



**CARDIOLOGISTS' AND CARDIOVASCULAR SURGEONS' AWARENESS,
OPINIONS AND PRACTICE BEHAVIORS RELATING TO THE ASSOCIATION
BETWEEN PERIODONTAL DISEASE AND CARDIOVASCULAR DISEASE**

**KARDİYOLOGLARIN VE KARDİOVASKÜLER CERRAHLARIN PERİODONTAL
HASTALIK VE KARDİOVASKÜLER HASTALIK ARASINDAKİ İLİŞKİSİ İLE
İLGİLİ FARKINDALIK, GÖRÜŞ VE UYGULAMA DAVRANIŞLARI**

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ÖZ

Aim: There is a growing evidence that periodontal disease is associated with an increased risk of cardiovascular diseases. To assess the awareness levels, views, and clinical practices of cardiologists and cardiovascular surgeons in Turkey on the association of periodontal diseases with the diseases of the cardiovascular system.

Material and Methods: A survey that included twenty-three questions was prepared and mailed to 99 cardiologists and cardiovascular surgeons practicing as resident, lecturer or specialist in Turkey. The response rate is 66%. Data was analyzed using SPSS® 18.0 software (SPSS, Chicago, IL, USA).

Results: Of the respondents; 80% were males, 98% were at the age of ≤ 50 years, 59% have been working in a university, and 37% were specialists. Fifty-three percent of lecturer and 38% of specialist received a periodontal treatment more than two years time ago. Fourteen percent of resident, 30% of specialist and 53% of lecturer referred patients to visit the dentist. Eighty-eight percent of the residents and lecturers agreed or strongly agreed with the opinion that periodontal disease treatment could lower the risk of an individual to develop a type of cardiovascular disease.

Conclusion: Cardiologists and cardiovascular surgeons had a lack of knowledge of the periodontal disease and its impact on systemic health. Programs on oral health in academic curricula of cardiologists and cardiovascular surgeons should be improved to leverage the level of awareness and knowledge on periodontal diseases.

Keywords: Cardiologists, cardiovascular surgeons, cardiovascular diseases, periodontal diseases, oral health.

ABSTRACT

Amaç: Periodontal hastalığın artmış kardiyovasküler hastalık riski ile ilişkili olduğuna dair kanıtlar artmaktadır. Bu çalışmanın amacı kardiyologların ve kardiyovasküler cerrahların periodontal hastalık ve kardiyovasküler hastalık arasındaki ilişki ile ilgili farkındalık, görüş ve uygulama alışkanlıklarını değerlendirmektir.

Gereç ve yöntem: Yirmi üç sorudan oluşan anket hazırlanmış ve Türkiye’de uzman, öğretim üyesi veya asistan olarak çalışan 99 kardiyolog ve kardiyovasküler cerraha mail yoluyla gönderilmiştir. Anketin cevaplanma oranı %66’dır. Veriler SPSS® 18.0 yazılımı (SPSS, Chicago, IL, USA) kullanılarak analiz edilmiştir.

Bulgular: Katılımcıların % 80’i erkek ve % 98’i 50 yaşında veya daha gençtir. Katılımcıların %59’u üniversitede çalışıyor ve %37’si uzman olarak görev yapmaktadır. Öğretim elemanının %53’ü ve uzmanların % 38’i iki yıldan uzun zaman önce periodontal tedavi görmüştür. Asistanların %14’ü, uzmanların % 30’u ve öğretim elemanının % 53’ü hastalarını diş hekimine gitmesi için sevk etmektedir. Asistanların ve öğretim elemanlarının %88’i periodontal hastalığın tedavisinin hastanın kardiyovasküler hastalık riskini azaltabileceği konusuna katılmakta veya çok güçlü katılmaktadır.

Sonuç: Kardiyologlar ve kardiyovasküler cerrahlar periodontal hastalık ve periodontal hastalığın sistemik sağlık üzerindeki etkisi hakkında yetersiz bilgiye sahiptir. Kardiyolog ve kalp damar cerrahların akademik müfredatlarında ağız diş sağlığı üzerine programlar, periodontal hastalıklar hakkındaki farkındalık ve bilgi seviyesini arttırmak için geliştirilmelidir.

Anahtar kelimeler: Kardiyologlar, kardiyovasküler cerrahlar, cardiovascular diseases, periodontal hastalıklar, ağız sağlığı

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INTRODUCTION

World Health Organization (WHO) reported that cardiovascular diseases remain the leading cause of death worldwide.¹ American Heart Association (AHA) has guessed that every 40 seconds a person will suffer an acute myocardial infarction (AMI) also that almost 695,000 persons will suffer a new acute coronary event and about 325,000 individuals will have a recurrent event.¹

On the other hand, periodontal disease has common inflammatory risk factors and process involving both cells and mediators from innate and adaptive immunity with other systemic and chronic inflammatory disorders.² It involves systemic dissemination of oral bacteria and inflammatory mediators, that are competent for initiation and maintaining mechanisms associated with the development of chronic systemic diseases inflammatory events involving. Periodontal bacteria can invade endothelial cells smooth muscle cells, leukocytes, and platelets and/or indirectly paracrine factor release that eventually affect cell function. In addition to direct invasion, periodontal bacteria can release products and components into the circulation and induce pro-atherogenic responses in endothelial cells.³

In recent years some studies have concluded that periodontal treatment improves impaired endothelial functions along with the improvements observed in the levels of lipids, glycated hemoglobin (HbA1c), and several biomarkers including C-reactive protein and interleukin (IL)- 6; particularly in individuals diagnosed with cardiovascular disease.⁴ Also, there is evidence from studies that periodontal treatment improves blood pressure, endothelial function, lipid profile and glycemic control in individuals with diabetes.^{4, 5} As such, a recent consensus statement suggested that patients with atherosclerotic cardiovascular disease should take a periodontal assessment and patients with moderate to severe periodontitis should be get clued in their potential increased risk of atherosclerosis.⁶ Thus both dental professionals and cardiologist should be aware of uncontrolled diseases or oral adverse drug reactions for patients, and they have an important role to play in oral and systemic disease prevention and treatment.

This study aimed to evaluate the awareness, views, and clinical practices of cardiologists and

cardiovascular surgeons in Turkey on the association between cardiovascular diseases and periodontal diseases. The findings of this study may affect future cooperation between medical and dental physicians and generate discussion on collaborative attempts between these fields of science.

MATERIAL AND METHODS

This is a cross-sectional study conducted using a survey, which was developed determine the level of awareness, views, and clinical practices of cardiologists and cardiovascular surgeons in Turkey about the relationship of periodontal diseases with the diseases of the cardiovascular system. The survey focused on oral health and the systemic wellbeing of an individual. It was developed by modifying a previous survey of Abant İzzet Baysal University in order to find explanations to the study questions currently raised by a referenced publication.⁷ These are a total of 23 questions divided into 3 sections that included information about demographics, oral health status, clinical practice behaviors, and views on periodontal diseases.

One-to-one interviews were made with cardiologists and cardiovascular surgeons in the National Cardiology Congress and their e-mail addresses were obtained after their consent. The selection criteria included cardiologists and cardiovascular surgeons practicing as resident, lecturer or specialist in Turkey. Retired cardiologists and cardiovascular surgeons, pediatric cardiologists, and cardiovascular surgeons or cardiologists and cardiovascular surgeons working abroad were not included in the study.

Our research was conducted in full accordance with the World Medical Association Declaration of Helsinki. The study was approved by the Ethics Committee of the University of Bolu Abant İzzet Baysal (Number: 2018/80). After the ethical approval was granted, a pilot survey was administered to seven specialists in cardiology. According to the results of this pilot administration, some minor modifications were made on the survey. Then, the surveys created with Google Forms and survey emails were sent to the respondents between 2018 May to 2018 November.

Power analysis

When the studies are examined, a power analysis was performed considering the effect of the

their working position on the oral health status and practice behaviors, which is one of the primary outcomes of the study. Considering a similar study,⁷ the sample size was calculated considering Type I errors (0.05), targeted power (0.80), and it is concluded that there should be at least 27 people in each trial group.

Statistical analysis

Data taken from the respondents were entered into an Excel database and were analyzed using SPSS® 18.0 software (SPSS, Chicago, IL, USA). Pearson's Chi-square analyses were performed to assess whether working position was related to cardiologists and cardiovascular surgeons' behaviors or opinions. The Spearman correlation analyses were used to correlate the working position, oral health status and practice behaviors. The results were evaluated at 95% confidence interval, at a significance level of 0.05.

RESULTS

Surveys were mailed to 150 cardiologists and cardiovascular surgeons. The response rate was 66% and the number of completed surveys by the respondents was 99, which were appropriate for conducting the data analysis. Demographic data are reported in Table 1. Eighty percent of respondents were males and 98% were at an age of ≤50 years. Fifty-nine percent of respondents have been working in university and 37% were specialist. Four percent of respondents informed that they spent longer than 20 years in providing care to patients with cardiovascular diseases. Of the respondents, 80% have been working more than 40 hours per week and 4% reported working less than 4 hours per week.

Turkey's cardiologists' and cardiovascular surgeons oral health status and practice behaviors according to their working position is shown in Table 2. Forty-three percent of resident and 43% of specialist reported that they received dental check-up 1 to 2 years ago and 47% of lecturer reported receiving dental check-up within the last year. Thirty-six percent of resident received a periodontal treatment 1 to 2 years ago, 53% of lecturer and 38% of specialist received a periodontal treatment more than two years time ago. Eighty-six percent of resident and 70% of specialist did not refer patients to visit the dentist, although 53% of lecturer referred

Table 1. Demographics of Turkey's cardiologists and cardiovascular surgeons (Respondents)

	n	Percent of respondent (%)
Age (in years)		
25-40	66	66.7
41-50	31	31.3
51-60	2	2
Gender		
Female	20	20.2
Male	79	79.8
Clinical practice setting		
Public hospital	34	34.3
University	58	58.6
Private practice	7	7.1
Working position		
Resident	28	28.3
Lecturer	34	34.3
Specialist	37	37.4
Years treating patients with cardiovascular disease		
<5 years	30	30.3
5 to 10 years	39	39.4
11 to 15 years	18	18.2
16 to 20 years	8	8.1
>20 years	4	4
Weekly working hours		
<20 hours	4	4
21 to 39 hours	12	12.1
>40 hours	83	83.3

Table 2. Turkey's cardiologists' and cardiovascular surgeons oral health status and practice behaviors according to their working position

	Resident n (%)	Lecturer n (%)	Specialist n (%)	P value
Last time received dental check up				
Never	0(0.0)	0(0.0)	2(5.4)	0.316
<1 year	8(28.6)	16(47.1)	13(35.1)	
1 to 2 years	12(42.9)	10(29.4)	16(43.2)	
>2 years	8(28.6)	8(23.5)	6(16.2)	
Last time received a periodontal treatment				
Never	8(28.6)	0(0.0)	4(10.8)	<0.001
<1 year	8(28.6)	12(35.3)	9(24.3)	
1 to 2 years	10(35.7)	4(11.8)	10(27.0)	
>2 years	2(7.1)	18(52.9)	14(37.8)	
How would you grade your oral health?				
Poor	0(0.0)	2(5.9)	2(5.4)	0.136
Fair	12(42.9)	20(58.8)	22(59.5)	
Good	14(50.0)	8(23.5)	13(35.1)	
Very good	2(7.1)	4(11.8)	0(0.0)	
Have you ever been told that you have periodontal disease?				
Yes	8(28.6)	12(35.3)	17(45.9)	0.145
No	12(42.8)	16(47.1)	18(48.6)	
Not remembered	8(28.6)	6(17.6)	2(5.4)	
Have you ever taken education about oral health?				
Yes	10(35.7)	16(47.1)	17(45.9)	0.620
No	18(64.3)	18(52.9)	20(54.1)	
Would you care about oral health of your patients?				
Yes	6(21.4)	14(41.2)	13(35.1)	0.249
No	22(78.6)	20(58.8)	24(64.9)	
Would you take anamnesis about oral health?				
Yes	4(14.3)	10(29.4)	9(24.3)	0.366
No	24(85.7)	24(70.6)	28(75.7)	
Would you advise your patients to visit the dentist?				
Yes	4(14.3)	18(52.9)	11(29.7)	0.005
No	24(85.7)	16(47.1)	26(70.3)	



Table 3. Opinions About Periodontal Disease and Systemic Health

	Resident n (%)	Lecturer n (%)	Specialist n (%)	<i>p</i> <i>value</i>
Inflammation is an important component between periodontal disease and cardiovascular disease.				
Disagree	0	0	2(5.4)	0.064
Agree	16(57.1)	26(76.5)	25(67.6)	
Strongly Agree	2(7.1)	4(11.8)	6(16.2)	
Unsure/Don't know	10(35.7)	4(11.8)	4(10.8)	
Good oral health is essential to the rest of the body.				
Disagree	0	0	0	0.154
Agree	22(78.6)	20(58.8)	18(48.6)	
Strongly Agree	6(21.4)	12(35.3)	17(45.9)	
Unsure/Don't know	0	2(5.9)	2(5.4)	
I am knowledgeable relating to the studies linking periodontal disease and cardiovascular disease.				
Disagree	0(0.0)	0	2(5.4)	0.022
Agree	10(35.7)	18(52.9)	18(48.6)	
Strongly Agree	0(0.0)	4(11.8)	0(0.0)	
Unsure/Don't know	18(64.3)	12(35.3)	17(45.9)	
Patients with periodontal disease are more likely to have increased atherosclerosis and risk for myocardial infarction and stroke, even after adjusting for traditional cardiovascular disease risk factors				
Disagree	0	0	0	0.753
Agree	16(57.1)	18(52.9)	18(48.6)	
Strongly Agree	0	2(5.9)	2(5.4)	
Unsure/Don't know	12(42.9)	14(41.2)	17(45.9)	
Taking control of infection and inflammation is important for managing cardiovascular disease.				
Disagree	0	0	2(5.4)	0.320
Agree	18(64.3)	16(47.1)	23(62.2)	
Strongly Agree	8(28.6)	12(35.3)	8(21.6)	
Unsure/Don't know	2(7.1)	6(17.6)	4(10.8)	
Patients diagnosed with cardiovascular disease are more likely to tend periodontal disease.				
Disagree	2(7.1)	2(5.9)	2(5.4)	0.012
Agree	16(57.1)	8(23.5)	12(32.4)	
Strongly Agree	0	8(23.5)	2(5.4)	
Unsure/Don't know	10(35.7)	16(47.1)	21(56.8)	
Treatment of periodontal disease can decrease a patient's risk for cardiovascular disease.				
Disagree	2(7.1)	0	2(5.4)	0.015
Agree	20(71.4)	14(41.2)	20(54.1)	
Strongly Agree	0	8(23.5)	2(5.4)	
Unsure/Don't know	6(21.4)	12(35.3)	13(35.1)	
I am interested in learning more about the association between cardiovascular disease and periodontal disease.				
Disagree	0	0	4(10.8)	0.005
Agree	24(85.7)	18(52.9)	23(62.2)	
Strongly Agree	4(14.3)	14(41.2)	6(16.2)	
Unsure/Don't know	0	2(5.9)	4(10.8)	
It is important for cardiologists/cardiovascular surgeons and periodontists to work together to educate their patients on these diseases.				
Disagree	0	0	2(5.4)	0.433
Agree	18(64.3)	22(64.7)	23(62.2)	
Strongly Agree	8(28.6)	10(29.4)	12(32.4)	
Unsure/Don't know	2(7.1)	2(5.9)	0	

patients to visit the dentist. Respondents' opinions about periodontal disease and systemic health is reported in Table 3. The majority percent of

cardiologists for all groups concurred or strongly concurred with the idea that inflammation is an important common factor shared by both periodontal diseases and cardiovascular diseases but this difference was not statistically significant between groups, and also 85.8% of cardiologists were of the opinion that elimination of the infection or inflammation was essential in approaching the diseases of the cardiovascular system. In regards to the awareness levels of the respondents about the studies investigating the relationship of periodontal diseases with the cardiovascular diseases; the 64% of residents were unsure, 53% of lecturers were agreed and half of the specialist were disagreed or unsure. This difference was statistically significant between groups ($p=0.022$). When asked if patients suffering from cardiovascular diseases had a higher possibility for being diagnosed with periodontal diseases, 57% of residents and 46% of lecturers were agreed or strongly agreed but 63% of specialist were unsure or disagreed ($p=0.012$). The seventy-one percent of residents and 65% of lecturers were agreed or strongly agreed with the information that treating periodontal diseases would lower the risk of an individual to develop a disease involving the cardiovascular system, although 40% of specialist were unsure or disagreed ($p=0.015$). 85.7% of cardiologists for all groups were significantly willing to receive more information on the association of periodontal diseases with the diseases of the cardiovascular system ($p=0.005$).

DISCUSSION

According to our results, cardiologists and cardiovascular surgeons had a lack of knowledge of the periodontal disease and its impact on systemic health. As far as we observed that there were no previous studies evaluation of knowledge, opinions, and practice behaviors of Turkey population. As a result of the association between periodontal disease and cardiovascular diseases and the rising numbers of patients diagnosed with cardiovascular diseases, it is important to know about the oral health information patients with cardiovascular diseases.

The concept of "periodontal medicine" refers to a new field of research that may have an important effect on dentistry because it emerged to address dental health and its relation to systemic diseases. It is depended on the emerging data that suggests that



periodontal disease provides the morbidity and mortality of individuals with systemic diseases such as premature birth, low birth weight, diabetes mellitus, Alzheimer's disease and cardiovascular problems like atherosclerosis and myocardial infarction.^{8, 9} Dentists are trained about the oral-systemic relationship during their professional education.^{10, 11} What is less clear is how medical providers are educated about oral-systemic research relating to periodontal diseases and systemic complications. According to the results of our study, when we asked respondents whether they received oral health education, despite the absence of statistically significant differences between the groups, it was seen that more than half of all groups did not receive oral health education. There is an association between periodontal disease and cardiovascular disease, although little is known between medical providers about the link because of lack of oral health education. Like our study, Mosley et al reported that major percent of North Carolina Cardiologists did not receive any education on oral health care.⁷ We suggest that oral health education in medical school and the medical post-graduate setting is essential, and projects and teamwork in collaboration with dentistry may increase knowledge and awareness.

When the demographic data of our study is examined, it is seen that the majority of the respondents' who participated in the study are young adult and male. More than half of the participants take part in university hospitals. There are very few volunteers in working life for more than 20 years. However, it was observed that the participants worked very long hours a week. When we asked our participants whether they took their anamnesis about their patients' health, recommended that they go to the dentist and care about the oral health of their patients, a high rate of 'no' answer was given. Although, Mosley et al demonstrated that 78% of North Carolina Cardiologists ask for a consultation from dental clinics for their patients and 85% percent of respondents informed that they underwent dental treatments last year.⁷ Due to the long and tiring working hours, we think that our participants are not able to spend time on these issues. At the same time, it is seen that the participants disrupted their oral health controls.

Physicians are helpful in preventing oral disease, however knowledge and skill to do it may be lack. In our study, it was observed that the residents and lecturers know better the relationship between

periodontal and cardiovascular diseases. Also, it was seen that the group of lecturers have more information about the studies related to periodontal and cardiovascular diseases compared to other groups. We think that the participants closely follow the studies as they work as lecturers in universities. Periodontal disease status, periodontal disease information and the opinions of physicians in different branches were questioned in many studies. It was found that majority of the physicians had inadequate knowledge regarding periodontal diseases¹²⁻¹⁵, and major percent of the physicians reported that they had no training in medical school or residency regarding oral health.^{14, 16} A common finding between studies is that the surveyed physicians have a generally positive opinion about learning more about oral conditions and their relationship to systemic health.^{17, 18} Physicians explained that generally they did not perform an oral examination and refer patients to the dentists.¹⁹ It was seen that the knowledge and training physicians have in connection with the oral cavity is limited. They claim that most physicians consider having an important role to prevent oral disease.

In our study results, it was seen that our participants had a high level of knowledge about the periodontal disease and cardiovascular disease in all groups. Also in Turkey, Şenol et al²⁰ found the similar results about physicians' awareness to our study. Our participants want to learn more about the relationship between these two diseases, and with this cooperation, they care about the awareness of the patients. Similar to our study, Mosley et al⁷ found that the majority of cardiologists were more likely to acquire further information on the relationship of periodontal diseases with the diseases of the cardiovascular system. In studies conducted on different health groups, it is seen that healthcare professionals do not know exactly the relationship between systemic and periodontal diseases. They agreed that literature shows a potential link between systemic diseases and periodontal diseases, however, many of them indicated they do not have sufficient knowledge about these studies. The majority indicated they would appreciate continuing education courses explaining how to educate their patients and when to refer to a dental Professional.²¹⁻²⁴ Overall, it has been found that dentists are more likely to assess for risks and to discuss systemic health issues with their patients and that they are less likely to actively manage their patients.²⁵⁻²⁷



The relationship of oral health status with systemic diseases have been established in several publications in the literature, therefore, the oral health condition of the patients should not be overlooked in the clinical practice. As the level of physician awareness is increased in regards to the potential consequences of impaired oral wellbeing on the development of systemic disorders, health care providers will increasingly attempt more to inform their patients about the bidirectional effects of systemic diseases and periodontal diseases. In the present study, major percent of Turkey cardiologist and cardiovascular surgeons had the opinion that they should work with dentists and healthcare professionals in dentistry to raise the awareness of patients. We propose that increasing the availability of education programs and the number of sessions on oral health in academic curricula of cardiologists and cardiovascular surgeons would leverage the level of awareness and knowledge on periodontal diseases and their potentially adverse effects on the systemic wellbeing of individuals. In addition, we strongly promote increased collaboration between cardiologists, cardiovascular surgeons, and healthcare providers in the field of dentistry to collaborate more so that more comprehensive modes of treatment approaches would be provided for their patients with heart diseases.

Because of the increasing numbers of patients with cardiovascular diseases and the prevalence of periodontal disease, we think that this report is very timely. Both cardiovascular and periodontal diseases have been a primary focus of medical and dental investigations and will continue to increase in the coming years. We hope that cardiologist and dental professionals alike will work together to help their patients with cardiovascular diseases. Patients must be educated for the prevention of disease and the association between oral disease and systemic health. An increased awareness of certain aspects of the relationship between periodontal disease and systemic conditions is vital, and patients should be counseled about this link at each health care contact they have, whether it is with a dentist, a physician, or any other health care provider. Continuing training for medical and dental professionals about the oral health-systemic health relationship is important, and optimizing communication and collaboration between them will be healthful for patients.

Our study has a few limitations requiring a discussion. A sufficient rate of response should be

achieved in surveys so that nonresponse bias would be decreased. Although we had initially estimated a higher response rate initially, we considered the achieved response rate of 66% appropriate enough to allow for making an evaluation on the knowledge levels and clinical practices of cardiologists and cardiovascular surgeons regarding periodontal disease and adverse cardiovascular diseases effects. Factors affecting response rates may be the length of questionnaire and the available time to complete it. It is important to indicate that a sample such as this group may not be representative of the cardiologist and cardiovascular surgeons providers everywhere, thus limiting the external validity. Nonresponse bias is taken into a consideration in research. It can be used with more extensive criteria in the wider population.

CONCLUSIONS

In our study, Turkey cardiologists and cardiovascular surgeons demonstrated a low level of knowledge about the relationship of periodontal diseases with the diseases of the cardiovascular system, but they were willing to learn. In the future, policies can be enhanced that develop the relation of good oral health care practices between all health care providers. Formal education strategies will be needed in medical and dental schools regarding the relationship between oral health and systemic health for practitioners to be capable of fully understand the health consequences of an untreated oral infection. In addition, a higher level of education will be needed for all health workers. Developed communication between dental and medical professionals will become critical as increased knowledge is gained in this important area of health care. As well, studies are needed in effective ways to include important science in clinical practice to benefit the health of all patients.

NOT: Çalışmada herhangi bir yazar, kurum ya da kuruluş ile çıkar çatışması içerisinde bulunmamaktadır. Makale daha önce hiçbir yerde yayınlanmamış ve yayınlanmak üzere işlem görmemektedir

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