

Original Article

Knowledge, Practice and State of Periodontal Health among Egyptian Patients attending Diagnostic Center at Faculty of Dentistry, Cairo University: A Cross-Sectional Study

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Abstract

Aim: This investigation aimed to evaluate the knowledge and practice of periodontal health with assessing periodontal health status among adult Egyptian patients. **Methodology:** This study was performed on 511 subjects who were recruited in a consecutive manner from the diagnostic center at faculty of Dentistry, Cairo university. A well-structured questionnaire was filled from all the participants via personal interview including a section for demographic data, diabetes and smoking. Periodontal health knowledge was assessed focusing on the basic knowledge of gingival appearance, causes and outcomes of periodontal disease, impact of systemic disease on the periodontal disease progression. Periodontal practice was assessed evaluating tooth brushing, flossing, mouth rinsing, scaling in recent five years and how to alleviate gingival bleeding. The CPITN/CPI scores were measured reflecting state of periodontal health. Statistical analysis was done using SPSS program. **Results:** Level of knowledge towards periodontal health was 48.9% of the participants, but the majority (92.4%) lacked knowledge of the etiology of periodontal disease. Half of the participants didn't practice tooth brushing and only 6.3% used dental floss. There was a significant positive association between frequency of tooth brushing, flossing, scaling visits and periodontal health knowledge. Also, a significant inverse correlation between CPITN/CPI scores and periodontal health knowledge was noticed. There was a significant association between periodontal health practice and periodontal health status. **Conclusions:** Educational level was a positive predictor of periodontal health knowledge, while CPITN/CPI scores were found to be negative predictors of periodontal health knowledge.

Keywords: Knowledge; Periodontal health; Practice, state; Educational level

I. INTRODUCTION

Periodontal health is an essential component of the general health thus; it may be considered one of the human rights. Since the oral cavity is considered as the body mirror, preserving a good periodontal health and functional dentition is crucial for maintenance

of the general health. Thus, early diagnosis of periodontal disease through regular periodontal screening is vital for maintenance of the periodontal health (Preshaw, 2015).

Good knowledge of oral hygiene measures and its importance is essentially needed in order to allow individuals to follow a

healthy periodontal practice (Muhammad and Lawal, 2010). Consequently, determining the level of knowledge of a certain population would help implementing the necessary preventive measures. Several studies have proved that prevention of periodontal disease is highly dependent on a person's periodontal health knowledge, attitudes and practices (Wehmeyer et al., 2014, Stein et al., 2015, Holtzman et al., 2017).

Epidemiological data regarding periodontal health knowledge and practice is available from numerous countries in the world. Data from Saudi Arabia, Syria and Lebanon have shown that adults with completely healthy periodontal tissues comprise a small minority of their population (Gholami et al., 2014, Nyorobi et al., 2018, Zhao et al., 2019, Penmetsa et al., 2019). However, little published data is available on the level of periodontal knowledge and its impact on the state of periodontal health among the eastern Mediterranean countries (El-Qaderi and Quteish Ta'ani, 2004, Gholami et al., 2014, Penmetsa et al., 2019).

To the best of the authors knowledge, data on periodontal health knowledge, practice and state in Egypt is not available. Indeed, poor oral health awareness is the main cause of increasing in prevalence of periodontal disease and the subsequent financial implications (Ali et al., 2012). Thus, this cross-sectional study aimed to evaluate the knowledge and practice of periodontal health with a simultaneous assessment of periodontal health status of adult Egyptian dental patients attending the diagnostic center at Faculty of Dentistry, Cairo University.

II. MATERIALS AND METHODS

A. Ethical Review

This is an observational cross-sectional study. The study protocol was registered in ClinicalTrials.gov (ID: NCT04478864) and approved by the Research Ethics Committee, Faculty of Dentistry, Cairo University

(December 2019) (Ref. No.: 12122019) and performed according to the Declaration of Helsinki (Palacios, 2013). The detailed steps were clearly described to all patients who agreed to participate in this work and signed a written informed consent. CONSORT guidelines: N/A.

B. Study Design and Participants

The current cross-sectional study included 511 patients recruited in a consecutive manner from a sample of adult Egyptian patients seeking dental treatment at Faculty of Dentistry, Cairo University. Sample size calculation was done using prevalence of periodontal health knowledge as the primary outcome, based on a previous study reporting a percentage of 13.8% (Gholami et al., 2014).

Using an acceptable margin of error 3%, 0.05 significance level and a confidence level of 95%, the estimated sample size was 511 subjects. Inclusion criteria included patients above 15 years seeking dental treatment at the outpatient clinic. Exclusion criteria were patients with mouth opening problems where oral examination was not possible, and patients diagnosed with psychiatric problems.

C. Interview and Data Collection

Periodontal health knowledge and practice

A well-structured questionnaire was filled through a face-to-face personal interview with each patient by the examiner (IBA). It included a section for demographic information, addressed diabetes and smoking habits, involved questions about knowledge and practice of periodontal health. This questionnaire was designated from two sources; knowledge part questions was based on Gholami et al. (2014), while practice was assessed according to questionnaire adopted by Zhao et al. (2019). All questions were explained to the patients.

D. Clinical Periodontal health status

Periodontal examination using the CPITN and CPI was done for all the participants using WHO probe to assess the status of the periodontal condition. Ten indexed teeth were probed with a light force at six surfaces to assess presence of calculus and measure pocket depth where CPITN scores were given and treatment needs for each patient were planned accordingly. Information on CAL was collected from the same index teeth using CPI modified system. The highest code number corresponding to the worst periodontal condition around each of the 10 indexed teeth was recorded (Ainamo et al., 1982, Cutress et al., 1987).

E. Statistical analysis

All Qualitative data were presented as frequencies and percentages. Quantitative data were presented as mean, standard deviation (SD), median and range values. Kruskal-Wallis test was used to study the association between periodontal status and practices of periodontal health. Dunn's test was used for pair-wise comparisons when Kruskal-Wallis test is significant. For univariate analysis; Chi-square test was used for comparisons regarding qualitative variables. Spearman's correlation coefficient was used to determine the correlation between knowledge scores, CPITN/CPI scores. For multivariate analysis; binary logistic regression analysis was used to determine significant predictors of knowledge levels. The regression coefficient (b), standard error (SE), and 95% confidence interval (95% CI) were calculated. The significance level was set at $P \leq 0.05$. Statistical analysis was performed with IBM SPSS Statistics for Windows, Version 23.0. Armonk, NY: IBM Corp.

III. RESULTS

A. Descriptive data

The present study was conducted on 511 subjects; 195 males (38.2%) and 316

females (61.8%), with the predominant age group being 20 – 44 years old. Approximately half of the participants had primary school and lower educational level, only 10% of them had a history of diabetes while 21.3% of participants were smokers.

B. Periodontal health Knowledge, Practice & state

Frequencies and percentages for the answers to questions about knowledge of periodontal health are shown in Table 1. Overall, more than half of participants (51.1%) was found to have poor level of periodontal health knowledge. The highest proportion of participant's poor knowledge was regarding dental plaque as the primary etiology for periodontal disease (92.4%).

Concerning periodontal health practice, almost half of participants never brush their teeth, and majority of them (93.7%) do not perform dental flossing as part of their daily hygiene measure (Table 2). Periodontal health status reflected by CPITN/CPI scores was below average, with a mean CPITN/CPI scores of 3.01 (± 0.72) and 0.85 (± 0.94) respectively.

C. Univariate analysis

The association between periodontal health knowledge and gender, age, residence, marital status and educational level is presented in Table 3. Level of knowledge was significant among residence, marital status and educational level ($P \leq 0.05$). Residency at rural areas was 1.263 folds prone to have poor knowledge level than residency at urban areas ($P \leq 0.05$). Single and married participants showed lower while divorced and widowed participants showed higher prevalence of poor level ($P \leq 0.05$). Concerning educational level, participants with primary and lower educational levels showed higher prevalence of poor knowledge levels than those with middle, high school and college degree levels ($P \leq 0.05$).

There was a statistically significant association between level of knowledge and

periodontal health practice in terms of frequency of tooth brushing, flossing and scaling visits (≤ 0.05). Patients who never brush their teeth nor perform dental flossing showed the statistically significant lowest mean knowledge scores ($P < 0.001$, < 0.002). Patients who had scaling visits annually showed the statistically significantly highest mean knowledge scores (8 ± 1.41), whereas those who never had scaling visits showed the statistically significantly lowest mean scores (5.31 ± 1.74) ($P < 0.006$).

A statistically significant inverse correlation was found between periodontal health status reflected by CPITN/CPI scores and periodontal health knowledge scores ($P < 0.001$). An increase in CPITN, CPI scores was associated with a decrease in knowledge scores and vice versa. Furthermore, significant association was present between periodontal health status and periodontal health practice in terms of toothbrushing and flossing. Patients who never brush nor floss their teeth showed the statistically significant highest mean CPITN/CPI scores, while those who brush and/or floss their teeth more than once a day showed the statistically significant lowest mean CPITN/CPI scores ($P < 0.001$).

D. Multivariate Analysis

Binary logistic regression analysis

Binary logistic regression model was constructed using knowledge scores (Poor and good) as the dependent variable. Demographic data, CPITN and CPI scores were the independent variables. The model was adjusted for the following covariates: gender, age, marital status, educational level and residence. Model fitting was tested by -2 Log Likelihood test which showed statistically significant results (-2 Log Likelihood = 574.712, P-value < 0.001). Pseudo R-square tests results were as follows: Cox and Snell = 0.611 and Nagelkerke = 0.451. High values of these tests indicate good model fit.

Education was found to be a statistically significant positive predictor of knowledge scores. Participants with college or higher degrees were 5.776 folds prone to have good knowledge than those with primary school and lower. Moreover, CPITN scores was found to be a statistically significant negative predictor of knowledge scores indicating that participants with high CPITN have poor knowledge level.

Table 1: Frequencies (n), percentages (%) for the answers to questions about knowledge of periodontal health (n = 511)

Question (Correct answer)	Correct		Incorrect	
	n	%	n	%
1. How would you describe healthy gums? (Pink and firm)	248	48.5	263	51.5
2. What is dental plaque? (Soft colorless and sticky deposits containing microbe and food debris)	98	19.2	413	80.8
3. What causes gum disease? (Dental plaque)	39	7.6	472	92.4
4. Which one is an early sign of gum disease? (Red gingiva)	235	46	276	54
5. Which one is the outcome of progressed gum disease? (tooth mobility)	153	29.9	358	70.1
6. Which of the following systemic diseases affects progression of gum disease? (Diabetes)	323	63.2	188	36.8
7. Mostly gum disease is preventable. (Yes)	459	89.8	52	10.2
8. Twice a day tooth brushing together with flossing is efficient in preventing gum disease? (Yes)	425	83.2	86	16.8
9. Regular dental visits can prevent gum disease. (Yes)	430	84.1	81	15.9
10. Avoiding smoking prevents gum disease. (Yes)	375	73.4	136	26.6

Table (2): Frequencies (n), percentages (%) for oral health practices among the study participants (n = 511)

Periodontal health practices	n	%
Frequency of tooth brushing in the last year		
Never	246	48.1
Once a day	173	33.9
More than once a day	92	18
Frequency of flossing in the last year		
Never	479	93.7
Once a day	26	5.1
More than once a day	6	1.2
Frequency of mouth rinsing after meals in the last year		
Never	40	7.8
Once a day	119	23.3
More than once a day	352	68.9
Frequency of scaling visits in the last five years		
Never	378	74
Once in more than two years	108	21.1
Once in two years	14	2.7
Annually	4	0.8
Once in half a year	5	1
Once in less than six months	2	0.4
Self-care measures that could be taken to stop gingival bleeding if it occurs in the next year		
Stop brushing	3	0.6
Brushing more carefully	53	10.4
Mouth rinsing	205	40.1
Using medications	49	9.6
Visiting a dentist	251	49.1
Don't take measures	47	9.2

Table (3): Univariable analysis† modeling the association of gender, age, residence, marital status and educational level with different levels of periodontal health knowledge

	Poor level (n = 261)		Good level (n = 250)		P-value	Effect size (OR)
	n	%	n	%		
Gender						
Male	102	39.1	93	37.2	0.662	1.083
Female	159	60.9	157	62.8		
Age						
20 – 44 y	175	67	168	67.2	0.155	0.085
45 – 64 y	76	29.1	79	31.6		
≥65 y	10	3.8	3	1.2		
Residence						
Urban	43	16.5	61	24.4	0.026*	1.263
Rural	218	83.5	189	75.6		
Marital status						
Single	63	24.1	76	30.4	0.006*	0.157
Married	166	63.6	164	65.6		
Divorced	17	6.5	5	2		
Widowed	15	5.7	5	2		
Educational level						
Primary school and lower	151	57.9	79	31.6	<0.001*	0.288
Middle and high school	79	30.3	96	38.4		
College and higher	31	11.9	75	30		

IV. Discussion

Epidemiology of a certain health phenomenon reflects a population-based model that allows a valid estimate of health variations and disease distribution in a community level (Costa et al., 2012). Data collected from a survey will facilitate customizing the awareness programs and will set the health priorities and actions to be implemented in a given community (Haloi et al., 2014). The WHO CPITN is a useful and important tool for determining periodontal treatment needs in a single community and has been widely used by several epidemiological studies to assess periodontal health status (Mombiedro Sandoval and Llena Puy, 2008). The modified CPI index adopted by the WHO (1997) additionally comprises measurement of CAL scores. It successfully provided a better estimation of presence of periodontitis.

Data on CPITN revealed a high prevalence of periodontal disease in non-industrialized countries' population (Pilot et al., 1986). However, scarce literature is present among the middle east countries (Al-Harathi et al., 2014). Only few studies examined the health state of periodontal tissues of the evaluated participants (El-Qaderi and Quteish Ta'ani, 2004, Penmetsa et al., 2019). Hence, the present population-based study was thought to be a good representation of Egypt's target adult population since it was conducted in one of Egypt's major hospitals that serve about 223,200 patients annually. This study utilized both the CPITN and the modified CPI indices to accurately and more precisely measure the periodontal health status of all the participants.

This cross-sectional study revealed that almost half of the participants had an acceptable level of knowledge regarding many aspects of periodontal health. However, majority of them (92.4%) didn't recognize that dental plaque biofilm is the primary cause of periodontal disease. Lack of health education concerning this important aspect of periodontal disease could be the possible reason for the inadequate

public awareness. In contrast, another cross-sectional study investigated the impact of knowledge and attitude on the status of periodontium among an Indian population and reported a good knowledge level among majority of the study participants regarding the role of dental plaque and its causation to periodontal disease. The authors attributed this high knowledge score to the adequate health education programs that were regularly performed by the dental institutes within the study area (Penmetsa et al., 2019). Furthermore, most of the present study participants had a good knowledge towards the positive role of oral hygiene measures and regular dental visits in prevention of periodontal disease, a finding which was also reported in previous studies (Taani, 2002, Deinzer et al., 2009, Gholami et al., 2014, Allam et al., 2020).

The findings currently observed in this cross-sectional study indicated that nearly half of the participants never brushed their teeth and a minority of them (6.3%) used dental floss as part of their routine oral hygiene practice. On the contrary, an online-based survey performed among Iraqi population showed that half of their sample had an adequate tooth brushing frequency. The authors attributed their findings to the fact that the online survey method of data collection may have attracted highly educated individuals as compared to the paper-based questionnaire (Abdulbaqi et al., 2020). Nonetheless, the poor level of interdental aids usage was a frequent finding in the later survey as well as in other published studies (Al-Shammari et al., 2007, Ehizele et al., 2011, Zhao et al., 2019). Another aspect of periodontal health practice was mouth-rinsing using mouthwash as a chemical means of plaque control. About two thirds of the participants in this study used to rinse their mouth after meals. However, mouth rinsing was practiced solely via plain water, and most of participants considered this measure as a substitute to mechanical oral hygiene measures. This finding emphasizes the need to educate our

patients on the importance of mechanical tooth cleaning methods as an essential element of the oral hygiene program.

Most of the current study participants (74%) never experienced scaling or regular preventive dental visits in the past five years. This finding is in line with results from other studies conducted in Kuwait (Al-Shammari et al., 2007), India (Penmetsa et al., 2019), and China (Zhao et al., 2019). This could be due to the patients' misconception that scaling could make their teeth weaker and sensitive, or that frequent scaling would create a widened gum space or even damage the gingiva. Young (2008) reported a similar misunderstanding of their study participants that negatively affected the frequency of regular scaling visits. However, despite this negative attitude toward scaling, half of the participants in this study stated that they will visit a dentist if they experienced any gingival bleeding in the next year. This indicates that patients would rather visit a dentist to seek treatment than to commit themselves to a regular dental attendance.

Another important part of the present cross-sectional study is the periodontal health status. Findings from CPI scores in this study indicated that severity of periodontal disease increases with age. Elder patients tended to get higher scores, as previously reported in other studies (Al Mugeiren, 2018, Susanto et al., 2020). In fact, it is the cumulative destructive effects of plaque biofilm accumulation on periodontal tissues over a long period of time (Tadjoedin et al., 2017).

The current univariate analysis showed that rural residents and those with lower educational levels had poor periodontal health knowledge. Despite the overall economic and educational progress achieved in Egypt in recent years, an imbalance in the development of urban versus rural areas still exists and needs to be addressed. The present multi-variate analysis revealed that educational level is a statistically significant positive predictor of knowledge. Subjects learn this knowledge

through a variety of sources, including media, school, parents, friends, and dentists. However, most of these sources are unreliable, and only a small proportion of people follow the written or verbal instructions given by their dentists (Masood Mirza et al., 2007).

Moreover, the present statistical analysis revealed a significant direct correlation between periodontal health knowledge scores and periodontal health practice. Patients who brush and floss their teeth at least once daily and those who were committed to regular scaling visits showed the highest knowledge scores. This was consistent with another cross-sectional study conducted in Saudi Arabia where participant's poor level of knowledge negatively affected their oral hygiene behavior (Farsi et al., 2020). Furthermore, current investigation showed a direct relation between knowledge and state of periodontal health. Individuals who achieved lower knowledge scores were found to have a higher CPI scores. Sensibly, as lower levels of knowledge would result in poorer periodontal health practice, the result will be a worse state of periodontal health. This suggests that periodontal health knowledge, practice and state are interrelated in one way or another.

Additionally, periodontal health practice was statistically associated with the participants' periodontal health status in the current investigation. This finding was in agreement with another study in Libya where brushing frequency was significantly correlated with CPI scores (Peeran et al., 2012). However, unlike brushing, frequency of flossing did not have a significant effect on the present CPI scores. This finding could be convenient for subjects who do not prefer flossing, out of fear to hurt their gum from excessive flossing habit (Gillette and Van House, 1980).

Furthermore, the present multi-variate analysis showed that CPITN is a significant negative predictor of knowledge level. Patients who got higher CPITN scores were found to be less knowledgeable about periodontal health.

This suggests that adequate periodontal knowledge would contribute in reducing the CPITN scores thus reducing the treatment needs of the community (Sekhon et al., 2015).

One of the valuable points of the present study is that each participant had received a comprehensive oral hygiene education by the investigator after completion of questionnaire and oral examination. Additionally, they were informed about their current periodontal condition and a personalized periodontal care advice was provided. Findings from this study provide a baseline upon which a future work could be done.

V. CONCLUSIONS

Within the limitations of this cross-sectional study, it could be concluded that periodontal health knowledge, practice and status were below average among the study population. Majority of participants lacked knowledge of the etiology of periodontal disease. Half of the participants didn't perform tooth brushing and minority used dental floss as routine periodontal health practice. State of periodontal health was unfavorable among the study participants reflected by CPITN/CPI scores. Knowledge, practice and state of periodontal health were interrelated in one way or another. Future larger cross-sectional studies that use a more inclusive tailored questionnaire are recommended to allow addition of the attitude section together with the knowledge and practice of the individuals. Community-based professional periodontal health education is mandatory to the general population with the use of more innovative techniques to reinforce the importance of preventive oral hygiene measures.

VI. CONFLICT OF INTEREST AND SOURCE OF FUNDING

The authors declare that there is no conflict of interest, and the study is self-funded.

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