



# Effect of dental education on knowledge and clinical behavior of turkish dentists' regarding oral-systemic health of geriatric patients

## Oral-systemic health of geriatric patients (Running title)

Efeito da educação odontológica no conhecimento e comportamento clínico de dentistas turcos em relação à saúde oral e sistêmica de pacientes geriátricos

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### ABSTRACT

**Objective:** The aim is to evaluate the perspectives of dentists' clinical approaches in terms of their knowledge and education regarding oral-systemic health relation of geriatric patients with a digital survey. **Materials and Methods:** The demographics, oral-systemic health-related lectures in participants' dentistry education, the level of awareness of the oral-systemic health relationship, and behaviors related to clinical applications were investigated on a digital platform with 49 multiple-choice questions. The results were analyzed with the SPSS 24.0 program. **Results:** Of a total of 410 dentists (206 women and 204 men), 23% have doctoral and/or specialty titles. While 93.1% of dentists had taken systemic health-related lectures, 21.3% of them rated these courses as "adequate" and 49.3% as weak. 72% of the participants received medical history only at the initial appointment, while 17.9% of them received it at each appointment. Dentists more often associate diabetes and cardiovascular diseases with periodontitis, compared to the development of dental caries. Dentists who think that they should work with physicians in the treatments of geriatric patients with systemic diseases refer more patients to physicians per year ( $p < 0.001$ ). **Conclusions:** Dentists have found the lectures on the relationship between oral-systemic health of geriatric patients in dentistry education inadequate. Besides, there is a lack of information on the effects of systemic diseases on caries development, intra-oral findings, and knowledge on treatment approaches. Dentists believe that defining a curriculum that emphasizes interdisciplinary work and organizing scientific activities in partnership with medical associations will play an important role in establishing awareness of oral-systemic health.

### KEYWORDS

Dental education; Dental health survey; Geriatric dentistry; Interdisciplinary communication; Oral health.

### RESUMO

**Objetivo:** O objetivo é avaliar as perspectivas das abordagens clínicas dos dentistas em relação ao seu conhecimento e educação sobre a relação da saúde oral e sistêmica de pacientes geriátricos através de um questionário digital. **Material e Métodos:** Os dados demográficos, as aulas relacionadas à saúde oral-sistêmica na educação odontológica dos participantes, o nível de conhecimento da relação saúde oral e sistêmica e os comportamentos relacionados às aplicações clínicas foram investigados em uma plataforma digital com 49 questões de múltipla escolha. Os resultados foram analisados com o programa SPSS 24.0. **Resultados:** De um total de 410 dentistas (206 mulheres e 204 homens), 23% possuem título de doutor e / ou especialidade. Enquanto 93,1% dos dentistas tiveram aulas sobre saúde sistêmica, 21,3% avaliaram esses cursos como "adequados" e 49,3% como fracos. 72% dos participantes recebem histórico médico apenas na consulta inicial, enquanto 17,9% deles recebem em cada consulta. Os dentistas associam mais frequentemente diabetes e doenças cardiovasculares à periodontite, em comparação ao desenvolvimento de cárie dentária. Os dentistas que acham que devem trabalhar em conjunto com médicos no tratamento de pacientes geriátricos com doenças sistêmicas encaminham mais pacientes ao médico por ano ( $p < 0,001$ ). **Conclusões:** Os cirurgiões-dentistas consideram inadequadas as palestras sobre a relação entre saúde oral e sistêmica de pacientes geriátricos no ensino de odontologia. Além disso, faltam informações sobre os efeitos das doenças sistêmicas no desenvolvimento de cárie, achados intraorais e conhecimento sobre as abordagens de tratamento. Os dentistas acreditam que a definição de um currículo que enfatize o trabalho interdisciplinar e a organização das atividades científicas em parceria com as associações médicas terá um papel importante no estabelecimento da consciência sobre a saúde oral e sistêmica.

### PALAVRAS-CHAVE

Educação em odontologia; Inquéritos de saúde bucal; Odontologia geriátrica; Comunicação interdisciplinar; Saúde bucal.

## INTRODUCTION

The World Health Organization, which defines ideal oral health as a state of freedom from caries, periodontal disease, pain, and discomfort, declared in 2018 that oral health is essential for the systemic health and quality of life of individuals [1]. Due to the increased life expectancy every year, the population of elder people is arising coordinately. UN recently reported that by the year 2050, 1 in 11 patients will be over the age of 65 which is 1 in 6 in 2019 [2]. Accordingly, dental care for the elder population has shifted primarily from denture care to more brushing, and flossing, to maintain the health of natural dentition. Studies have demonstrated that oral diseases affect the systemic health of elder patients and may even delay mortality [3]. As elder patients mostly carry one or more systemic diseases, having ideal oral health ensures more importance than in earlier adulthood. Furthermore, 120 different systemic conditions or diseases have been reported to have oral manifestations, and it has been shown that 90% of systemic diseases can be diagnosed by oral and dental examination [4].

As the age advances, both the hard and soft tissues of the oral cavity show many alterations such as mucosal wear, loss of calcified tissues, and salivary gland hypofunction. Those changes can alter the oral tissues becoming more permeable to harmful substances and vulnerable to external carcinogens [5,6]. Moreover, as digestion begins from the oral cavity, impaired oral health could have an adverse impact on diet and nutrition. Malnutrition of geriatric patients caused by lack of teeth or dentures could increase the risk of infections and on the other hand, overnutrition may cause gastrointestinal and cardiovascular diseases or lead to obesity and even cancers [7]. Therefore, it is not only crucial for dentists to investigate elder patients' systemic conditions along with their oral examination and have adequate knowledge of the oral symptoms of systemic diseases, but also for geriatric patients

to comply with regular dental check-ups.

Besides, it will be more than beneficial for physicians to have basic knowledge about oral and dental health and to direct their patients to dentists when necessary. It will only be possible if their education includes lectures on oral and dental health. In recent years, especially regarding the relationship between oral and systemic health of geriatric patients, it has been emphasized that lectures on oral health should be added to the curricula of medical sciences programs so that an integrative education system can be established [8]. However, lectures on the relationship between oral and systemic health are not included in the relevant programs in many countries around the world. A study conducted in the USA determined that 90% of medical interns did not receive any information on periodontal diseases [9]. Similarly, courses on oral health are out of the scope of 77% of the training programs conducted by the American Association of Diabetes Educators (AADE) [10]. A study from Saudi Arabia revealed that physicians had inadequate oral health knowledge [11]. Furthermore, it was observed that medical interns were frequently administered questionnaires about their dental education however, no studies are investigating the medical lectures included in the dentistry curriculum [8,12,13].

The present digital survey explored dentists' curricula concerning the relationship between oral and systemic health, the dentists' level of knowledge of oral and systemic health, and clinical approaches to oral findings of systemic diseases that are carried by the geriatric patients.

We sought to answer the following questions: (1) Did dentists find the lectures regarding oral and systemic health relationships on the curriculum adequate? (2) What is their perception of the oral-systemic health relationship? (3) How does their knowledge of systemic diseases affect their clinical processes on geriatric patients?

## METHODS

Along with a cover letter containing detailed information about the study by the Turkish Dental Association (TDA), questionnaires were sent via e-mail to the dentists who have contact information in the TDA database. Participants were asked to fill only one questionnaire between February and May 2018 and Power analysis (G\*Power 3.1) was applied before the distribution of the questionnaires. It was determined that at least 376 dentists should participate in the survey, which was planned to have a 95% confidence interval and 80% power, for the awareness of the relation between oral-systemic health to be statistically significant.

The questionnaire prepared for the study consists of 3 parts and 38 multiple-choice questions (Appendix 1). Demographic information, opinions on oral and systemic health-related lectures in undergraduate and graduate curricula, levels of awareness, and knowledge of participants on the relation between oral and systemic health were investigated in the survey.

### Statistical Analysis

The results were evaluated in SPSS 24.0 program and the frequency distribution of the answers was calculated. Due to the abnormal distribution of the results, Kruskal-Wallis and Mann-Whitney U tests were applied at the level of  $p < 0.05$ .

## RESULTS

### Part 1.

In this section, questions that looked at the demographic information of dentists, their working areas, their number of patients per day, and the years in their profession are examined. 206 women (average age 38.1) and 204 men (average age 47.2), a total of 410 dentists,

answered all of the questions. Male dentists participating in the survey were significantly older ( $p < 0.001$ ). Among the participants, 23% had a post-doctoral title or specialty; most of them were periodontists (19.6%). There were also two forensic dentists, one public health specialist, one molecular medicine specialist, and one pharmacologist. There were no statistically significant differences among those with doctorate/specialty areas about the age and gender of the participants ( $p > 0.05$ ).

Working areas of the dentists in the survey were grouped as private, public, or university. 86% of the dentists were in private enterprises (private practices, polyclinics, and hospitals), 8% were in universities (private or state universities), and the rest were in public hospitals. While there were no statistically significant differences between the working areas and ages of the dentists ( $p = 0.273$ ), it was determined that female dentists worked at universities significantly more often than males ( $p = 0.003$ ).

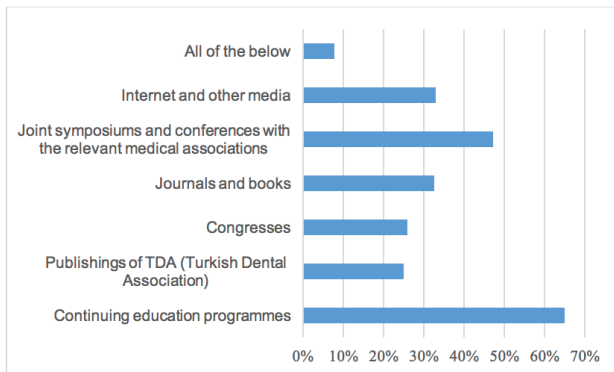
10.3% of dentists examined or treated more than 20 patients a day, 24.9% of them saw 10–20 patients, 47.7% of them saw 5–10 patients, and 17% of them saw fewer than five patients a day. Having a post-doctorate/specialty degree was not associated with a statistical difference in the number of patients examined or treated per day ( $p = 0.215$ ). It was determined that the working areas were associated with a statistically significant difference ( $p < 0.001$ ); dentists who worked in private enterprises and university hospitals examined or treated 5–10 patients per day, while dentists who worked in the public examined or treated more than 20 patients a day.

While 45.2% of the dentists had been practicing for more than 20 years, 20.7% of them had been practicing for less than 5 years, 14.8% of them for 5–10 years and only 8.6% had been practicing dentistry for 11–15 years.

## Part 2.

When examining dentists' opinions on the oral and systemic health-related lectures of dental and post-graduate curricula, it was detected that 93.1% of them had had lectures on systemic health in their dental education. 43.4% of these dentists had on average more than 20 hours of lectures in this area. 23% of them had between one and five hours, 18.9% between six and ten hours, and 14.7% between ten and twenty hours. 21.3% of dentists evaluated these lectures during their dental education as adequate, 49.3% as weak, and 18.2% as very poor. The resources that dentists would like to apply after graduation on the relationship between oral and systemic health are shown in Table I.

**Table I** - Postgraduate education resources to be utilized on the relationship between oral and systemic health



94.8% of the dentists reported that curriculum planning should include interdisciplinary collaboration for physicians and dentists. There were no significant differences in terms of gender ( $p=0.614$ ) or years in the profession ( $p = 0.057$ ).

## Part 3.

In this section, the levels of awareness and knowledge of dentists regarding oral-systemic health relationships and their relevant approaches to clinical practice are investigated. Findings revealed that 72.1% of dentists took a

medical history (anamnesis) only at the initial appointment and 17.9% of them did so at each appointment. 0.2% of the dentists did not take any medical history, 8% took a medical history occasionally, and 1.8% did so rarely or only when the patient declared any systemic problem.

Statistically, the frequency of taking a medical history showed a significant relationship to dentists' working areas. According to results, dentists who record medical anamnesis at each appointment ( $n = 69$ ) and only at the initial appointment ( $n = 53$ ) (61.7%) worked mostly in private enterprises.

The frequency of dentists recording a medical anamnesis did not change with years of practice ( $p = 0.266$ ). It was determined that 55.4% of the dentists who record the medical history at each appointment had been in the profession for more than 20 years, followed by those who had been in the profession for fewer than 5 years. Besides, the number of patients examined or treated by dentists per day did not affect the frequency of their medical-history review ( $p = 0.526$ ); however, it was found that female dentists were significantly more likely to record medical histories at each appointment than males ( $p = 0.001$ ). Reasons for not taking a medical history were reported as follows: not knowing how to question the patient (24%), finding it a waste of time (14.4%), and assuming that the responsibility belongs to physicians (12.6%). At the same time, 19% of the participants stated that they already had information about the general health status of their patients.

Dentists' attitudes towards precancerous lesions, diabetes, cardiovascular, and respiratory diseases are examined in the current section. In the presence of a precancerous lesion, 57.7% of dentists referred their patients to an ear, nose, and throat (ENT) or dermatology specialist and 23.1% of them referred to the relevant dental departments. 12.7% of them took biopsies and

send them to pathology laboratories; only 6.5% recommended regular follow-up appointments. There was no statistically significant difference between dentists' years in their profession and their approach to precancerous lesions ( $p > 0.05$ ). On detecting precancerous lesions in their patients, the clinical approach of dentists who thought that they should work collaboratively with physicians differed significantly from dentists who did not think so ( $p < 0.001$ ). Most of the dentists who wanted to work in an interdisciplinary way took biopsies from the lesions and sent them to the pathology unit (43%), while 23% referred to the ENT physician and 24% wanted to track the condition of the lesions.

When the knowledge levels and awareness of dentists on the oral symptoms of diabetes were examined, it was found that 72% of the participants knew about the relationship between diabetes and the development of dental caries regardless of their years in the profession ( $p = 0.289$ ) (Table II). Dentists who had more than 20 and fewer than 10 years of experience were significantly more aware of the relationship between diabetes and periodontitis of dentists than other participants ( $p < 0.001$ ). It was determined that the awareness of dentists working in private enterprises was significantly higher than their colleagues working in public institutions or universities ( $p < 0.001$ ).

**Table II** - Dentists' awareness of the relationship between diabetes, caries development, and periodontitis

	Yes	No	No idea
Diabetes – Caries development	72%	21%	6.9%
Diabetes – Periodontitis	93.3%	1%	0.7%
CVD – Caries development	38.9%	46.6%	14.5%
CVD - Periodontitis	55.3%	31.4%	13.3%

Participants who were aware of the relationship between diabetes and periodontitis reported that the most frequent oral symptom in patients with diabetes was tooth loss, followed by

gingival bleeding (Table III). It was determined that the years in the profession and the type of working areas did not have a significant effect on the awareness of dentists of the oral symptoms of diabetes ( $p > 0.05$ ).

**Table III** - Participants' knowledge of the frequency of oral symptoms in diabetic patients

Oral symptoms	Frequency	High	Low	No difference
Tooth loss		91%	12%	7.7%
Gingival bleeding		89.2%	2.4%	8.4%
Ulcerative lesions		85%	3.1%	11.8%
Candida infection		78.3%	4.3%	17.4%

82.3% of the dentists who participated in the survey stated that they paid attention when scheduling the appointments of diabetic patients and 65.8% stated that being edentulous for a long time is an important concern in diabetes. 46.1% of the dentists stated that consultation should be done with a diabetes specialist only in surgical applications, and 22.5% suggested a referral in all cases.

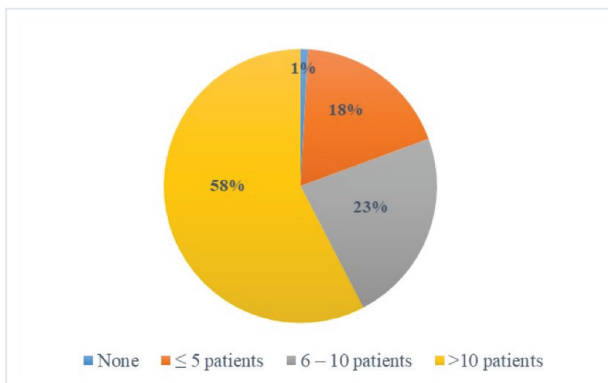
In evaluating the knowledge of dentists on the oral symptoms associated with cardiovascular disease (CVD), 55.3% of them associated CVD with periodontitis and 38.9% of them with the development of dental caries (Table II). Results did not differ statistically with the years in the profession and working areas ( $p > 0.05$ ).

97.8% of dentists stated that they had consulted a physician before surgical procedures in patients with CVD. The results did not change statistically with the number of patients they examined or treated during the day ( $p = 0.332$ ), their gender ( $p = 0.103$ ), area of specialty or possession of a PhD ( $p = 0.691$ ), or working areas ( $p = 0.321$ ).

Evaluating dentists' knowledge on oral symptoms associated with respiratory diseases, 62.8% of the participants associated chronic obstructive pulmonary disease (COPD) or asthma with susceptibility to dental caries

however, nearly 20% of the participants had no information on this relationship. Similarly, 50.4% of the participants reported that individuals with periodontitis had a high probability of having a bronchial infection and 34% had no knowledge of this issue.

Participants who stated that they should work collaboratively with physicians in the treatment processes of patients with systemic diseases (95.9%) referred more than ten patients per year to physicians, a significantly higher rate than those who did not state they should work collaboratively (57.6%) ( $p < 0.001$ ) (Figure 1). There was no significant difference between the number of patients referred to a physician per year and the gender of dentists ( $p = 0.221$ ), their specialty ( $p = 0.906$ ), working areas ( $p = 0.608$ ), or the years in the profession ( $p = 0.270$ ).



**Figure 1** - Number of patients dentists referred to physicians per year.

91.1% of the dentists reported that following dental treatments of individuals with systemic problems, the probability of the recurrence of the problem caused by their systemic diseases would decrease. In addition, 58% of these dentists referred a statistically higher number of patients to physicians per year ( $p < 0.001$ ).

Regardless of the years in the profession and any specialty areas ( $p > 0.05$ ), 88.7% of the

participants thought that drugs had effects on the systemic health of the individuals and 54.5% reported that they consulted with a physician before prescribing. Similarly, participants who thought that the systemic health of the individuals would be better after dental treatments directed their patients to or consulted with a physician before prescribing drugs at a significantly higher rate ( $p < 0.023$ ). For dentists who reported having no knowledge about prescriptions of systemically affected individuals, the patients' dental problems were the top priority, rather than the possible systemic effects of the drugs ( $p < 0.05$ ).

## DISCUSSION

The importance of routine dental examinations has become even more evident today when the life expectancy has increased and patients live with more of their natural dentition. While major changes are prominent in the oral cavities as age advances, the effects of systemic conditions may become more of a burden to the systemic health of geriatric patients so, it is crucial to indicate the symptoms at the earliest. Undoubtedly, dentists must have information on the impact of systemic health on the oral environment to integrate their knowledge into clinical examination routines of geriatric patients. It is also important for dentists to learn the systemic effects of oral diseases commonly seen in geriatric patients in a proper curriculum, develop their competencies on the subject, stay up to date, and also educate their elder patients on the relationship between oral and systemic health.

In the present survey, dentists' level of knowledge, awareness, and approaches to clinical practice regarding the relationship between oral and systemic health were investigated. Male and female dentists participated in the survey and differed in terms of age, years in the profession, specialty area or doctorate title, the number of examined or treated patients, and working areas.

The current digital survey was conducted using the TDA database, which enabled it to reach 410 dentists and distinguished it from other dental surveys [4,14,15].

It is recommended in health sciences to implement an “integrative education system,” which should include the relationship between oral and systemic health to structure a curriculum accordingly [8]. The related education system may also allow working in interprofessional collaborations which may lower the time and efforts of geriatric patients. Although 93.1% of the participants had lectures or content related to systemic health during their dental education and 43.3% stated that they had more than 20 hours of these lectures, 67.5% of them reported these courses to be “insufficient.” Oral health should be included in programs of health sciences in which the Association for Dental Education in Europe (ADEE) also declared that specific care for geriatric people should be in the curricula of dentistry faculties and at the same time, general dentists should have the competency of knowing when to refer the patient to physicians [16]. Gerodontology is included in lectures of most of the dentistry faculties in Europe and acknowledged as a specialty program in Brazil [17]. However, even after more than 10 years, the number of gerodontologists is found inadequate in Brazil and it was advised to put gerodontology in curricula of more Brazilian dentistry faculties to supply the daily dental workforce [17].

It was not possible to compare the curriculum data within the present survey, as no study evaluating systemic health education in dental curricula was found. Nevertheless, as a response to the first question of the current study, lectures on systemic health were found to be inadequate by the participants, and 94.8% stated that curriculum planning for interprofessional collaboration would be appropriate for dentists, indicating that curricular restructuring is also needed.

Training in the continuing education

programs of oral health, which is based on an interdisciplinary understanding between dentists and other health professionals, has been reported to rapidly develop the clinical applications of the participants about this relationship [18]. In parallel with the outcomes of the present study, the participants mostly wanted to benefit from continuing education programs after graduation to eliminate the lack of knowledge of systemic health. Interdisciplinary training in health sciences was reported to be more effective with case sharing, and simulations [19]. Apart from curriculum changes, continuing education programs that explain interdisciplinary education and include clinical applications should be established, and courses covering the present issue should be included in symposia, conferences, and congresses.

Dentists' approaches to clinical practices regarding the oral-systemic health relationship of the patients were examined to evaluate the second question of the study. In case of an emergency or complications before or during dental treatments, dentists' knowledge of the medical conditions of the geriatric patients ensures intervention in a short time which may prevent mortal incidents. It was determined that 72.1% of the participants asked about medical histories only at the initial appointment, regardless of the working area and gender of the dentist. Although the approaches of the dentists regarding different clinical practices have been investigated in many studies [10,14,15], the subject of medical history was examined only by Smereka et al. (2019) in a survey that evaluated the method of taking an anamnesis with the participation of 419 dentists [20]. In the present study, it was found that only 17.9% of dentists recorded a medical anamnesis at each appointment. Besides, it was determined that dentists who received the medical anamnesis at each appointment or only at the initial appointment were significantly more likely to be working in private. On the other hand,

dentists working at public institutions recorded the fewest medical histories of the patients, which could be attributed to the higher number of patients examined or treated per day. Also, 55.4% of those who reviewed a medical history at each appointment had been practicing in the profession for fewer than five years or more than twenty years. We believe that those who graduated fewer than five years ago may have more oral-systemic health-related lectures or content in their curricula, or those with more years of experience in the profession may have developed awareness about recording medical history.

Furthermore, it was expected in the present survey that dentists (95.9%) who stated that they should work with physicians refer their patients at a higher rate after detecting a precancerous lesion. However, according to the results, dentists adopt different attitudes towards precancerous lesions. Approximately 15,000 older adults are affected by oral cancer each year and the average age of diagnosis is 60 to 65.3. Thus, it is crucial not only for dentists to diagnose oral cancer and to work collaboratively in the treatment plans but also for geriatric patients to spare time for routine oral examinations. In a study in which the knowledge of non-specialist dentists regarding oral cancer and precancerous lesions was measured, four-hour courses and videos were given to nearly 30,000 dentists [21]. It was found that dentists significantly improved their knowledge of oral cancer and precancerous lesions immediately after the courses. Behaviors towards precancerous lesions are shaped by the training received so that a common protocol or curriculum on the relevant topics should be prepared according to the results of the present survey as well.

Dentists need to dominate the oral symptoms of systemic diseases, diagnose geriatric patients' possible systemic conditions, and manage their oral hygiene habits. With the detailed oral and dental examination, further damage will be inhibited not only for the oral

environment but also for systemic health. It has been reported that the control of systemic diseases becomes easier by improving the intra-oral findings [4]. To evaluate the third question of the study, clinical behaviors of dentists regarding the relationship between oral and systemic health were investigated. It was found that diabetes was associated with periodontitis more than caries development. Regardless of the dentists' years in the profession and working areas, the most common oral findings were tooth loss and gingival bleeding, followed by ulcerative lesions (85%), and candida infection (78.3%). Although most of the participants were found to know about the oral manifestations of diabetes, the rates are still improvable. Dentists' association of diabetes with periodontitis rather than caries development maybe because there are more publications (such as articles and books) on periodontal topics.

On the other hand, it was determined that dentists working in private institutions were significantly more familiar with the relationship between diabetes and periodontitis. Considering that those working in private institutions record medical anamneses more frequently and perform fewer patient examinations or treatments during the day, oral conditions of diabetic patients may be better evaluated. Moreover, dentists were found to have less awareness of the relationship between long-term edentulousness and blood glucose management, compared to other oral findings of diabetes. To summarize, it has been determined that some specific findings such as the relationship between diabetes and the development of dental caries or prolonged edentulism are less known by dentists, and there is no knowledge of these issues at rates exceeding 20%. As edentulism could be encountered in geriatric patients, training in different ways (e.g., didactic.) and/or creating written or visual (infographic, poster, etc.) resources by the experts in the subject may be beneficial in eliminating the lack of knowledge.

Another common group of systemic diseases of geriatric patients that should be well-known



by dentists is cardiovascular disease (CVD). Oral mucosa contains extensive vascularization; thus, the oral environment is undoubtedly affected by vascular diseases. While only 55.3% of the dentists associated CVD with periodontitis, only 38% were able to associate CVD with caries development. However, studies have reported that CVD is closely related to both periodontitis and dental caries [22,23]. Various gram (-) and anaerobic bacteria located in periodontal pockets can settle in cardiovascular tissues. Kim et al. (2019), screened more than 234.000 patients and reported that the presence of advanced caries directly increased the risk of CVD [23]. Although the relationship of periodontitis and dental caries with CVD has been demonstrated in studies, dentists participating in this survey did not have sufficient knowledge of the issue.

Studies have also shown a strong relationship between periodontitis and pulmonary diseases such as bronchitis, asthma, and chronic obstructive pulmonary disease (COPD) [24,25]. High amounts of periodontal and cariogenic bacteria found in both saliva and dental plaque may increase the risk of bronchitis. Besides, good oral hygiene protects from lung diseases by preventing the deterioration of oropharynx microbiota [24]. Drugs used for asthma increase the development of dental caries, especially in adolescents [24,25]. 62.8% of the dentists who participated in the survey associated COPD and asthma with the development of dental caries. However, it was determined that one out of every five dentists did not have any knowledge about the effects of diabetes, CVD, and respiratory diseases on oral health, and 56.6% of dentists did not have sufficient knowledge in cases of complications that may occur due to systemic diseases of the patients during clinical practice.

In the last section of the third part of the questionnaire, the consultation and cooperation rates of dentists with physicians were investigated. Dentists, especially those who did not have sufficient knowledge about CVD, respiratory diseases, and possible complications of systemic

diseases, were expected to consult frequently with physicians. Accordingly, it was found that almost all (97.8%) of the dentists, regardless of gender, specialty, and working areas, consulted with physicians in cases of CVD, whereas only 22.5% consulted in cases of diabetes. These results are in accordance with Laurence's (2012) and Atai et al. (2017) studies in which revealed that consultation with physicians occurred most frequently when patients had CVD [26,27].

Consultations before dental treatment of patients with systemic diseases allow physicians and dentists to work together to help with prompt recovery, control the disease faster, use resources more effectively, and eliminate possible complications during treatments. According to the current study, dentists who stated that they should work collaboratively with physicians (95.9%), referred a significantly higher number of patients annually (ten patients) to physicians than dentists who did not. Similarly, 58% of dentists who stated that following dental treatments decreased the probability of problems arising from systemic diseases referred to a significantly higher number of patients to physicians. Studies from different countries, which were conducted with the interview method, showed completely different results [28,29]. In Sippli et al. (2017) study, general practitioners and dentists reported that it is necessary to work collaboratively only for patients using drug prescription, anticoagulants, and bisphosphonates [30]. Although the dentists participating in the study stated that they were willing to expand their cooperation with physicians, general practitioners reported no need to work inter-professionally on different subjects. Since the results were not expressed as a percentage, they could not be compared with the outcomes of the current study.

According to results, 88.7% of the dentists stated that the drugs they prescribed had effects on systemic health and 54.5% had consultations with the physician before prescribing. Similarly, dentists who reported that the systemic health of patients would be better after dental treatments

referred their patients to or consulted a physician before prescribing medication at a statistically higher rate. It has been determined that dentists with inadequate knowledge on this subject prioritized the patient's oral problems rather than the possible systemic effect of the drug. In two separate studies conducted in the UK, the primary reason for physicians and dentists not working in an interdisciplinary manner was stated as the lack of information [28,29]. At the same time, dentists were of the opinion that other departments of health sciences should also offer oral health training for its practitioners to work comfortably in an interprofessional team [29]. When evaluating geriatric patients' points of view, referring directly to a physician or a dentist while maintaining a treatment plan is time-saving and cost-effective at the same time. This may also lower the health-care costs reserved on the budgets of governments as well. In the light of the answers given to the third part of the questionnaire, it can be concluded that most dentists may transform what they think into a way of behavior and show a working attitude in cooperation with physicians.

According to 410 dentists with different demographic characteristics, the hours and/or contents of the lectures they received during their dental education on the relationship between oral and systemic health on the geriatric patients were insufficient. It is obvious that dentists, who would like to have more information on this relationship, would like to participate in continuing education programs and scientific events such as congresses and symposia.

## CONCLUSION

As oral diseases are preventable, the knowledge gained by dentists will directly encourage the provision of proper oral care and assist in at least reducing oral-systemic health-related problems of geriatric patients. There are promising researches after including gerodontology as postgraduation courses but the main dental work for geriatric patients could only be diminished by general dentists who were

educated at dentistry faculties. Therefore, the awareness that oral health is an integral part of general health should be instilled through lectures or added into content, and the curricula that define interdisciplinary collaboration should be developed by the faculties of health sciences. The cooperation of physicians and dentists should be encouraged with the training, symposia, and congresses and organized with the joint participation of professional organizations and the relevant scientific associations.

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## Conflict of interest

The authors have no proprietary, financial, or other personal interest of any nature or kind in any product, service, and/or company that is presented in this article.

## Regulatory Statement

This study was conducted in accordance with all the provisions of the local human subject's oversight committee guidelines and policies of: the Istanbul University Clinical Research Ethics Committee of the Faculty of Dentistry in accordance with the guidelines for the Helsinki Declaration of Human Rights. The approval code for this study is: 2018/32.

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