Perception and Attitude About Systemic Health and Periodontal Disease Among Dentistry Undergraduates

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Purpose: To evaluate the perceptions held by dentistry undergraduates about the relationship between general health and periodontal disease. In addition, student knowledge about treatment of patients with systemic disorders was also examined.

Materials and Methods: Participants were all undergraduates in the last year of dental school from three different universities (N = 253). Inclusion criteria were students enrolled in their last year of the dental curriculum and who agreed to participate in the research. After the participants filled out a structured questionnaire, the results were analysed using Epi Info 3.5.1 software and the chi-square, Friedman and Wilcoxon tests.

Results: The majority of participants recognised the relationship between periodontal and cardiac disease and diabetes mellitus. However, only half of the participants were aware of the relationship between periodontal disease and stroke (50.5%). In relation to caring for patients with systemic diseases, 61.4% of students surveyed did not know the blood glucose level that characterises a hypoglycemic status. The majority of participants (61.8%) stated the importance of evaluating vital signs prior to dental treatment. However, only 13.3% of the participants included temperature and respiratory rate as vital signs.

Conclusion: The perception and attitude of undergraduates about the items on the questionnaire were deficient. Thus, a more holistic view of the patient is warranted within dental education, promoting health and quality of life.

Key words: dental education, dental students, higher education, periodontal diseases

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The opening of the first school of dentistry in Baltimore, Maryland (USA) in the 19th century separated the disciplines of dentistry and medicine (Rutkauskas, 2000). The distinction between the fields led to a dissociation of the impact of oral health on general physical health.

The hypothesis that a relationship exists between systemic disorders and pathological oral conditions arose with the emergence of the field of periodontology, which examines the relationship between oral bacterial infections and the systemic condition of the organism (Machiavelli and Pio, 2008). In the last ten years, studies have focused on the influence of bacterial infection in oral cavity tissues on systemic disease (Li et al, 2000; Renvert, 2003). Oral disease has been shown to increase the risk of many systemic diseases, such as stroke (Joshipura et al, 2003), cardiovascular diseases (Söder et al, 2005) and diabetes mellitus (Saremi et al, 2005). The association is due in part to the presence of gram-negative microorganisms (Matilla et al, 2000).

Because chronic and acute systemic illnesses are increasingly prevalent in the population, it is

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imperative for health professionals to be knowledgeable about possible causes and be able to identify those at high risk (Ezmek et al, 2010). Endocrine and cardiovascular diseases are two of the most common disorders. Thus, dentists have the obligation to make complex decisions that influence the patient's quality of life (Jolly, 1995). The importance of clinical risk evaluation of the patient has increasingly become a subject of interest over the last years. A study by Carvalho et al (2008) found that dentistry undergraduates feel that they are given only superficial knowledge about systemic complications during dental school.

Thus, it is essential to have a quality education well-grounded in problem-based learning that promotes the development of thought processes and attitudes which can be beneficial in real-life situations (Grady et al, 2009). It is crucial for educators to emphasise the application of emergency medical treatment and innovative concepts (Fedorowicz and Newton, 2010), providing students with the theoretical and technical support necessary to treat all patients (Clark et al, 2006), with or without systemic disease. It is therefore critical that dentistry undergraduate programmes emphasise the importance of oral health for the maintenance of systemic health (Renvert et al, 2003; Wilder et al, 2008), and, consequently, the physical, psychological and social well-being of the patient. The purpose of the current study was to evaluate the perception, attitude and knowledge of dentistry undergraduates about the relationship between general health and periodontal disease.

MATERIALS AND METHODS

All dentistry undergraduates (N = 253) in their last year of classes of three Brazilian universities – a state school, a federal school and a private school – during the 2010 academic year were invited to participate in this cross-sectional study. All participants signed an informed consent form. The directors of the universities' dental faculties were informed about the purpose and methodology of the research.

A structured questionnaire based on the works of Kahn et al (2010) and Tofolo (2008) was administered to participants. The questionnaire examined the conduct, attitudes and knowledge of dentistry undergraduates in the holistic and integral approach to treatment. The instrument included both open and closed questions pertaining to the participant's knowledge about the relationship between periodontal disease and cardiac diseases, diabetes mellitus and stroke. In addition, the instrument included questions about dentist conduct in the treatment of patients with cardiovascular and endocrine disorders.

Dental school directors and students received the results of the questionnaire for future discussion. The data were analysed using the Epi Info 3.5.1 (CDC, 2008) software and the chi-square, Friedman and Wilcoxon Tests. Statistical significance was set at $P < 0.05$ for two-tailed tests.

All methods and procedures were approved by the Ethics Committee in Research with Humans of the Araçatuba Dental School (process code: FOA-01374/2010).

RESULTS

Of the 253 dentistry undergraduates invited to participate, 210 agreed to complete the questionnaire.

The results showed that the majority (89%) of the participants correctly stated the relationship between periodontal disease and diabetes mellitus and 83.8% of the undergraduates knew that periodontal pathology is the most common oral manifestation in uncontrolled diabetes (Table 1). 85.2% of the participants recognised the relationship between coronary disease and periodontal disease. However, only 50.5% of all undergraduate participants correctly indicated the relationship between periodontal disease and stroke (Table 1). There

Table 1 Total frequency (%) of the three universities in relation to the students' answers about the association of periodontal disease and systemic disorders, Brazil, 2010

	Students' answers	Diabetes mellitus	Cardiac disease	Stroke
		%		
Periodontal disease	There is an association	89.0	85.2	50.5
	There is no association	8.7	8.6	30.5
	Don't know	1.4	2.9	13.3
	No answer	0.9	3.3	5.7
Total (N = 210)		100	100	100

Table 2 Total frequency (%)of the three universities in relation to students' answers on vital signs, Brazil, 2010

%	Carotid pulse	Respiratory rate	Arterial blood pressure	Temperature
Sample size N = 210	87.6	13.3	94.7	13.3

*Note: 2.8% of participants did not answer this question.

Table 3 Total frequency (%)of the three universities in relation to students' answers on systemic complications during dental treatment of patients with hypertension, Brazil, 2010

%	Myorcardial infarction	Angina	Bleeding	Stroke	Arrhythmias	Cardiopulmonary arrest	Hypertensive crisis	Tachycardia	Hyperventilation
Sample size N = 210	28.1	3.3	38.6	18.6	4.8	15.7	15.7	11.4	1.9

Note: 17.1% undergraduates did not answer this question.

Table 4 Total frequency (%) of the three universities in relation students' to wrong answers on systemic complications during dental treatment of a hypertensive patient, Brazil, 2010

%	Syncope	Lipothymy	Hypotension	Endocarditis	Malaise	Fainting	Convulsions	Sweating	Pallor
Sample size N = 210	6.1	5.2	3.3	8.5	1.4	11.4	1.4	2.8	1.4

Note: 17.1% of the students did not answer this question.

were statistically significant differences between the universities: the private university had the lowest rate of correctly relating periodontal disease and stroke ($P < 0.001$). It was also found that the federal university was significantly more likely to incorrectly report a relationship between multiple sclerosis and periodontal disease ($P < 0.001$).

When the participants were asked about their attitudes towards patients with cardiovascular and endocrine diseases, 61.8% declared the necessity of vital sign evaluation when treating patients with a history of cardiovascular disease. However, only 13.3% knew that temperature and respiratory rate were part of the vital sign evaluation (Table 2). Most of the undergraduates did not recognise cardiovascular complications that may occur during dental procedures in patients with uncontrolled hypertension (Tables 3 and 4). In relation to endocarditis, 82.4% affirmed that procedures that can result in bleeding can put patients at high risk of bacteraemia, but 30% of participants did not know which patients are at high risk for bacterial endocarditis.

As for patients with endocrine disorders, especially diabetics, 61.4% of all undergraduate participants did not know the glucose levels that are characteristic of hypoglycaemia. There was a statistically significant difference between the universities, with state university students having the lowest rate of knowledge in this respect ($P < 0.01$). However, a majority of the undergraduates knew the signs and symptoms that precede hypoglycaemic shock. The participants from the federal university were statistically more likely to correctly identify these symptoms than those from state and private universities ($P < 0.001$). The Friedman and Wilcoxon tests showed statistically significant differences in correct answers of federal university students compared with the other universities ($P < 0.001$): the federal university had the lowest probability of answering correctly of the three universities (Table 5).

Table 5 Probabilities of correct answers given by undergraduates from the three universities, Brazil, 2010

Variables analysed	Probabilities
Federal School Private School	0.002*
Federal School State School	0.003*
Private School State School	0.084

* Wilcoxon test, $P < 0.05$

DISCUSSION

Historically, the field of dentistry has focused on the avoidance of edentulism through the control of dental caries and periodontal pathology. However, over the years the relationship between oral health and overall general health has come into focus due to broadening knowledge about the multifactorial etiology of human diseases (Villalba, 2008). The necessity of an academic education that has a solid basis in this relationship, with sound theoretical and practical experience in clinical treatment of patients suffering from systemic diseases, is essential for ethical and responsible dental practice. Such attitudes include well-founded knowledge of the principal oral disorders and their relationship to systemic diseases.

The relationship between periodontal disease and diabetes mellitus was recognised by 89% of participants and 83.8% of participants responded that periodontal pathology is the most common oral disease in uncontrolled diabetes, as shown in previous research by Sonis et al (1996), who found that 75% of diabetic patients have gingival inflammatory disorders. The relationship between cardiovascular disease and periodontal disease was recognised by 85.2% of participants in the present study. These results indicate that dental students are knowledgeable about the relationship of periodontal health and certain systemic diseases.

However, in the current study, only 50.5% of all participants were aware that periodontal disease was related to the incidence of stroke. Students from private and public universities differed significantly in their responses on this topic: the private university had the lowest rate of knowledge ($P < 0.001$). A recent study of 110 doctors from five hospitals in Rio de Janeiro City, Rio de Janeiro State, Brazil, found that only 23.6% of those interviewed were aware of a relationship between oral infections and stroke (Kahn et al, 2010).

It is important to emphasise that in answering the questionnaire, the students were faced with two diseases that have no association with oral afflictions (multiple sclerosis and poliomyelitis). Here, too, there was a statistically significant difference between students from different universities, with students from the federal university being significantly more likely to report a relationship between multiple sclerosis and periodontal disease ($P < 0.001$).

The above results indicate that a large contingency of dentistry students needs to know how to work with other healthcare practitioners (McKinnon et al, 2007), learning and keeping up to date on information about the relationship between oral disease and general physical health. It is therefore critically important to educate dentistry students to appropriately help each patient as a unique and complex being.

In addition to an education that focuses on the connection between oral disease and general medical diseases, it is also vital that dental students be prepared to treat patients with systemic illnesses such as cardiovascular and endocrine diseases, avoiding possible complications in the dental care of these individuals. The majority (61.8%) of participants in the current study reported the necessity of vital sign evaluation when treating patients with a history of cardiovascular disease (McCarthy, 1980; Holm et al, 2006). However, the participants were unclear as to which vital signs were important. While many participants recognised the importance of blood pressure and pulse, the recording of body temperature and respiratory rate was cited by only 13.3%. These results are in contrast to research by McCarthy (1980), which reports on the importance of the evaluation of vital signals starting with carotid pulse, followed by measurement of respiratory rate, arterial blood pressure and temperature.

The present study also showed that cardiovascular complications that may be experienced during dental treatment of patients with uncontrolled hypertension were recognised by a minority of students: bleeding (38.6%), myocardial infarction (28.1%), stroke (18.6%) and tachycardia (11.4%). Previous research has reported on the occurrence of these events (Findler and Galili, 2002; Conrado et al, 2007). However, some participants cited complications that are not associated with hypertension, such as fainting (11.4%), transient global cerebral hypoperfusion (syncope, 6.1%), lipothymia (5.2%), hypotension (3.3%) and general malaise (1.4%). These results indicate that dental undergraduates are not well educated in the specific problems that can occur in patients with uncontrolled hypertension during dental visits. These results again suggest a lack of understanding of the connection between oral health and systemic disorders.

Furthermore, bacterial endocarditis is a serious condition that involves infection of the endocardium surface and cardiac valves (Cavezzi Júnior and Zanatto, 2003). Prior research has reported a mortality rate as high as 20% for this complication (Skehan et al, 1988). Romans and App (1971) provided evidence that endocarditis can be caused by

gingival bleeding due to the simple use of a water jet during oral hygiene care. Among participants in the current study, 82.4% reported that procedures that can result in bleeding, such as prophylactic tooth cleaning, can put patients at high risk of bacteraemia, necessitating the use of prophylactic antibiotics. However, 30% of participants did not know which patients are at high risk for bacterial endocarditis and specifically did not know that patients with a cardiac valve prosthesis are at a higher risk for the development of bacterial endocarditis. These findings indicate the need for dentistry undergraduates to review theoretical concepts in dentistry during the last year of course work.

In terms of patients with endocrine disorders, especially diabetics, much has been said about the glycaemic control through the use of oral hypoglycaemic drugs and dietary restrictions. Although it is common for diabetic patients to experience hypoglycaemia with plasma glucose levels under 70 mg/dl while undergoing dental work (American Diabetes Association Workgroup on Hypoglycemia, 2005). This phenomenon may be related to complications from excessive doses of oral drugs for hypoglycaemia, insulin, or use of alcohol or other drugs that interact and potentiate the effect of hypoglycaemia drugs (Andrade and Ranali, 2002). 61.4% of all undergraduates surveyed were unaware of glucose levels that are characteristic of hypoglycaemia. There was a statistically significant difference between undergraduates from federal and private universities in identifying the blood glucose level that characterises a hypoglycemic status when compared with undergraduates from the state university ($P < 0.01$).

The signs and symptoms of hypoglycaemic shock start with nausea, hunger and a decrease in brain function followed by sweating, anxiety, tachycardia, chills, and finally seizures, loss of consciousness, hypotension and hypothermia (Gomez et al, 1999; Andrade and Ranali, 2002). 60% of the students were able to identify these signs. Students from the federal university were statistically more likely to correctly recognise these symptoms than those from state and private universities ($P < 0.001$).

Results from the Friedman test exploring correct responses on the questionnaire found statistically significant differences among students from different universities ($P < 0.001$). The Wilcoxon Test for data series found that federal university students scored significantly lower than students from the other two universities.

The results of the current study indicate that education in general health must be an integral part of dental education. It is possible that the subject of the relationship between oral health and general health is introduced too early in the curriculum, at which point students have not yet identified themselves with the field of dentistry.

A second likely problem was shown in a study by Zilbovicius et al (2011), who observed the poor integration of basic disciplines in clinical areas. In many cases, it is up to the students to develop the association of the contents (Ditterrich et al, 2007). The disciplines that are taught in the first years of dental school in Brazil are extremely important for the professional training of the future dental surgeon. It is through them that undergraduates can better understand clinical practice and consequently have a more holistic view of their patients. Another point that may have influenced the dental undergraduates is the teaching model, which has been reformed to some extent, but more progress in this area is required.

The Brazilian dental schools are improving their curriculum continuously, with changes being made to provide more comprehensive training (Toassi et al, 2012). It is essential to provide well-founded dental education which focuses on and promotes the critical thinking of students, in order to better prepare them for clinical practice and decrease patient exposure to risk and complications.

CONCLUSIONS

- Dentistry undergraduates have a good understanding about the relationship between periodontal disease and cardiac and endocrine disorders. However, dental students are not as knowledgeable about the association between oral disease and stroke.
- Few students knew that temperature and respiratory rate were included in the measurement of vital signs during evaluation of patients with a history of cardiovascular disease.
- Most participants were not aware of cardiovascular complications that may occur in patients with uncontrolled hypertension during dental procedures.
- The majority of undergraduates had a good understanding about which group of patients was most susceptible to the occurrence of bacterial endocarditis.
- A minority of dentistry students correctly identified the blood glucose level that characterises hypoglycaemia. However, a majority of undergrad-

uates were aware of signs and symptoms that precede hypoglycemic shock.

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