duraisamy contributed to review the manuscript.

All the authors have discussed the results and contributed to the final manuscript.

Conflict of Interest
None

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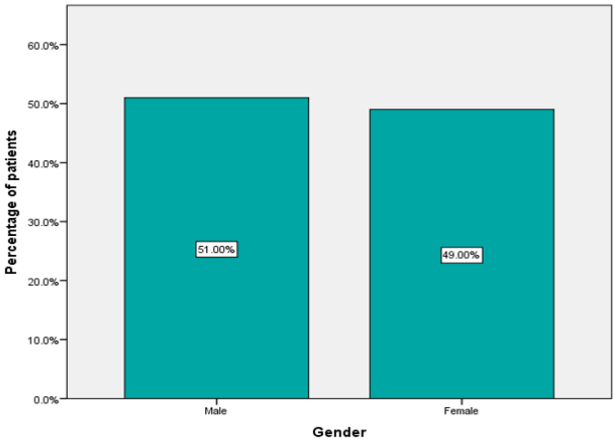

Fig.1: Simple bar chart shows frequency distribution of gender of the study population. X axis denotes the gender and Y axis denotes the percentage of participants in each gender. Out of 1152 patients, 51% were males and 49% were females.

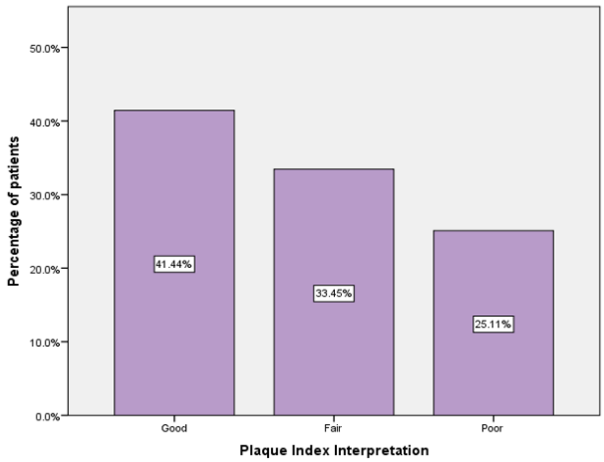

Fig.2: Simple bar chart shows frequency distribution of Plaque Index Scores. X axis denotes the Plaque Index score interpretation and Y axis denotes the percentage of participants in each plaque score. Most of the patients had good plaque score

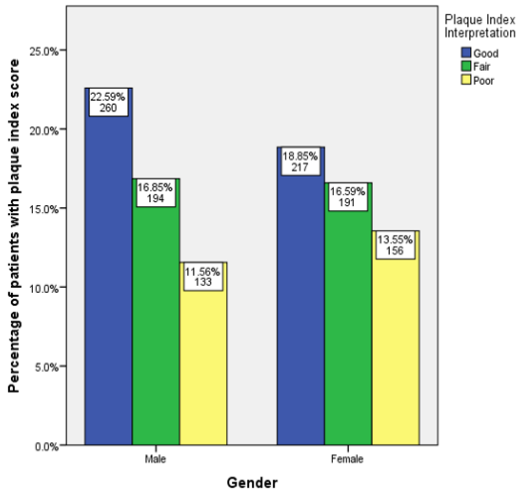

Fig.3: Bar chart showing distribution of plaque scores based on gender. X axis denotes gender and Y axis denotes the percentage of participants in each plaque score. Chi-square test was done and found to be not significant (Chi square test = 5.266, p = 0.621). Most of the male and female patients had good plaque scores. Amount plaque accumulation was less in both genders. However, the proportion of poor plaque score was high in females compared to males.