PRACTICE OF ORAL HYGIENE AND ITS RELATION TO PERIODONTAL HEALTH STATUS AMONG FEMALE POPULATION WITH CHRONIC PERIODONTITIS; A RETROSPECTIVE ANALYSIS

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ABSTRACT

Chronic periodontitis is the second most common oral disease worldwide. At an individual level, personal oral hygiene practice remains an integral part of the prevention and control of periodontal diseases. The study was aimed to assess the relationship between oral hygiene practice of female population with chronic periodontitis and their periodontal health status. A retrospective data of 91 female with chronic periodontitis population that attended IIUM Dental Clinic was retrieved from patients' case records from the year 2014 to 2017. ANOVA test was applied to infer the relationship between personal oral hygiene practice and the periodontal health status. Mean age for the group was 49.7±10.25, with the majority of them were Malays aged between 50 to 64 years old. All of them practice at least once a day brushing and lesser were flossing or used mouthwash as their daily oral care. ANOVA test showed the effect of cleaning more than once daily [F (2,88)= 3.37, p<0.05] and flossing [F (3,87)= 5.29, p<0.05] habits and frequency has significantly influenced the level of plaque scores. However, the analysis showed no significant relationship with other periodontal health parameters such as bleeding on probing, periodontal pocket depth, and missing teeth status. Oral hygiene practice found to influence the plaque control level in the female with chronic periodontitis. As plaque biofilm is one of the primary etiologies of periodontitis, it is essential to encourage the excellent practice of more than once brushing teeth daily and promoting flossing habit in patients suffering from chronic periodontitis.

Key words: female with chronic periodontitis, oral hygiene, brushing teeth, flossing, periodontal parameters.

INTRODUCTION

Chronic periodontitis is defined as an inflammatory disease of gingival and tooth supporting structures comprising of bone, cementum, and periodontal ligaments. Dental plaque biofilm and inadequate personal oral hygiene care are known significant risk factor of periodontitis (Bakdash, 1994; Haffajee & Socransky, 1994; Berezow & Darveau, 2011). Other risk factors are diabetes mellitus (Llambés et al, 2015) and smoking (Grossi et al, 1994). The adherence of plaque biofilm to tooth surface releases the toxin, which triggers a cascade of inflammatory response and infection. This complex interaction of bacterial, host susceptibility and the hyperactive immune response had subsequently led to the destruction of tooth-supporting structures; the alveolar bone loss that manifested clinically with tooth mobility, higher chances of tooth loss and gingival recession. (Cekici et al, 2014). Greater severity of periodontitis exerting the most significant impact of individual quality of life by compromising the aspects related to function and esthetics (Ferreira et al, 2017). Mainly the impacts were due to multiple tooth loss that causing edentulism then altering the normal masticatory function of an affected individual (Ferreira et al, 2017). Therefore it is significant to recognize periodontitis individuals, treat the disease, and prevent its progression.

Periodontitis prevalence was reported to increase in many countries. The National Health and Nutrition Examination Survey 2009 – 2012 conducted in United States demonstrated the prevalence of periodontitis is nearly half (45.9%) of the population aged 30-years and above (Eke et al, 2015). Whereas, the National Oral Health Survey of Adult Malaysia (NOHSA) 2010 showed

18.5% of increasing deep pockets in 10 years. The study had depicted male showed twice of deep pocket as compare to female but the latter was noted to have a higher prevalence of missing teeth (6.1% vs. 10.9%) (NOHSA, 2010). In an Indian population, the prevalence was reported higher in female compared to males (Ramoji et al, 2016). The reasons have been attributed to hormonal imbalance, poor nutrition, and frequent childbirths in females (Reddy, 1999).

In the prevention and treatment of periodontitis, the personal oral hygiene care combined with professional biofilm removal to control the inflammation remains as an essential part of the disease management (Corbet & Smales, 2012; Tonetti et al, 2017). Literally the accumulation of plaque biofilm is usually caused by improper tooth brushing technique, failure to carry out interdental cleaning and occasional visits (Lertpimonchai et al, 2017). Therefore the most effective way of controlling the development of plaque biofilm is via the mechanical removal of the plaque employing brushing teeth and interdental cleaning use. Furthermore, Lertpimonchai and colleagues presented the result of a recent meta-analysis of 15 studies that poor oral hygiene increases the magnitude risk of periodontitis by two to five-fold (Lertpimonchai et al, 2017). In contrast, regular tooth brushing and dentist visits could reduce periodontitis by 34% and 32%, respectively (Lertpimonchai et al, 2017). Studies also have supported the facts that the optimal supragingival plaque control via brushing teeth and the use of interdental cleaning device able to change the quantity and the quality of the supragingival microbiota (Dahlen et al, 1992, Rosier et al, 2014).

Though other risk factors may influence the initiation and progression of the periodontitis, the removal of plaque biofilm remains as a must manageable risk factor by the patient. With regards to oral hygiene care, females group was reported to show higher adherence as compared to the male group (Eke et al, 2015; Lertpimonchai et al, 2017). However, the part of oral hygiene practices that related to better control of periodontitis parameters was not explored much in the literature. Although some epidemiological studies have been conducted to determine the socio-demographic of periodontal disease in Malaysia, the details of a specific population nor the association of oral hygiene care has not been reported. The apparent increasing trend of tooth loss and periodontal disease in female gender as reported by NOHSA 2010 urge the need to improve the management of the disease, including identifying the patients' role in it. Subsequently, strategic planning for preventive and therapeutic programs could be expedited for the control of periodontal infection. Therefore, our study was aimed to assess the socio-demographic data and oral hygiene practices of female with chronic periodontitis and its relationship with periodontal health parameters.

MATERIALS AND METHODS

The data presented is part of a retrospective study regarding the periodontitis patients who had attending IIUM dental clinic from 2014 to June 2017. Ethical approval was obtained from IIUM Research Ethical Committee (IREC) with the IREC no. 693. The inclusion criteria are all periodontitis patients with sufficient information on the demographic, diagnosis, oral hygiene practice and clinical periodontal parameters such as periodontal pocket depth (PPD), full mouth bleeding score (FMBS), full mouth plaque score (FMPS)) and missing teeth recorded. Data extraction forms consisted of three parts, which include socio-demographic information, etiological and oral hygiene status and full periodontal charting.

Characteristics of the subjects
In the first part, a detailed description of the characteristics of the study participants have been collected in the major age strata to facilitate the systematic understanding of the socio-demographic profile. In this study, age [20 to 34, 35 to 49, 50 to 64 and 65+]; race [Malay, Chinese, Indian] and occupation [Professional/Technical/Management, clerical/sales, services (domestic/water/security), business, homemaker, student, retired/unemployed and others] are reported.

The associated risk factors and oral hygiene status
The second part of data extraction form explored the associated risk factors such as Diabetes mellitus [No (0), Yes (1)] and smoking [No (0), Yes (1)] and oral hygiene practice; tooth brushing frequency [once a day (1), twice a day (2) and more than twice a day (3)]; Flossing frequency [no (0), everyday (1). Occasionally (2), Seldom (3)] and mouthwash frequency [no (0), everyday (1), occasionally (2), seldom (3)] are reported.

Periodontal parameters addressing the periodontitis status of the subjects
The third part includes the focuses on the clinical presentation of the disease, including FMPS, FMBS, PPD and no of missing teeth. For all patients diagnosed with periodontitis, the standard examination were performed using the standard index. The FMPS were collected after staining the teeth with disclosing table to help the recording of plaque [No (0) and Yes (1)]. The FMPS measures the amount of plaque biofilm. Similarly the FMBS were recorded for sites that bleed in 10 seconds after probing with periodontal probe [No (0) and Yes (1)]. The FMBS reflect the degree of inflammation in the patient's mouth. The PPD recorded the distance from free gingival margin (FGM) to the bottom of the sulcus of periodontal pocket. Each index measured six sites for each tooth. Each measurement was rounded to the lower whole millimeter.

Data analysis
The collected data were analyzed using IBM Statistical Package for Social Science (IBM-SPSS) Version 24. The frequency and percentages were calculated as summary measures for condensing the raw data. For analysis, the PPD was further sub-grouped into different pocket severity [percentages of PPD<4mm, percentages of PPD$\geq$4mm and percentages of PPD $\geq$6mm]. ANOVA 'F" test was applied to infer the relationship between personal oral hygiene practice and the periodontal health status. A calculated p-value less than 0.05 was considered statistically significant.

RESULTS

**Socio-demographic data, oral hygiene practices and periodontal health of the subjects.**

Table 1: Socio-demographic characteristics of the study subjects.

Age group (in years)	20 to 34	35 to 49	50 to 64	≥ 65	Total (%)
n (%)	11 (9.7)	43 (38.1)	56(49.6)	3(2.7)	91 (100)
Mean Age (years± standard deviation)			48.41 ±10.6		
Race					
Malay	5 (7.6)	25 (37.9)	35 (53)	1 (1.5)	66 (72.5)
Chinese	1 (4.3)	6 (26.1)	14(60.9)	2 (8.7)	23 (25.3)
Indian	1(50)	1(50)	0	0	2 (2.2)
Occupation (n=74)					
Professional/Technical/ Management	0 (0)	5 (35.7)	9 (64.3)	0 (0)	14 (15.4)
Clerical/sales	0 (0)	3 (50)	3 (50)	0 (0)	6 (5.6)
Services (domestic/water /security)	1 (25)	2 (50)	1(25)	0 (0)	4 (4.4)
Business	1 (6.7)	7 (46.7)	7 (46.7)	0 (0)	15 (15.5)
Homemaker	0 (0)	11 (39.3)	17 (60.7)	0 (0)	28 (30.8)
Student	3 (100)	0	0	0	3 (3.3)
Retired /unemployed	0 (0)	0(0)	3 (60)	2 (40)	5 (5.5)
Others	2 (11.8)	4(23.5)	10(58.8)	0	16 (17.6)
Smoking habits (Yes)	1 (14.3)	0	0	0	1 (1.1)
Diabetes Mellitus (Yes)	0	2 (6.3)	9 (18.4)	0	11 (12.1)

The table 1 showed the socio-demographics of the subjects. From 2014 up to 2017, a total of 91 females have been identified suffering from mild to severe chronic periodontitis with mean age ±SD of 48.41 ±10.6. Female aged 50 to 64 years old and Malay population has been the most to be affected by chronic periodontitis (49.6%). Majority of them was working-women (40.9%) compared to homemaker (28%). One adolescent female was a smoker, and 11 were found to be diabetic aged between 35 to 64 years old.

Figure 2 showed that all of them brushing their teeth daily (n,%) at least twice a day (55, 60.4%), once a day (2, 2.2%) and more than twice a day (34, 37.4%). Only 36% of them flossing and performed it daily (13, 14%). 52.7 % of them using mouthwash and performed it daily (20, 22%). Table 3 showed the periodontal health parameters of the subjects. Mean FMPS and FMBS (mean ± SD) were 76.4 ± 20.9 and 76.6 ±21.7. The level could be considered as quite poor and high. The mean percentages of PPD were low at 5.1 ±8.2, but the number of women presented with deep pockets was about 59 subjects

Figure 2: Oral hygiene methods and frequency of practice of subjects (n=91).
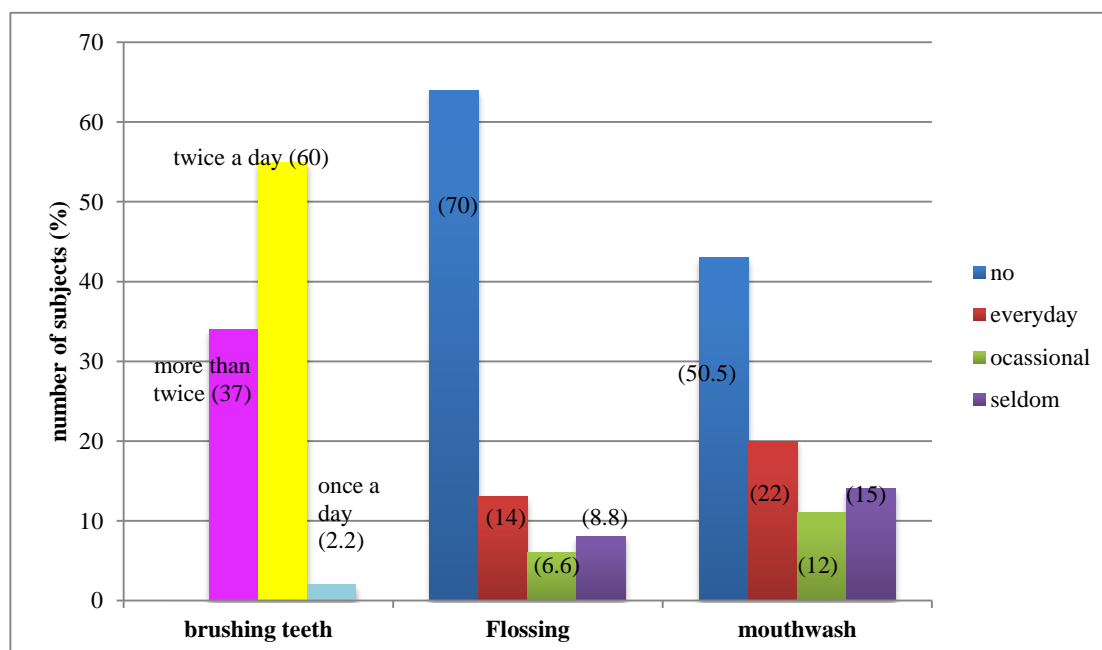
The relationship between oral hygiene practice and periodontal health parameter

A one-way between subjects ANOVA was conducted to compare the effects of brushing frequency on periodontal health parameters in women with chronic periodontitis (Table 4). There was a significant effect of brushing frequency on the amount of plaque present in the subjects' mouth (FMPS) at the $p<0.05$ level for the three different frequency [$F_{(2,89)}= 3.365$, $p=0.039$]. However, no effects of brushing frequency found on other periodontal parameters such as probing pocket depth, full mouth bleeding score, and number of missing teeth. Post hoc comparisons using the Games-Howell test indicated that the mean difference for brushing once a day was significantly different from brushing for twice (MD = 35.6, SD = 4.58) and more than twice (MD = 30.4, SD = 4.63). However, brushing frequency more than twice (MD = 5.18, SD = 4.23) did not significantly differ from the brushing twice daily.

Table 3: The periodontal health characteristics of the subjects (n=91)

Periodontal Parameters	Mean ±SD (n)	Max, Min
Percentages of FMPS	76.4 ±20.9 (91)	22,100
Percentages of FMBS	76.6 ±21.7 (91)	12, 100
Percentages of PPD<4mm	71.9 ±27 (87)	0, 97
Percentages of PPD≥4mm	19.3 ±17.8 (88)	0, 90.9
Percentages of PPD≥6mm	5.1 ±8.2 (59)	0, 46.9

When a one-way between-subjects ANOVA was conducted to compare the effects of flossing frequency on periodontal health parameters in women with chronic periodontitis (Table 5), there was a significant effect of flossing frequency on the subjects' missing teeth number at the $p<0.05$ level for the four different frequency [$F_{(3,88)}= 5.289$, $p=0.02$]. Again no effects were found on other periodontal parameters. Post hoc comparisons using the Games-Howell test indicated that the mean difference (MD) for occasional flossing was significantly different from no flossing (MD =11.91, SD = 3.41), daily flossing (MD = 21.3 SD = 6.19) and seldom flossing (MD=36.1, SD= 9.21).

Table 4: Association between periodontal health parameters and frequency of brushing by subjects (N=91)

Periodontal parameters	Comparison	df	Sum of square	F	p-value
FMBS	Between group	2	2244	1.925	0.152
	Within group	89	51296		
FMPS	Between group	2	2779	3.365	0.039*
	Within group	89	36346		
PD<4mm	Between group	2	619	0.136	0.873
	Within group	89	200359		
PD≥4mm	Between group	2	2019	2.278	0.108
	Within group	89	39003		
PD≥6mm	Between group	2	68	0.597	0.553
	Within group	89	5021		
Missing teeth	Between group	2	88	0.802	0.452
	Within group	89	4875		

* Annova F test significant at p-value<0.05

Table 5: Association between periodontal health parameters and frequency of flossing by subjects (N=91)

Periodontal parameters	Comparison	df	Sum of square	F	p-value
FMBS	Between group	3	309	0.512	0.675
	Within group	88	604		
FMPS	Between group	3	2011	1.468	0.229
	Within group	88	380		
PD<4mm	Between group	3	3228	0.606	0.613
	Within group	88	2198		
PD≥4mm	Between group	3	279	0.549	0.650
	Within group	88	461		
PD≥6mm	Between group	3	31	1.870	0.141
	Within group	88	57		
Missing teeth	Between group	3	100	5.289	0.02*
	Within group	88	53		

* Annova F test significant at p-value<0.05

DISCUSSION

In this present study, the prevalence of chronic periodontitis in female aged 50 to 64 years old was high, followed by 35 to 49 years of age. Prevalence of periodontitis was comparatively lesser in the subjects of lesser age group concurred with other studies in the literature (Al Qahtani et al, 2017; Ramoji et al, 2016; NOHSA, 2010; Eke et al, 2015). Age is a non-modifiable risk factor for periodontal disease. However, age itself does not affect the periodontal status, but it is the cumulative effect of untreated disease and reaction on the plaque where the inflammation develops more rapidly and healing proceeds slowly (Van der velden, 1984). Aging is a natural process, and changes are there in host immunity against the disease process, but if one can practice optimum oral hygiene, he or she can maintain teeth throughout life (Ramoji et al, 2016). Nevertheless, the prevalence assessed among these types of samples should be interpreted carefully as the clinic care-based population may reflect the group which more accessible to dental facilities, and those who have dental problems.

High prevalence of periodontitis in male has been associated with the habits of smoking and poor oral hygiene whereas the prevalence in the female has been attributed to hormonal imbalance, poor nutrition, and frequent childbirths (Reddy, 1999). Nonetheless, a recent review highlighted that the sex dimorphism had been implicated in the periodontitis etiology possibly affecting the bacterial component and the host immune response both in the innate and adaptive levels to be higher in males compared to female (Ioannidou et al, 2017). The author proposed that the economic inequality and hardship for women are the factors that may contribute to the different severity of disease found in different geographic location and society. Due to this, women have limited access to oral care (Ioannidou et al, 2017).

The present study found that Malay female was identified to mostly affect by chronic periodontitis owing to the geographic location of the study in the Malay populated area. The prevalence of homemakers relatively high compared to other professions because timely homemakers have less restriction and has accessibility attending dental clinic compared to working individual. Similarly, a study of periodontal disease prevalence had reported that more than 50% of their subjects were the homemakers (Al Qahtani et al, 2017).

The overall oral hygiene status of the subjects was poor, with a high degree of inflammation. The mean of FMBS (±SD); 76.6 ±21.7 found in the studied population would increase the chances of worsening periodontitis. Lang and colleagues had stated an increase of attachment loss when periodontitis subjects presented with 16% and more of bleeding on probing (BOP) sites (Lang et al, 1986). Moreover, the presence of bleeding on probing had been corroborated to indicate the significant subgingival deposits present in periodontal patients (Cecchi et al, 2009). The subgingival deposits initially develop from the advancement of plaque biofilm from the supragingival of inadequately performed personal oral hygiene care. Therefore good oral hygiene practice is deemed necessary to control the degree of inflammation.

Despite the low overall prevalence of PPD>6mm, the number of subjects affected was more than 50%, indicating that many subjects suffering from a severe degree of chronic periodontitis. Since plaque biofilm is one of the significant risk factors for periodontitis, home and professional plaque controls indeed remain the most critical part of disease management (Axelsson et al, 2004). The practice of brushing twice daily by the subjects was the most recommended frequency, which expected to remove at least 20% of plaque sufficiently. More than 50% of subjects brushing teeth about twice daily in this study were slightly higher than reported in other studies (Han & Park, 2017). In contrast, another study had stated more female brushing one or less frequency daily (Al Qahtani et al, 2017). However, the cleanliness does not depend on the frequency only but also the time spent and technique (Slot et al, 2012). Two minutes brushing teeth is recommended by many guidelines (American Dental

Association; Slot et al, 2012). Two minutes brushing will remove twice more plaque (40%) than brushing less than 2 minutes (Slot et al, 2012), but unfortunately, no data of time spent for brushing could be retrieved from the subjects' case note.

Similar to other studies, the use of floss as interdental-cleaning aids was considered as low among chronic periodontitis patients compared to brushing habits (Al Qahtani et al, 2017). Studies found that the cost, ease of use, and motivation were the reasons for subjects not keen to use interdental aids. (Umanah & Braimoh, 2017; Mahtani & Lakshmanan, 2017). As tooth brushing cannot efficiently reach the interproximal areas where periodontal disease is prevalence (Cancro & Fischman 1995; Hodges, 1991), and interdental self-care with dental flossing is a standard method for disrupting the oral biofilm to achieve and maintain the periodontal health. Current literature, unfortunately, does not support dental floss usage for regular practice. However, the absence of evidence does not mean the absence of an effect. Higher frequency of interdental cleaning was correlated with increased periodontal health (Marchesan et al, 2018).

When further analyses were conducted to assess the effects of brushing frequency to periodontal health parameters, the frequencies of brushing teeth were found to be associated with the lower plaque control level of the subjects. Also, the effects of more than twice daily brushing were similar to twice daily brushing. Post hoc test also showed a significant difference in plaque levels in those who brush once daily and twice daily. Therefore it is critical to inculcate at least twice-brushing habits amongst the chronic periodontitis patients while recommending for a minimum of two minutes brushing teeth. Furthermore, Axelsson and Lindhe had highlighted in their article that the recurrent of periodontitis were not found in the groups who undergoing professional periodontal treatment with close monitoring of home plaque control (Axelsson & Lindhe, 1991). They did emphasize the use of interdental cleaning aids throughout the maintenance phase (Axelsson & Lindhe, 1991). Unfortunately, the use of interdental cleaning aids is quite low amongst studied subjects, and our result concurred with the situational in Malaysia adults generally (Esa et al, 1992). The flossing frequency significantly associated with the number of missing teeth but not associated with other periodontal health parameters. The low number of subjects that floss may contribute to insignificant difference. The interpretation of this result should be made carefully as the cause for missing teeth was not identified clearly, although most of the time, patients with chronic periodontitis may lost their teeth due the disease itself nor other causes.

Subsequent of NOHSA 2010 report, the Ministry of Health Malaysia has addressed the focus for improving the periodontal health of adults and adolescent by enforcing personal hygiene care, particularly the flossing habits (Oral Health Division, 2011). Our findings corroborate the need for female's patients with chronic periodontitis in specific and generally the community to use interdental cleaning devices such as floss as an integral part of their daily oral hygiene care together with routine brushing habits twice a day in the management of the periodontal disease.

CONCLUSION

Within the limitation of this study, it can be concluded that many females with chronic periodontitis presented with a severe degree of chronic periodontitis and poor periodontal health status. Despite that majority practicing at least twice daily brushing teeth but much fewer use interdental-cleaning devices. Twice daily brushing frequencies associated with an improvement of plaque control level; while the flossing frequency was associated with the lower number of missing teeth in periodontitis subjects. Therefore, the clinicians should play a significant role in creating awareness about periodontitis and the importance of oral hygiene care in its management that in line with the National oral health plan to promote personal dental care among the population.

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