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Assessment of Knowledge of the Relationship between Periodontal Disease and Systemic Disease among Dental Students and Its Impact on Oral Hygiene Practices

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Abstract

Background: Dental students play a role in both oral and general health education in their communities, so it is important that they have good knowledge to enable them offer good counsel. Knowing the relationship between periodontal disease and systemic conditions will put them in better stead when giving oral health education. The aim of this study was to assess the level of knowledge among dental students of the relationship between periodontal diseases and systemic conditions, and to determine whether there was a correlation between this knowledge and their oral hygiene practices. **Methods:** This was a cross-sectional study among dental students of the University of Port Harcourt, Rivers State, Nigeria. Consenting participants were given a self-administered questionnaire eliciting socio-demographic information, knowledge about the relationship between periodontal diseases and systemic diseases, as well as oral hygiene practices. Each correct response on knowledge was scored as 1, while incorrect responses were scored 0, with a maximum score of 7. Participants' knowledge was graded as poor (0 - 2), fair (3 - 5) and good (6 - 7). Data was analyzed using IBM SPSS version 21. $p \leq 0.05$ was considered statistically significant. Spearman's ranked correlation was used to assess the correlation between knowledge of the relationship between periodontal diseases and systemic diseases and oral hygiene practices. **Results:** There were 109 dental students (58 males, 51 females) in this study, with a mean age of 24.1 ± 3.6 years. Preclinical students were 43 (39.4%) while clinical students were 66 (60.6%). All (100%) participants knew that oral health was important to systemic health, with 89.9% knowing that periodontal disease was specifically linked to systemic disease. Only 50.5% of participants knew that there

was a link between periodontal disease and diabetes mellitus. Sixty-four (58.7%) of the participants regularly cleaned in between their teeth. The most commonly used interdental cleaning aid was toothpick (45.0%). Clinical students had significantly better knowledge on the relationship between periodontal disease and systemic disease compared to pre-clinical students ($p = 0.001$). There was positive correlation between knowledge about periodontal disease and its link with systemic disease and better oral hygiene practices, but this was not statistically significant. **Conclusion:** The majority of dental students had a fair knowledge about the relationship between periodontal diseases and systemic diseases.

Keywords

Periodontal Disease, Systemic Disease, Oral Hygiene Practices, Dental Students

1. Introduction

The term periodontal disease includes a spectrum of conditions affecting the supporting structures of the teeth, with gingivitis on one end of the spectrum, and periodontitis on the other [1]. Gingivitis commonly presents with bleeding gums as one of its earliest features [2]. If left untreated, gingivitis can progress to periodontitis, which is characterized by loss of the periodontal attachment and alveolar bone, with eventual tooth loss [2] [3]. Periodontal disease is a major global health burden, and is estimated to have a global prevalence of 20% to 50%. It is one of the major causes of tooth loss [1] [4]. There has been reported associations between periodontal disease and a number of systemic conditions, including diabetes mellitus, [4] [5] [6] cardiovascular disease, [4] [6] respiratory diseases, [4] and adverse pregnancy outcomes [4] [7].

Periodontal disease can be controlled and may even be reversed by good oral hygiene practices aimed at effective plaque control. This includes measures such as toothbrushing and the use of interdental cleaning aids (e.g., dental floss) [2]. Control of periodontal disease can thus have significant impact not just on oral health, but on systemic health as well. A good level of awareness of periodontal disease, its causes and recognition are integral to successful prevention and management [8]. Despite the high prevalence of periodontal disease, the level of awareness among the populace is still low, especially in developing countries such as Nigeria [9] [10]. Previous reports have shown a low dentist-to-population ratio in Nigeria, [10] with patients more likely to seek oral health care from medical professionals than from dentists. Dental students can play a great role in plugging this gap, because in Nigeria, they are often consulted informally by family members and friends on a variety of health issues. In addition, many dental schools in Nigeria carry out periodic rural outreach programmes to underserved communities, with dental students playing a key role. Therefore, it is important that they have good knowledge to enable them offer good counsel. Knowing the

relationship between periodontal disease and systemic conditions will put dental students in better stead when giving oral health education.

A number of studies have assessed participants' knowledge about a possible link between periodontal disease and systemic conditions. Most of these have ever been conducted among medical doctors, [11] [12] with some focusing on internal medicine physicians, [2] [13] family physicians and medical interns [14] [15]. There is paucity of similar information about dental students. Moreover, there is a lack of data about whether knowledge of periodontal disease and/or its association with systemic conditions has any influence on an individual's oral hygiene practices.

The aim of this study therefore was to assess the level of knowledge among dental students of the relationship between periodontal diseases and systemic conditions. The study also aimed to determine whether there was a correlation between this knowledge and participants' oral hygiene practices.

2. Methods

This was a questionnaire-based cross-sectional study carried out among dental students of the University of Port Harcourt, Rivers State, Nigeria. The population of the entire dental students (100Level to 600 Level) based on the approved quota by the National Universities Commission ranges from 90 to 120 students, hence to give a better representation, the study was designed to include all consenting dental students. The preclinical students were those from 100 L to 400 L, while those in 500 L and 600 L were categorized as clinical students due to their exposure to clinical dental practice. Data for this study was collected from July 2019 to September 2019. Informed consent was obtained from the proposed study participants, and consenting participants were enrolled into the study. A self-administered questionnaire was used to obtain information of participants. The questionnaire was divided into three sections, with section A eliciting socio-demographic information (age, gender, level of study, marital status). Section B contained seven questions eliciting knowledge about the relationship between periodontal diseases and systemic diseases. Each correct response was scored as 1, while incorrect responses were scored 0, with a maximum score of 7. Participants knowledge on the relationship between periodontal diseases and systemic diseases were graded as poor (0 - 2), fair (3 - 5) and good (6 - 7). Section C contained questions on oral hygiene practices such as brushing or rinsing the mouth after snacking, cleaning the teeth after meals and interdental cleaning aids.

Data obtained from the questionnaires were entered into a spreadsheet, and analyzed using IBM SPSS for windows version 21, and results are presented as frequencies and means. Chi square test was used to determine the strength of associations, with $p \leq 0.05$ considered statistically significant. Spearman's ranked correlation coefficient was used to assess the correlation between knowledge of the relationship between periodontal diseases and systemic diseases and oral hygiene practices.

3. Results

Sociodemographic characteristics of Participants

There were 109 dental students (58 males, 51 females) that participated in this study. The participants' age ranged from 16 - 32 years, with a mean age of 24.1 ± 3.6 years (Table 1). There were 43 (39.4%) preclinical students and 66 (60.6%) clinical students. The mean age of the preclinical students (21.3 ± 3.0 years) was significantly less than that of the clinical students (25.9 ± 2.6 years) ($p = 0.011$).

Knowledge of the relationship between periodontal disease and systemic disease, and Oral hygiene practices of participants.

All (100%) participants agreed that oral health was important to systemic health, with 89.9% knowing that periodontal disease was specifically linked to systemic disease. However, only 50.5% of participants knew that there was a link between periodontal disease and diabetes mellitus (Table 2). Sixty-four (58.7%)

Table 1. Sociodemographic characteristics of the participating Dental students.

	Preclinical students	Clinical students	Total
Age (years)			
Minimum	16.0	22.0	
Maximum	30.0	32.0	
Mean ± SD	21.3 ± 3.0	25.9 ± 2.6	24.1 ± 3.6
Gender			
Male	17 (39.5%)	41(62.1%)	58 (53.2%)
Female	26 (60.5%)	25 (37.9%)	51 (46.8%)
Marital status			
Single	41 (95.3%)	62 (93.9%)	103 (94.5%)
Married	2 (4.7%)	4 (6.1%)	6 (5.5%)

Table 2. Dental students' knowledge about the relationship between periodontal disease and systemic disease.

Variables	Frequency (%)		
	Yes	No	Not sure
Is oral health important to systemic health?	109 (100)	0	0
Is periodontal disease linked to systemic conditions?	98 (89.9)	1 (0.9)	10 (9.2)
Is periodontal disease is linked to:			
Diabetes mellitus	55 (50.5)	50 (47.9)	4 (3.7)
Cardiovascular disease	72 (66.1)	33 (30.3)	4 (3.7)
Respiratory disease	34 (31.2)	71 (65.2)	4 (3.7)
Adverse pregnancy outcomes	24 (22.0)	81 (74.3)	4 (3.7)
Obesity	8 (7.3)	97 (89.0)	4 (3.7)

of the participants regularly cleaned in between their teeth. The most commonly used interdental cleaning aid was toothpick (45.0%), with 2.8% of participants using pins/needles to clean in between their teeth (Table 3). Clinical students had significantly better knowledge on the relationship between periodontal disease and systemic disease compared to pre-clinical students ($p = 0.001$). Similarly, those that were married also had significantly better knowledge on the relationship between periodontal disease and systemic disease compared to those that were single ($p = 0.01$) (Table 4). Spearman's ranked correlation showed a positive correlation between knowledge about periodontal disease and its link with systemic disease and more frequent brushing or rinsing of the teeth after snacking ($\sigma = 0.174$, $p = 0.071$), more frequent cleaning in between the teeth ($\sigma =$

Table 3. Dental students' oral hygiene practices.

Variables	Frequency (%)	
	Yes	No
Do you brush your teeth or rinse your mouth regularly after snacking?	53 (48.6)	56 (51.4)
Do you regularly clean in between your teeth?	64 (58.7)	45 (41.3)
Type of Interdental cleaning aid used	Frequency (%)	
Toothpick	49 (45.0)	
Dental floss	9 (8.3)	
Interdental brush	5 (4.6)	
Pins/Needles	3 (2.8)	

Table 4. Association between sociodemographic variables and knowledge about the relationship between periodontal disease and systemic disease.

Variables	Poor (%)	Fair (%)	Good (%)	*p* value
Age group (years)				
16 - 25	12 (16.0)	57 (76.0)	6 (8.0)	0.082
26 - 35	2 (5.9)	25 (73.5)	7 (20.6)	
Gender				
Male	4 (6.9)	47 (81.0)	7 (12.1)	0.137
Female	10 (19.6)	35 (68.6)	6 (11.8)	
Level of study				
Preclinical	11 (25.6)	31 (72.1)	1 (2.3)	0.001
Clinical	3 (4.5)	82 (75.2)	13 (11.9)	
Marital status				
Single	13 (12.6)	80 (77.7)	10 (9.7)	0.01
Married	1 (16.7)	2 (33.3)	3 (50.0)	

0.108, $p = 0.266$) and more frequent use of interdental cleaning aids ($\sigma = 0.144$, $p = 0.134$).

4. Discussion

Periodontal disease is a major global health burden, and is one of the major causes of tooth loss. It has been associated with a number of systemic conditions, including diabetes mellitus, cardiovascular disease, respiratory diseases, and adverse pregnancy outcomes [4] [5] [6] [7]. A good level of knowledge about relationship between periodontal disease and systemic disease may lead to better oral hygiene practices and better oral and systemic health.

The pre-clinical students in this study were significantly younger than the clinical students. This is expected, since the pre-clinical students were in their 1st to 4th year of training, while the clinical students were in their 5th or 6th year of training. Although all participants (100%) agreed that oral health was important to systemic health, only 89.9% knew that periodontal disease was specifically linked to systemic disease.

The relationship between periodontal disease and diabetes mellitus (DM) has been considered bi-directional. On the one hand, DM has been implicated in both the initiation and progression of periodontal disease, with subsequent periodontal ligament destruction [16] [17]. Diabetics have also been shown to have a threefold high risk of periodontitis, as well as higher levels of inflammatory mediators in both saliva and gingival crevicular fluid when compared to non-diabetics. [17] [18] On the other hand, the presence of periodontitis in a diabetic patient worsens glycemic control, through increasing insulin resistance [17]. Periodontal treatments in DM have resulted in reduced HbA1c levels and improvement in glycemic control [16] [17]. Fifty-five (50.5%) study participants correctly identified that periodontal disease and DM were linked. Previous Nigerian studies among medical doctors showed a greater level of knowledge of the association between periodontal disease and DM [2] [19].

Several studies have shown that advanced periodontal disease increases the risk for a number of cardiovascular events including myocardial infarction, heart failure, stroke and peripheral artery disease [3] [4] [6] [20]. The precise mechanism through which periodontal disease increases the risk for cardiovascular disease (CVD) is not fully understood, but it is thought that dissemination of oral microorganisms into the bloodstream appears to play a major role [6]. It has also been proposed that chronic periodontal infection increase the levels of heat shock proteins, which in turn increase the risk of CVD [21]. Most of the study participants had knowledge of a link between periodontal disease and CVD.

Definite associations between periodontal disease and respiratory disease, especially Chronic Obstructive Respiratory Disease (COPD) have been established in the literature [4] [22]. Similarly, periodontal disease has been linked to a number of adverse pregnancy outcomes including preterm birth, low birth weight and preeclampsia [4] [23]. Surprisingly, only 31.2% and 22.0% of the dental stu-

dents in this study knew of an association between periodontal disease and respiratory and adverse pregnancy outcomes respectively. This finding follows the same trend in the study conducted by Al Johani *et al.* among medical and dental students, both medical and dental students were less aware about the link between periodontal disease and respiratory disease but contrary to the finding with pregnancy outcomes [24]. Obesity has been identified as a risk factor for periodontitis by increasing the oxidative stress within the periodontal tissues and thus facilitating their breakdown [25] [26] [27]. There was a very low level of awareness of an association between periodontal disease and obesity in this study, with only 7.3% of participants having knowledge of such a relationship.

Although the majority of dental students in this study had a fair knowledge about the relationship between periodontal disease and systemic conditions, there is significant room for improvement if they are to be effective at providing oral health education in relation to systemic health. Exposure of dental students to symposia on such subject matter will go a long way in bridging the gap in knowledge.

Maintenance of good periodontal/ oral health behaviour will affect the systemic health, regular oral hygiene practices such as regular visit to dentist, less snacking and mouth rinsing after snack, also the use of interdental cleaning aids can help improve the oral health. Less than half of the study participants rinsed their mouth or brushed their teeth regularly after snacking. The interdental space is the highest site for bacterial stagnation. Interdental cleaning was endorsed as a useful aid to toothbrushing to reduce dental plaque accumulation interproximally leading to improved oral health [28]. Among the interdental cleaning aids, dental floss is the most recommended, although others include interdental brushes and toothpick. Regular use of interdental cleaning aids was seen among 58.7% of participants, with toothpicks (45.0%) being the most commonly used interdental cleaning aid. Only about 8.3% of participants regularly used a dental floss. The finding in this present study is in contrast to the finding by Soroye *et al.*, [29] in which, though 64.1% of the dental students and Interns used interdental cleaning aids, 71.6% used dental floss. The difference in these findings could be that the study by Soroye *et al.* was conducted among dental students and Interns in seven dental schools while this present study was conducted among dental students in one dental school. This reflects sub-optimal oral hygiene practices compared to what would be expected of "would be" dentists.

This study did not show any association between participants age and gender with the level of knowledge about the relationship between periodontal disease and systemic conditions. However, there was statistically significant association when the level of study and marital status were considered, with the clinical students and those that were married showing higher levels of knowledge compared to the pre-clinical students. This is because the clinical students have spent more time in training, and have more exposure to both the medical and dental curriculum. The finding of this study that married dental students had significantly

better knowledge about the relationship between periodontal disease and systemic conditions may not reflect the true situation, since there were only 6 (5.5%) married dental students in this study. While assessing the oral health status, knowledge, attitude and practice of patients with heart disease, Rasouli-Ghahroudi *et al.* did not find any associations between marital status and knowledge of the participants [30]. Other authors have also not found any association between marital status and oral health knowledge and behaviour [31]. Knowledge of dental students on the associations between periodontal disease and systemic diseases as well as their oral hygiene practices can be improved by organizing regular oral health programs, especially for preclinical students. Purposeful lectures, seminars and workshops should be organized for dental students soon after admission into dental schools to address a number of oral health issues, including possible links with systemic conditions. In addition, regular oral health education programmes should be organized for both dental students and the general public. The current practice in most dental schools in Nigeria where dental students are not exposed to core courses in dentistry until their 4^{th} or 5^{th} year of study may need to be tweaked if dental students are to be effective in providing adequate information on issues related to oral health to the general populace. There is also need for intense oral health enlightenment campaigns at the grassroot level to improve the knowledge of the general public on oral health and its link to systemic health/disease.

5. Conclusion

The majority of dental students had a fair to good knowledge about the relationship between periodontal diseases and systemic diseases, especially those in the clinical classes. Such knowledge was positively correlated with better oral hygiene practices. Improving knowledge about the relationship between periodontal disease and systemic conditions through health education will likely lead to better oral hygiene practices and better oral and systemic health amongst the populace.

Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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