

**Knowledge of senior students concluding the courses of Dentistry and Medicine toward
the interrelationship of periodontal diseases and systemic health**

**Conhecimento dos alunos concluintes dos cursos de Odontologia e Medicina sobre a
inter-relação entre doenças periodontais e doenças sistêmicas**

**Conocimiento de estudiantes concluyendo los cursos de Odontología y Medicina sobre la
interrelación entre la enfermedad periodontal y las enfermedades sistémicas**

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Abstract

Background/Purpose This study evaluated the knowledge of last year's students of dentistry (DENT) and medicine (MED) regarding the association between periodontal disease (PD) and systemic disease (SD). **Materials and methods:** A questionnaire developed to evaluate the knowledge, attitudes and behaviors related to PD was applied for the students. **Results:** 287 students participated, 81 from DENT and 206 from MED. 47% of DENT students correctly answered all five questions of true or false, compared to 51% of MED students ($p > 0.05$). Between MED students, 67% never ask their patients if they have ever been diagnosed with PD; 51% never evaluate their patients for PD; 28% never refer their patients to a dentist; 95% didn't receive PD training during the course; 61% believe that patients do not expect them to discuss/evaluate PD and 51% agree that discussing/evaluating periodontal condition is secondary to their role. For DENT, 12% never ask their patients if they have ever been diagnosed with PD, although 98% always do the evaluation, and 9% do not feel comfortable doing the periodontal examination. **Conclusion:** Although the students of both courses presented a good theoretical knowledge about PD and its association with systemic health, when approached regarding clinical practices, the results were unsatisfactory.

Keywords: Education; Educational measurement; Periodontal diseases; Periodontics; Oral medicine; Dental students; Medical students.

Resumo

Introdução/Objetivo Este estudo avaliou o conhecimento dos alunos concluintes dos cursos de odontologia (DENT) e medicina (MED) sobre a associação entre doença periodontal (DP) e doenças sistêmicas (DS). **Materiais e métodos:** Foi aplicado aos alunos um questionário desenvolvido para avaliar os conhecimentos, atitudes e comportamentos relacionados com a DP. **Resultados:** Participaram 287 alunos, 81 do grupo DENT e 206 do grupo MED. 47% dos alunos DENT responderam corretamente todas as cinco questões de verdadeiro ou falso, em comparação com 51% dos alunos de MED ($p > 0,05$). Entre os estudantes de MED, 67% nunca perguntam a seus pacientes se eles já foram diagnosticados com DP; 51% nunca avaliam seus pacientes para DP; 28% nunca encaminham seus pacientes ao dentista; 95% não receberam treinamento de DP durante o curso; 61% acreditam que os pacientes não esperam que eles discutam / avaliem a DP e 51% concordam que discutir / avaliar a condição periodontal é secundário ao seu papel. Para DENT, 12% nunca perguntam a seus pacientes se eles já foram diagnosticados com DP, embora 98% sempre façam a avaliação e 9% não se sintam confortáveis para fazer o exame periodontal. **Conclusão:** Embora os alunos de ambos

os cursos apresentem bom conhecimento teórico sobre DP e sua associação com a saúde sistêmica, quando abordados quanto à prática clínica, os resultados foram insatisfatórios.

Palavras-chave: Educação; Avaliação educacional; Doenças periodontais; Periodontia; Medicina bucal; Estudantes de odontologia; Estudantes de medicina.

Resumen

Introducción /Objetivo Este estudio evaluó los conocimientos de estudiantes de odontología (DENT) y medicina (MED) del último año sobre la asociación entre enfermedad periodontal (EP) y enfermedades sistémicas (SD). Materiales y métodos: Se aplicó a los estudiantes un cuestionario desarrollado para evaluar conocimientos, actitudes y comportamientos relacionados con la EP. Resultados: participaron 287 estudiantes, 81 del grupo DENT y 206 del grupo MED. El 47% de los estudiantes de DENT respondieron correctamente las cinco preguntas de verdadero o falso, en comparación con el 51% de los estudiantes de MED ($p > 0,05$). Entre los estudiantes de MED, el 67% nunca pregunta a sus pacientes si ya han sido diagnosticados con EP; El 51% nunca evalúa a sus pacientes para la EP; El 28% nunca deriva a sus pacientes al dentista; El 95% no recibió formación en DP durante el curso; El 61% cree que los pacientes no esperan que discutan / evalúen la EP y el 51% está de acuerdo en que discutir / evaluar la condición periodontal es secundario a su función. Para DENT, el 12% nunca pregunta a sus pacientes si ya han sido diagnosticados con EP, aunque el 98% siempre hace la evaluación y el 9% no se siente cómodo con el examen periodontal. Conclusión: Si bien los estudiantes de ambos cursos tienen un buen conocimiento teórico sobre la EP y su asociación con la salud sistémica, cuando se aborda en relación a la práctica clínica, los resultados fueron insatisfactorios.

Palabras clave: Educación; Evaluación educacional; Enfermedades Periodontales; periodoncia, Medicina oral; Estudiantes de odontología; Estudiantes de medicina.

1. Introduction

Periodontal disease (PD) is one of the most prevalent oral pathologies (SB Brasil 2010: Pesquisa Nacional de Saúde Bucal: resultados principais., 2012) . The main etiological factors for periodontal disease are the accumulation of dental biofilm in combination with host susceptibility and environmental factors, such as deficiency in oral hygiene and poor diet (Chan et al., 2017). Thus, several diseases may be related to chronic periodontitis. Among

those that have greater evidence are cardiovascular diseases and diabetes (Kaldahl et al., 1996)

Regarding the relationship with cardiovascular disease, studies suggest that even a moderate increase in C-reactive protein levels, such as found in patients with periodontitis, may predict an increased risk for cardiovascular disease and atherosclerosis (Chan et al., 2017; Kaldahl et al., 1996; Toregeani et al., 2014). The studies are not satisfactory to affirm the existence of a cause and effect relationship between periodontal and cardiovascular diseases, however, cardiovascular disease accounts for 31% of deaths in 2011, and it is important to consider its possible relationships with PD (BRASIL. Ministério da Saúde, 2011; Sanz et al., 2020).

Considering the interaction with diabetes, the evidence suggests that periodontal changes are the first clinical manifestation of the disease (Lamster et al., 2008; Llambés et al., 2008). Diabetes mellitus and periodontitis are interconnected and there are a large number of studies addressing the effect of periodontal intervention therapy on glycemic control. Periodontal tissues are the oral structures most affected by diabetes mellitus, which predisposes to the development of periodontitis and leads to the lack of glycemic control, highlighting the importance of the bidirectional relationship between these two diseases (Katagiri et al., 2013); (Wu et al., 2015). According to the American Academy of Periodontology on its most recent classification of periodontal diseases, Diabetes is an important factor that modifies the grade of progression of periodontal diseases (Caton et al., 2018).

In addition to diabetes and cardiovascular disease, periodontitis may be associated with other systemic diseases, such as genetic modification (Andia et al., 2010; Feng et al., 2014; Kinane et al., 2005), chronic obstructive pulmonary disease (Zhou et al., 2011), aortic aneurysm (Fang et al., 2014), low birth weight and premature birth (Kramer, 1987), stroke (Arbes et al., 1999), osteoporosis, cancer, rheumatoid arthritis, dysfunction erectile dysfunction, Alzheimer's disease, gastrointestinal disease, prostatitis and renal diseases (Chan et al., 2017; Gulati et al., 2013).

The human organism is a unique and complex unit in which diverse physiological events are very closely linked, and, therefore, a pathological factor in a certain place can have systemic effects (Albujeer & Taher, 2017; Johnson et al., 2006). Due to the historical formation based on the Flexner's paradigm in medicine and derived to dentistry, characterized by a mechanistic conception of the health-disease process, coupled with the respected professional limits, we now observe a poverty of cooperation, inhibiting the synergy between

professionals of different areas. Oblivious to this lack of integration, the nature does not discern professional categories, as well as diseases do not consider the limits of our respective professions (Chan et al., 2017).

Considering the interrelationship between periodontal disease and systemic diseases, it is important to emphasize the need to recover the perception of the whole and, therefore, better meet the needs of the population, which is known as integrality of health care, and a multi-professional care (Lin et al., 2014). The integrality appears as a differential in Brazil, being the guiding axis of the public policy of universal access to health, materialized in the Unified Health System (SUS), which contemplates health actions in an integrated and articulated way between the different levels of attention (Sá & Almeida, 2003). Since its implementation, several advances have been achieved in the development of primary health care, however, its guiding principles are still not a reality in the daily life of health services (Mattos, 2004). Among its principles and guidelines, perhaps integrality is the least visible in the trajectory of the system and its practices. Regarding the integral attention to patients with systemic diseases in SUS, one study pointed out that despite the majority of patients being under medical supervision, less than half were under dental treatment (Silva et al., 2010).

Based on the data presented, the importance of the knowledge of dental and medical students about the association between periodontal disease and systemic health is clear. This knowledge will be fundamental to transform health services practices in order to articulate prevention and assistance, reaching the integrality of health actions. Therefore, the aim of this study was to evaluate the knowledge of last year's academic students of dentistry and medicine with regard to the association between systemic health and periodontal disease.

2. Methodology

The present study was performed in accordance with the ethical standards detailed in the Declaration of Helsinki and received approval by the Research Ethics Committee of the institution (# 3112). Students who were attending the last year of undergraduate courses of Dentistry and Medicine between August 2016 and July 2017 were included in the research. The subjects of the study have provided written informed consent.

The volunteers who agreed to participate in the study were evaluated using a self-administered structured questionnaire adapted from Quijano et al. (Quijano et al., 2010), composed of five items of true/false type and eight questions, measured by Likert scale. The questionnaire was developed to evaluate the knowledge, attitudes and behaviors regarding the

periodontal disease of last year students of dentistry and medicine courses. Participants were also asked about gender and age. The approach was carried out in the classroom, with the consent of the responsible teacher at that moment, after the class, when the interviewees were verbally explained the purpose of the questionnaire and the confidentiality of their personal information. The students were advised to tick off the response that they deemed most appropriate.

Data analysis was performed using statistical software R (R Core Team, 2016). Respondents received a total score ranging from 0 to 5, adding a point for each question of the true/false type answered correctly. The Chi-square test was used for comparison between medical students and dental students. For the correlation between the total number of correct answers and self-reported knowledge by the participants the Spearman test was applied. A descriptive analysis of the issues that explore behaviors and orientations in clinical practice (questions 6 to 8), perceived knowledge and training (questions 9 to 11) and attitudes towards periodontal disease and perceptions that may influence clinical practice (questions 12 and 13) were presented, and the answers between the dentistry and medicine courses were compared using the Chi-square test. Unanswered questions were excluded from the analysis. A significance level of 5% was considered for all analyses.

3. Results

A total of 287 students, including 81 undergraduate students of dentistry and 206 undergraduate medical students, have participated in the study. The average age of dentistry students was $22,6 \pm 2,9$ years being 29 (36%) male students and 52 (64%) females. The average age of medical students was $26,5 \pm 4,0$ years, being 77 (38%) male students and 126 (62%) females.

Table 1 shows the true/false knowledge items with the correct answers and the percentage of individuals who answered the items correctly in each course. The percentage of students who answered any of the items correctly ranged from 73% to 96% among dental undergraduates and from 72% to 95% among medical undergraduates, with no significant difference between groups ($p=0.991$). Most of the individuals interviewed have demonstrated knowledge regarding the signs and symptoms of periodontal disease and its association with diabetes and cardiovascular disease. The lowest percentage of correct answers for both courses was the association between periodontal disease and elevated levels of systemic inflammatory markers. Figure 1 summarizes the results of the interviewees' scores on the first

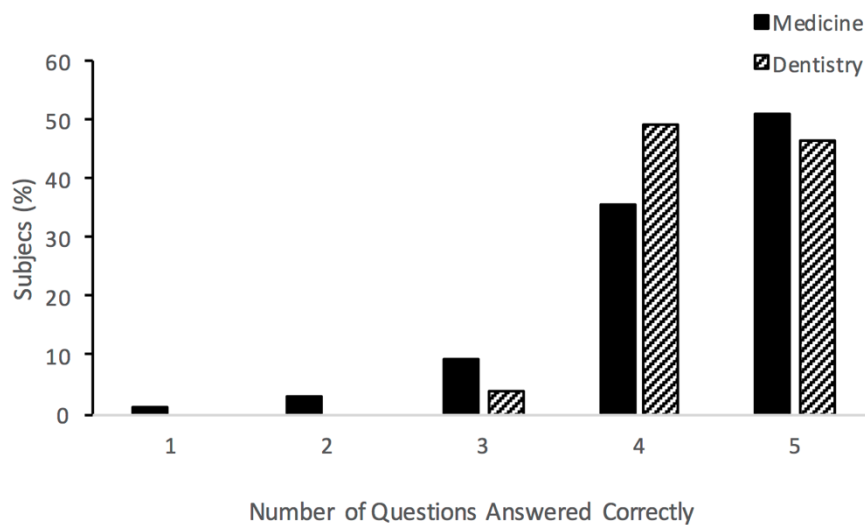
5 questions. The median score was 4 for dental students and 5 for medical students. A perfect score (5) was achieved for 47% of dentistry students and 51% of medical students. Six undergraduates in dentistry and ten in medicine did not answer all five questions and were excluded from this analysis. None of the dentistry students answered less than 3 correct questions, while 2 (1%) and 6 (3%) medical students answered only 1 and 2 correct questions, respectively.

Table 1. True/False knowledge items with correct answers and percentages of subjects who answered correctly.

Item	Correct Answer	Answering Correctly			
		Senior undergraduates in Dentistry		Senior undergraduates in Medicine	
		n	%	n	%
1. Bleeding gums, gum recession, unsteady teeth and tooth loss are signs and symptoms of periodontal disease.	True	78	96.30	195	94.66
2. Periodontal affects as many as 80% of the Brazilian adult population.	True	66	81.48	176	85.44
3. Periodontal disease has been associated with suppressed levels of serum inflammatory markers.	False	59	72.84	149	72.33
4. Poor oral health may increase the risk of cardiovascular disease.	True	69	85.19	185	89.81
5. Periodontal disease is less prevalent/severe in patients with diabetes.	False	78	96.30	193	93.69

Source: Authors.

Figure 1. Percentage of subjects achieving two, three, four or five correct answers on the five true/false knowledge items (Dentistry: n=75; Medicine: n=196).



Source: Authors.

Table 2 summarize the answers to the questions that explored attitudes, orientations and behaviors. Clinical practice questions were interpreted to reflect practices during the final year of graduation: 67% of medical students interviewed never asked their patients if they were diagnosed with periodontal disease, compared to 12% of graduates in Dentistry ($p < 0.001$); 51% of medical students never evaluate their patients for the presence of PD, while 98% of dental students always do this evaluation ($p < 0.001$); and 28% of medical students never referred their patients to a dentist for evaluation and treatment, compared with 9% of dental students ($p < 0.001$).

As shown in Table 2, 25% of the medical interviewees do not feel at all comfortable with the idea of performing a basic oral examination in their patients, compared to 3% of dental students ($p < 0.001$); 84% of medical students reported limited or moderate knowledge about periodontal disease and its association with general health, compared with 21% of dental graduates ($p < 0.001$); and 95% of the medicine students interviewees did not receive any training to identify and/or quantify periodontal disease, while all dental students reported receiving this training ($p < 0.001$). However, there was no correlation between self-reported knowledge and total of correct answers in any of the groups (Dentistry: $p = 0.088$; Medicine: $p = 0.597$).

Finally, as shown in Table 2, 61% of medical students strongly disagree with or disagree that their patients expect them to evaluate and discuss periodontal disease, and 52%

agree or fully agree that assessing and discussing periodontal status is secondary to their professional role. Among graduates of dentistry, only 4% disagree or strongly disagree that their patients expect them to evaluate and discuss periodontal diseases and 14% agree or fully agree that assessing and discussing periodontal status is secondary to their professional role. A statistically significant difference was observed between groups in both questions ($p < 0.001$).

Table 2. Questions measured by Likert scale with percentages of subjects who answered correctly.

Questions	Answers	Senior undergraduates in Dentistry		Senior undergraduates in Medicine	
		n	%	n	%
6. Do you ask your patients if they have ever been diagnosed with periodontal disease?	Always	36	44	9	4
	Sometimes	35	43	59	29
	Never	10	12	136	67
7. Do you screen your patients for periodontal disease?	Always	79	98	11	5
	Sometimes	2	2	88	43
	Never	0	0	105	51
8. Do you refer patients to a dentist/periodontist for evaluation/care?	Always	54	69	28	14
	Sometimes	17	22	120	59
	Never	7	9	57	28
9. How comfortable are you in performing a simple periodontal exam?	Not at all	2	3	49	25
	Somewhat	5	6	97	50
	Very	73	91	49	25
10. How would you rate your knowledge about periodontal disease and its association with general health?	Limited	15	19	6	3
	Moderate	53	65	36	18
	Good	12	15	64	33
	Excellent	1	1	89	46

11. Did you receive training in periodontal disease in school?	Yes	81	100	9	5
	No	0	0	186	95
12. Agree or Disagree? “Patients expect me to discuss/screen for periodontal disease”	Stongly disagree	1	1	9	5
	Disagree	2	3	109	56
	Agree	48	62	67	34
	Strongly agress	27	35	11	6
13. Agree or Disagree? “Discussing/evaluating periodontal status is peripheral to my role.	Stongly disagree	41	51	13	7
	Disagree	28	35	82	42
	Agrees	7	9	91	46
	Strongly agrees	4	5	10	5

Source: Authors.

4. Discussion

In Brazil, as well as in some developed countries, the primary care services are at the heart of health care, being the main entry point to the health system, and the production of care at the primary care settings depends on the interdisciplinary team's combined efforts. The relations between healthworkers are crucial to intervene at a health-disease production level (Taşdemir & Alkan, 2015), but, unfortunately, communication between health professionals in different areas is often flawed (Shimpi et al., 2016).

The knowledge of the association between oral diseases and general health is essential to stablish an adequate diagnosis, treatment and maintenance of many diseases. Observations from previous studies indicate that, generally, physicians are less interested in this interrelationship when compared to dentists (Seymour et al., 2017). Thus, considering the need to understand this association, as well as to rescue the principle of integrality in health, this study aimed to evaluate the knowledge of dental and medical academics about the association between periodontal disease and systemic health, intending at the future to add further knowledge to the academics about this interrelationship, and possibly to establish

interdisciplinary trainings among the students in order to encourage synergism among these future professionals.

It is well documented in the literature that periodontal disease is the sixth complication of diabetes and that individuals with diabetes are at high risk of suffering from periodontal disease, and it is also a significant risk factor for the development of cardiovascular diseases.(Almeida et al., 2006; Chan et al., 2017; Lamster et al., 2008). In the present study, the majority of the individuals interviewed demonstrated the knowledge of the signs and symptoms of periodontal disease and its association with diabetes and cardiovascular disease, thus revealing the knowledge of academics regarding these two groups of systemic diseases. However, the lower percentage of correct answers for both courses regarding the association between periodontal disease and elevated levels of systemic inflammatory markers suggests that although they know about the association, they do not understand the process by which this association occurs.

In addition, despite knowing the association between the signs and symptoms of periodontal disease and general health, when the medical students were asked about clinical attitudes and practices, the application of this knowledge was not observed, since most of the interviewees of this course never ask about periodontal disease when performing the anamnesis of their patients, besides not referring their patients to a dentist. The same was observed by Tasdemir & Alkan (2015), who performed a study with physicians, applying questionnaires containing questions about the knowledge of the relationship between periodontal disease and general health. The authors found that the majority of physicians knew the relationship but had difficulties in dealing with clinical practice. The results of the present study also agree with Shimpi et al., (2016), who applied questionnaires to physicians and nurses to evaluate their knowledge about oral health and observed the lack of referral to dental services.

Furthermore, half of the medical students interviewed do not evaluate their patients regarding the presence of periodontal disease, and are not comfortable with this, since the majority affirm that they did not receive training during the course. Even more disturbing is the fact that most of the medical interviewees believe that discussing or evaluating the periodontal condition of their patients is secondary to their role as a physician. This reality is consistent with the results presented by Mattos (2004), who showed that the guiding principles of SUS are not followed in the daily routine of health services, prospective medical professionals appear not to be receiving the necessary education and guidance, and therefore,

future efforts to improve physicians' ability to contribute for oral health should be included in the medical course.

With regard to the students of dentistry, it is clear that they are better trained in the epidemiology, diagnosis and clinical practices that involve periodontal disease, when compared to the medical students, which is to be expected, since this is the approach of the dentistry course (Lin et al., 2014). However, the results of the present study reveal limitations related to the clinical practice of these students, such as the fact that only 44% always question their patients about having a previous history of periodontal disease, and also due to the fact that 9% of students in the last year of dentistry do not feel comfortable doing the periodontal exam, this is worrying, as they received training for this. The same was reported by Lin et al. (2014) who showed that, although dentistry students have theoretical and practical training, most of them do not deal adequately with periodontal disease.

The lack of correlation between the self-reported knowledge and the total of correct answers showed an insecurity among the students of dentistry interviewed, since the majority affirm to have a moderate knowledge, in spite of the high number of hits. In contrast, among medical students it was observed that self-reported knowledge was higher than that actually observed.

Students need to be educated during graduation so that they can use this knowledge in future clinical practice, since in an interdisciplinary health care group proper communication is crucial because it minimizes errors and increases the patient's satisfaction. Additionally, individuals who engage in team-work are more likely to overcome the barriers and to take actions to ensure patient safety (Shimpi et al., 2016).

5. Conclusion

Although the students of both courses presented a good theoretical knowledge to the periodontal disease and its association with systemic diseases, when the questions of clinical practices were addressed, the results were unsatisfactory, mainly for the students of the medical school, being recommended the oral examination training during undergraduate courses.

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