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Research Article

Awareness of Dental and Medical Health Care Professionals about the Manifestations of Systemic Conditions Affecting the Periodontium in Western Region, Saudi Arabia

Hattan A Zaki[1]*, Rayan Meer[2], Muhannad Kaaki[1], Hamzah Babkair[1], Roqia Abdoh[3], Nadia Elgendy[4] and Ismail Abdouh[1]

[1]Departments of Oral Basic and Clinical Sciences, College of Dentistry, Taibah University, Medina, Saudi Arabia

[2]Department of Preventive Dental Sciences, College of Dentistry, Taibah University, Medina, Saudi Arabia

[3]Department of Prosthodontic, Ministry of Health, King Fahad Hospital, Specialized Dental Center, Medina, Saudi Arabia

[4]Faculty of Dentistry, King Abdulaziz University, Jeddah, Saudi Arabia

***Corresponding Author:** Hattan A Zaki, Departments of Oral Basic and Clinical Sciences, College of Dentistry, Taibah University, Medina, Saudi Arabia.

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Abstract

Objectives: This study aims to identify the knowledge gaps in the awareness of the association between periodontal and systemic diseases among dental and medical health care professionals in the Western Region of Saudi Arabia.

Methods: A cross sectional descriptive observational study was conducted on the target group using an online-based self-administrated questionnaire. The sampling was convenient with snowball effect; the questionnaire was sent to eligible participants (N = 272). It was divided into 4 sections as follow: demographic data and sections contained questions regarding the relationship between the systemic health and oral disease, systemic conditions and periodontal disease, oral health and genetic syndromes.

Results: The study group comprised 270 participants. The majority of the participants were Saudis and dentists 89.6% and 86.3% respectively. Most of the participants working in university hospitals 68.5%. 90% were strongly agrees that oral health is essential an integral part of systemic and have implication on certain systemic disease and influence the overall quality of life. However, majority of referral pattern were limited to intra-oral lesions. The responses highlighted moderate level of knowledge about the relation between systemic disease and periodontal problems and between syndromes and periodontal disease. Total knowledge score of the relation between systemic disease and periodontal disease was significantly higher among participants in dental field compared to other participants in medical field ($p = 0.012$).

Conclusion: The present study revealed that there is a need to enhance the level of awareness and knowledge related to the between periodontal and systemic diseases among dental and medical health care professionals. Early diagnosis of periodontal disease which is associated with systemic diseases and/or syndromes is very essential for better treatment outcomes and could influence good prognosis. Hence, further efforts and collaboration aiming to increase the related knowledge and information of oral health linked with general health is warranted.

Keywords: *Periodontal Disease; Systemic Disease; Awareness; Knowledge*

Introduction

Oral health is an integral part of systemic health, and periodontal disease is one of the most commonly affected infectious diseases. While extensive investigation has been carried out on the effect of periodontal diseases on oral health, a potential specific relationship between oral disease and systemic health is relatively recent. More importantly, periodontal disease has been reported to play an etiological role in the development of cardiovascular atherosclerotic disorders, diabetes mellitus and preterm low birth weights [1]. Inflammatory cascade induced by mediators in periodontal diseases has also been reported, and therefore oral microbes, lipopolysaccharides, and pro-inflammatory molecules can access to different body parts, that can contribute to chronic systemic conditions and infectious diseases [2]. The periodontal bacterium *Porphyromonas gingivalis* has been described as a potent factor responsible for vascular and atherosclerotic changes in cardiovascular disease [3]. Furthermore, analyses of the DNA of synovial joint fluid of rheumatoid arthritis patients reveal the percent of periodontal pathogens, suggesting their role in the aetiology of rheumatoid arthritis, [4] the relationship between periodontal disease and diabetes mellitus is bidirectional. One of the risk factors for periodontal diseases is diabetes, while uncontrolled periodontal diseases can develop insulin resistance and impair regulation of glycaemic [5].

In the United States, dentists noticed that the number of patients with systemic diseases has risen, these patients are difficult to treat when the relationship between systemic and oral diseases is not well understood. A previous qualitative study showed dentists' perceptions of the connection between oral and systemic diseases [6]. A greater understanding of dentists on oral-systemic associations would help educate patients who seek care from health professionals and enhance their oral and general health.

More investigation has been carried out on the effect of periodontal diseases on oral health, a potential specific relationship between genetic syndromes and periodontal health is relatively recent [7]. Also, genetic syndromes are thought to be uncommon, but they have an effect on the periodontium, which can be lost due to inflammation or through a different path from periodontitis. They are initiated by chromosome disorders or gene mutations, periodontitis which related to genetic disorders includes some disorders affecting gingival tissue (hereditary gingival fibromatosis), connective tissues (vascular Ehlers-Danlos syndrome, periodontal Ehlers-Danlos syndrome), some diseases associated with immunologic disorders (Down syndrome, leukocyte adhesion deficiency, Papillon-Lefèvre syndrome, Haim-Munk syndrome, Chediak-Higashi syndrome, Severe congenital neutropenia, cyclic neutropenia, Cohen syndrome) and metabolic disorders (glycogen storage disease 1b,hypophosphatasia) [7-12].

Although, it can be said that the target is the periodontium, the mechanism varies from one genetic syndrome to another, for example a syndrome characterized by widening in the periodontal ligament due to alveolar bone destruction is known as Scleroderma, another syndrome also causing extensive periodontal destruction but due to neutrophil impairment (quantitative disorders) is Cohen syndrome [13]. Others are responsible for localized or generalized gingival enlargement like Gardner syndrome, Gorlin syndrome, Cowden's syndrome. However, some can manifest in the oral cavity as an aggressive form of periodontitis like Papillon-Lefevre syndrome. Additionally, the Identification of specific genes and genetic variants aids in the diagnosis and treatment of aggressive periodontal disease [14].

WHO 2017, classified periodontitis into necrotizing periodontal diseases, periodontitis, and periodontitis as a manifestation of systemic disease [15]. Although many of these conditions are not preventable and have no definite treatment, the health care professionals' knowledge and awareness could accelerate the diagnosing process, which will lead to substantial development in the health care [16]. A greater understanding of dental and medical health care professionals on oral-systemic associations would help educate patients who seek care from health care professionals and enhance their oral and general health.

Moreover, the collaboration between dentists and other healthcare professionals would also be strengthened. However, the research lacks quantitative data on awareness of dental and medical health care professionals about these associations between periodontal diseases and systemic conditions which can be beneficial for patients' better oral health results [6].

Methods

A cross-sectional descriptive observational study was conducted between March and December of 2020. All male and female dental and medical practitioners who work in the western region of Saudi Arabia were eligible for participation. The study was approved by the Institutional Review Board (IRB), College of Dentistry, Taibah University (TUCDREC/20200411) and was conducted in accordance with the guidelines of the Declaration of Helsinki.

The tool used in this study was an online- based questionnaire that gather information on different aspects serving the purpose of the study. The validity of the questionnaire was tested by back translational method (Questionnaire in English was translated into Kannada by an expert in literature which was again translated back to English). The reliability of the questionnaire was checked by test and retest method.

Slight modifications were done to fulfil all the aspects of the current study. The survey consisted of five pages they were presented as follow: First page contained an introduction of the questionnaire in English explaining the aim and importance of the questionnaire, and an e-mail contact of the researchers in case of any questions or if clarification was required, the second page: consisted of questions on biographic information regarding the gender, age, nationality, profession, years of experience, and the type of practice, the remaining pages collected information on the participants awareness regarding the relationship between systemic and oral disease (page 3 and 4), awareness of the relationship between systemic and periodontal disease (page 5 and 6), and finally the relationship between genetic syndromes and periodontal disease (page 7 and 8).

The online questionnaire was created by using Google Drive and the link was sent to all potential participants (N = 270). The aims and methods of the study were explained, as well as assuring participants that their identities would remain anonymous and that all information given would stay confidential and be used for research purposes only. Responses were collected by using the Google Drive Excel document, and data were entered into a statistical software program (IBM SPSS Statistics, v25.0; IBM Corp). To describe data, we used frequency and percentages as well as mean and standard deviation (± SD) as needed. Inferential tests involved in this study were linear regression, Mann-Whitney, Kruskal Wallis, t-test, and ANOVA. Data entry and coding were conducted using Microsoft Excel (Microsoft, Redmond, WA, USA). The data then was transferred into SPSS software v.27 (Armonk, NY: IBM Corp). Significance level was determinate at $p < 0.05$.

Results

Table 1 shows the frequency and percentage of the demographic characteristics of the respondents. Numbers and percentages were used to summarize each variable. Almost half of the participants were males 56.70% while 43.30% were females with a mean age of 28.57 (6.74) years. The majority of the participants were Saudi which is 89.6% while 10.4% were non-Saudi. Regarding the field of their study the majority of the participant were dentist 86.3% compared to 13.7% in the medical field. With respect to the highest degree obtained for the participant was as follows 25.6% were student, 56.7% were bachelor, 3% were master/specialist, while 14.8% were board certified, consultant, doctorate levels with a mean of years since graduation 28.57 years (6.59). As for the participant working places the majority were in the university hospital which is 68.5% compared to 33% public hospital and 14.1% private hospital.

Table 2 shows the frequency and distribution of participants attitudes towards the relationship between oral health and systemic disease. 90% the respondent strongly agrees that oral health is an integral part of the systemic health. With respect to the manifestation of systemic disease in the oral cavity 88.10% of the participant strongly agrees to this relationship. Furthermore 74.80% of the participants strongly agrees that oral disease have an implication on certain systemic disease and 78.50% of the participant also strongly agrees that oral health has an influence on overall quality of life.

Variable		N	%
Gender	Female	117	43.3%
	Male	153	56.7%
Nationality	Saudi	242	89.6%
	Non-Saudi	28	10.4%
Field of study	Dentistry	233	86.3%
	Medicine	37	13.7%
Highest degree obtained	Student	69	25.6%
	Bachelor	153	56.7%
	Master/ specialist	8	3%
	Board certified/ consultant/PhD	40	14.8%
Working place	Public hospital	89	33%
	Private hospital	38	14.1%
	University hospital	185	68.5%

Table 1: *Demographic variables.*

	Strongly agree n (%)	Agree n (%)	Neutral n (%)	Disagree n (%)	Strongly disagree n (%)
Oral health is an integral part of systemic health	243 (90%)	25 (9.3%)	1 (0.4%)	0 (0.00%)	1 (0.4%)
Certain systemic diseases can manifest in the oral cavity	238 (88.1%)	25 (9.3%)	6 (2.2%)	0 (0.00%)	1 (0.4%)
Oral diseases have an implication on certain systemic disease/condition like cardiovascular, pregnancy, low birth weight babies…etc.	202 (74.8%)	51 (18.9%)	14 (5.2%)	2 (0.7%)	1 (0.4%)
Oral health has an influence on the overall quality of life	212 (78.5%)	44 (16.3%)	11 (4.1%)	1 (0.4%)	2 (0.7%)

Table 2: *Participants attitude toward the relationship between oral health and systemic disease.*

Table 3 shows participants practice and attitude of referral to oral medicine care and it shows that 69.60% do refer cases to the oral medicine care. Furthermore 57% of the participant stated that the most common reason for referral the presence of Intra-oral lesion, while 20% referred their cases due to lack of knowledge on the relationship between oral and systemic disease, 5% referred their cases due to halitosis, 4.5% due to the presence of gingival bleeding, 4% referred their cases before any medical intervention to reduce microbial burden, 3% referred their case due to tooth mobility and 6.5% referred their cases due to other reasons.

Table 4 shows the participants knowledge about the relation between systemic disease and periodontal problems. Total knowledge score of questions to the relation between systemic disease and periodontal problems (16 questions) has a mean of 8.06 (SD = 3.44). The majority of the participant which is 98.5% showed positive knowledge regarding the relationship between periodontal disease and systemic disease. With respect to the systemic disease/condition that is related to periodontal disease 90.7% of the participant answered for diabetes mellitus while 61.9% for anxiety and stress, 53.3% cardiovascular disease, and 43.7% osteoporosis.

Have you ever referred your patient to an oral-medicine or OFMS surgery specialist?	Yes	188	69.6%
	No	82	30.4%
What was the most frequent reason for referral?	Presence of intra-oral lesion	114	57%
	Knowledge on the relationship between oral and systemic disease	40	20%
	Malodor/(halitosis)	10	5%
	Gingival (gum) bleeding	9	4.5%
	Before any medical intervention to minimize oral microbial burden	8	4%
	Teeth Mobility	6	3%
	Other	13	6.5%

Table 3: *Participants practice of referral of oral medicine care.*

Question		Correct answer	N	%
Is there any relationship between periodontal disease and systemic health		Yes	266	98.5%
Which systemic disease/conditions do you think are related with periodontal health?	Osteoporosis	Yes	118	43.7%
	Obesity	Yes	57	21.1%
	Anxiety stress	Yes	167	61.9%
	Respiratory diseases	Yes	111	41.1%
	Cardiovascular disease	Yes	144	53.3%
	Diabetes mellitus	Yes	245	90.7%
	Preterm low birth weight	Yes	50	18.5%
	Kidney disease	Yes	94	34.8%
	Cerebrovascular diseases	Yes	69	25.6%

Table 4: *Participants knowledge regarding the relation between systemic disease and periodontal problems.*

Table 5 shows the participants knowledge for the relationship between syndromes and periodontal disease. Total knowledge score of the question related to relation between the syndromes and periodontal problems (6 questions) has a mean of 2.65 (SD = 1.25). Most of the participant which is 68.50% knows the relationship between periodontal disease and down syndrome compared to 41.90% for Papillon-Lefèvre syndrome, 23% for Ehlers-Danlos syndrome (EDS) type VIII and least knowledge was for Chediak-Higashi syndrome (CHS) which is 20.40%.

Question	Correct answer	N	%
Certain syndromes can manifest in the oral cavity	Yes	256	94.80%
Is there any relationship between periodontal disease and syndromes?	Yes	260	96.30%
Which syndrome do you think is characterized by diffuse palmoplantar keratoderma and generalized aggressive periodontitis?	Papillon-Lefèvre syndrome	113	41.90%
Which syndrome do you think characterized by oculocutaneous albinism, bleeding diathesis, recurrent bacterial infections, immunodeficiency, defective neutrophil function, neutropenia, and reduced chemotaxis?	Chediak-Higashi syndrome (CHS)	55	20.40%
Which syndrome do you think characterized by progressive destruction of connective tissue, distinct connective tissue produces a periodontal disease?	Ehlers-Danlos syndrome (EDS) type VIII	62	23.00%
Which syndrome do you think characterized by trisomy of chromosome 21 and more susceptible to infections including an increased prevalence of periodontal diseases?	Down syndrome	185	68.50%

Table 5: *The relation between the syndromes and periodontal problems.*

Using t-test to assess the relationship between total knowledge score of the relation between systemic diseases and Periodontal disease and total knowledge score of the relation between syndromes and periodontal disease and compare it with gender, nationality and field of study, all the relationships were insignificant expect that the total knowledge score of the relation between systemic disease and periodontal disease were significantly higher among participants in dental field compared to other participants in medical field (Table 6).

		Total knowledge score of the relation between systemic disease and periodontal disease			Total knowledge score of the relation between syndromes and periodontal disease		
		Mean	SD	p-value	Mean	SD	p-value
Gender	Female	8.38	2.55	.084	3.51	1.2	0.454
	Male	7.82	2.72		3.4	1.29	
Nationality	Saudi	8.04	2.63	0.764	3.45	1.25	0.807
	Non-Saudi	8.21	2.88		3.39	1.26	
Field of study	Dentistry	8.24	2.59	0.012	3.47	1.27	0.402
	Medicine	6.95	2.81		3.3	1.15	
Highest degree obtained	Student	7.45	2.64	0.119	3.19	1.23	0.117
	Bachelor	8.26	2.58		3.52	1.2	
	Master/specialist	9.13	2.36		4.12	1.64	
	Board certified/consultant/PhD	8.12	2.9		3.47	1.34	

Table 6: *The relation between Knowledge level and demographic variables.*

Also, using ANOVA test to assess the relationship between total knowledge score of the relation between systemic disease and periodontal disease and total knowledge score of the relation between syndromes and periodontal disease and compare it with highest degree obtained, there was no significant relationship between these two variables (Table 6).

Discussion

This study which was based on online-based self-administrated questionnaires aiming to identify the knowledge gaps in the awareness of the association between periodontal and systemic diseases among dental and medical health care professionals in the Western Region of Saudi Arabia. The majority of the participants (90%) strongly agreed that there is a relationship between oral health and systemic diseases. Current results revealed that up to 88% reported that certain systemic diseases can manifest in the oral cavity and majority of participants have sought oral diseases can be associated with variety of systemic diseases and adversely impact on the related quality of life 74%, 78.5% respectively. Current results mirror previous reports that found that dentists and physicians had appropriate level of awareness regarding the association between periodontal and systemic diseases in Saudi Arabia and Kuwait (98.3%, 92.5%) respectively [17].

Of note, present results highlighted that up to 69.6% have had referred patients to other specialities including oral medicine and maxillofacial surgery concerning further consultation and treatment needs. However, most of the referrals were related to coexisting oral lesions and/or conditions. Only 20% of aforementioned referrals were concerning oral manifestation of systemic diseases. These figures

raising concern regarding the pattern of referral of related-oral diseases and systemic diseases among health care professionals' practice [18].

Periodontal disease is an infectious disease characterized by destruction of soft and/or hard tissues surrounding the teeth. Although it is considered as a multifactorial condition that influenced by several factors including host factors and periodontal pathogens, previous evidence suggested that genetic background could play an important role in determining the immune response of the host to periodontal pathogens [8]. However, certain systemic diseases share similar genetic factors associated with periodontal diseases. Health conditions associated with periodontal diseases have been influenced with profound loss of periodontal tissues with or without associated genetic disorders such as diabetes mellitus, obesity, osteoporosis, cardiovascular diseases, preterm low birth weight and psychological anxiety and stress [19].

Moreover, previous evidence has reported that there is strong relationship between periodontal diseases and obesity [20]. Recent meta-analyses demonstrate a statistically significant positive association between obesity and periodontitis suggesting that obese individuals are 50% to 80% more likely to have periodontitis than individuals who are not [20-22]. Our results show that only 21% agreed with this association. Therefore, further efforts should be directed to enhance this aspect of physiopathological correlation along with other coexisting risk factors.

The strength of association between periodontitis and psychological disorders such as emotional stress and depression is weak and difficult to be proven since there is no definitive way to diagnose such comorbidities. However, proposed relationship has been suggested that psychological disorders may be accompanied with neglection of oral hygiene measures [20]. On the other hand, it has been reported that psychological stress and lack of sleeping may be a risk factor for necrotizing periodontal diseases claiming that stress alters the immune system like reduction in the salivary flow, disruption of polymorphonuclear leukocytes, and elevation of the level of periodontal pathogen like *P. intermedia* [19]. Approximately, 62% of the participants agreed with the relation between stress and periodontitis.

Although it is still controversial regarding the association between osteoporosis and periodontitis, recent systematic review stated that there is statistically significant association between the degree of clinical attachment loss in postmenopausal women who diagnosed with osteoporosis or osteopenia compared to control [20]. This finding might also be related to other factors such as depressed immune response along with variety of clinical characteristics including gingival bleeding, gingival enlargement and soreness [8].

For diabetes mellitus, it has been recognized as an important risk factor for periodontal diseases, and with the new classification of periodontitis, smoking and diabetes are added to be grade modifiers [15]. The majority of the present participants (91%) aware of the strong association between diabetes and periodontal diseases which agrees with reports [17].

Regarding the awareness of the relation between genetic disorders and periodontitis, 96.30% of the participants were aware of this relationship. However, there was lack of information about the clinical presentations of most of the specified syndromes. The results of this study highlighted the necessity of increasing the awareness about these syndromes and how to identify them clinically hence early diagnosis and prevention of related complications can be achieved.

Furthermore, the relationship between periodontitis and preterm births and low birth weight is still not clear. In systematic reviews conducted to investigate this relationship, it was concluded that the strength of this association is modest and vary depending on different study designs [16,23]. Although, previous evidence reported that it is safe to provide treatment for periodontal conditions in pregnant women, it does not affect the rate of pre-term birth and low birthweight [16]. The participants knowledge regarding this relationship was not confident thus concerning level of awareness regarding this aspect was detected.

A recent consensus report supports that periodontitis is independently associated with increases risk for cardiovascular diseases. This association could be because of oral microorganism entering the blood stream and cause bacteremia. Also, systemic inflammatory markers like increase in C-reactive protein level may play an important role in this association [13]. Thus, periodontitis patients should be aware of this association and the risk of developing cardiovascular diseases. Only half of the participants answered "yes" when they were asked about the relation between these conditions. However, present results reflect lack of essential knowledge that may lead to inappropriate clinical management of relevant cases.

Indeed, periodontal disease should not be treated as a separate disease since there is a strong association with other systemic entities, thus, an increased awareness of this association has to be highlighted. Collaboration and communication between dentists and other health care provider is crucial to reciprocate knowledge in order to provide an appropriate treatment plan for high-risk patients. Further enhancement of its incorporation into other healthcare education and practices is warranted therefore effective therapeutic intervention and oral health care can be delivered appropriately.

Limitation of the Study

Limitations of this study could be attributed to the variation in the years of experience as the participants in the questionnaire were from different group of ages, thus disclosing a wide variation in the level of education. Furthermore, the participants have different backgrounds as they graduated from different institutes and universities and subjected to different undergraduate curriculums and training programs. Despite these limitations, this study provides useful information on the level of awareness about of the association between periodontal and systemic diseases among dental and medical health care providers, and it allows a rational understanding of the educational needs. In view of the present results, there is perhaps sufficient evidence for the need to provide more education and training for health care professionals regarding the periodontal diseases and related health conditions and/or diseases.

Conclusion

The present study revealed the necessity to increase the knowledge and awareness about the manifestation of systemic conditions affecting the periodontium among dentists and physicians in western region, Saudi Arabia. A collaboration between medical and dental providers and sharing knowledge helps in establishing accurate treatment plan and providing better health outcomes. Further enhancement of the undergraduate education and continues professional development may help raising the awareness and increase the level of clinical skills needed for early diagnosis and proper therapeutic management for periodontal diseases especially those related to other systemic diseases and/or health conditions.

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Conflicts of Interest

The authors declare that there are no conflicts of interests.

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