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Nikolaos Andreas Chrysanthakopoulos[1], Panagiotis Andreas Chrysanthakopoulos[2]

Ispitivanje odnosa indeksa parodontne bolesti kod pacijenata sa sistemskim bolestima

Examination of the Relation Between Periodontal Disease Indices in Patients with Systemic Diseases

[1] Odjel maksilofacijalne i oralne kirurgije Opće vojne bolnice u Ateni, Grčka
Resident in Maxillofacial and Oral Surgery, 401 General Military Hospital of Athens, Athens, Greece
[2] Pukovnik, neurokirurg i ravnatelj Neurokirurškog odjela Opće vojne bolnice u Ateni, Grčka
Director of Neurosurgery Department, 417 Military Hospital of Athens, Athens, Greece

Sažetak
Svrha: Željelo se ispitati koliki je indeks parodontne bolesti kod pacijenata upućenih na Odjel neurokirurgije te njegova povezanost s češćim sistemskim bolestima među odraslim vanjskim pacijentima u Grčkoj. **Materijal i metode:** Analizirana populacija sastojala se od 728 vanjskih pacijenata – 340 muškaraca i 388 žena u dobi od 40 do 70 godina. Svi su klinički pregledani i ispunili su zdravstveni upitnik. Ti su podatci raščlanjeni višestrukom logističkom regresijskom analizom za procjenu mogućih poveznica između sistemskih bolesti kao neovisnih varijabli, a kao poveznica ovisnih varijabli analizirani su parodontni džepovi od pet milimetara i više, blagi do umjereni gubitak kliničkog pričvrstka, krvarenje ili nekrvarenje nakon sondiranja te vidljive zubne naslage. **Rezultati:** Dubina parodontnih džepova bila je značajno i pozitivno povezana s respiratornim alergijama (P<0,001) i šećernom bolešću (P<0,001), te reumatoidnim artritisom (P=0,048). Krvarenje nakon sondiranja također je bilo povezano s respiratornim alergijama (P=0,009), kardiovaskularnim bolestima (P<0,001) i dijabetesom (P<0,001), a značajno negativno s hipertenzijom (P<0,001). Zubne naslage bile su pozitivno povezane s reumatoidnim artritisom (P=0,048). **Zaključak:** Pronađena je velika povezanost indeksa parodontnih bolesti, poput dubine sondiranja, gubitka kliničkog pričvrstka te zubnih naslaga i sistemskih bolesti, poput kardiovaskularnih i respiratornih, dijabetesa i reumatoidnog artritisa.

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Adresa za dopisivanje
Dr. Nikolaos Andreas
Chrysanthakopoulos
35, Zaimi Street, PC 26 223
Patra, Greece
tel./faks: 0030 – 2610 – 225288
nikolaos_c@hotmail.com

Ključne riječi
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Uvod

U mnogim dosadašnjim istraživanjima proučavala se moguća uloga parodontnih bolesti kao uzročnih rizičnih čimbenika sistemskih bolesti ili poremećaja, uključujući kardiovaskularne i respiratorne bolesti, hipertenziju, šećernu bolest, reumatoidni artritis, respiratorne alergije, endokrine poremećaje, neželjene ishode trudnoća, osteoporozu, Sjoergenov sindrom, gojaznost i menopauzu (1-7). Fowler i njegovi suradnici (8) ustanovili su da odnos između nekih nabrojenih entiteta može biti dvostran te da parodontna bolest uključuje i lokalni i sistemski upalni odgovor domaćina. U dosadašnjim istraživanjima istaknuta je velika povezanost između indeksa parodontnih bolesti i kardiovaskularnih bolesti, posebice ateroskleroze, koronarnih bolesti srca i srčanog udara (4,9-16), a u samo nekoliko studija nije istaknuta povezanost između tih patoloških stanja (17,18). Povezanost između indeksa parodontnih bolesti i dijabetesa potvrđena je u prijašnjim istraživanjima (1,2,4,8,15-17,19-25) te se smatra obostranom – diabetes mellitus rizičan je čimbenik za parodontitis, a parodontitis je mogući uzrok dijabetesa (4,26).

Introduction

Many previous studies investigated a possible role for periodontal disease as a causative or risk factor for systemic diseases or disorders including cardiovascular disease, respiratory diseases, hypertension, diabetes mellitus, rheumatoid arthritis, respiratory allergy, endocrine disorders, adverse pregnancy outcomes, osteoporosis, Sjögren's syndrome, obesity and menopause (1-7). Fowler et al. (8) found that the relationship between some of these entities may be bidirectional and that periodontal disease involves both a local and a systemic host inflammatory response. A significant association between periodontal disease indices and presence of cardiovascular diseases, mainly atherosclerosis, coronary heart disease and stroke has been reported in earlier studies (4,9-16) while few studies have shown no associations between these pathological conditions (17,18). Associations between periodontal disease indices and the presence of diabetes mellitus has also been recorded in previous reports (1,2,4,8,15-17, 19-25) and this association is considered to be bidirectional: diabetes as a risk factor for periodontitis and periodontitis as a possible factor for diabetes (4,26).

U ostalim epidemiološkim izvještajima istaknuta je pozitivna korelacija između indeksa parodontne bolesti i rizika od respiratornih bolesti, uglavnom kronične opstruktivne pulpmonalne bolesti, iako je u istraživanjima ta povezanost čudna, pa čak i kontradiktorna. U nekima od spomenutih istraživanja, temeljenih na indeksima parodontne bolesti, istaknuto je da je parodontna bolest mogući rizični čimbenik za kroničnu opstruktivnu pulmonalnu bolest (16,25-27), premda nije jasno postoji li jasna uzročno-posljedična veza. Pronađena je velika povezanost između indeksa parodontne bolesti i reumatoidnog artritisa (16,30-33), respiratornih alergija (16,34,35), Sjoergenova sindroma (5), gojaznosti (6), menopauze (7) i neželjenih prekida trudnoća (3). U nekoliko istraživanja proučavala se moguća povezanost između kronične upale, poput upale parodonta i njezinih indeksa te hipertenzije, ali rezultati su nekonzistentni, što pokazuje da su potrebna daljnja istraživanja (15,36-39). Raspon istraživanja o mogućim poveznicama parodontne i sistemskih bolesti kreće se u velikim varijacijama, kako u načinu i metodama mjerenja stanja parodontnog zdravlja, tako i u postupku bilježenja medicinskih podataka. Oralno zdravlje procjenjivalo se kliničkim i radiografskim varijablama, kao i različiti indeksi (dubina sondiranja, gubitak kliničkog pričvrstka, krvarenje poslije sondiranja itd.). Visina alveolarne kosti (40), broj zuba koji nedostaju (31), dubina sondiranja džepa (10, 15,16,31,41) i gubitak kliničkog pričvrstka (10,16,31,34) samo su neki od indeksa korištenih za bilježenje prevalencije i težine parodontne bolesti. Glavni razlozi za nekonzistenciju u nalazima jesu različite metode i indeksi za procjenu ili definiranje parodontne bolesti. Moramo istaknuti da nema jedinstvenog kriterija za definiranje te bolesti ili načina kako se mjeri njezina jakost (42). Neka istraživanja oslanjaju se na sondiranje dubine džepova za definiranje parodontne bolesti u kombinaciji s gingivnim krvarenjem i zubnim naslagama, a drugi se koriste razinom kliničkog pričvrstka ili njegovim gubitkom kao osnovom za definiciju, ili pak kombinacijom dubine sondiranja džepova i gubitka kliničkog pričvrstka. Recimo također da se u većini istraživanja razlikuju razine označavanja krvarenja nakon sondiranja, sondiranje dubine džepova i klinički gubitak pričvrstka kao biljega parodontne bolesti. Medicinski podatci ispitanika dobiveni su tijekom kliničkog pregleda, iz ispunjenog upitnika (15,16,40,41), medicinske dokumentacije (41) i kombinacije navedenoga. U izvještajima se razlikuje raspodjela pojedinaca prema dobi i smatra se da uznapredovala dob parodontnih pacijenata itekako korelira s prevalencijom sistemskih poremećaja (10,34-36,41,43).

Svrha ovog istraživanja bila je proučiti koliko su česte sistemske bolesti kod vanjskih pacijenata upućenih u specijalističku kliniku, te kod odrasle grčke populacije istražiti moguće odnose između indeksa parodontne bolesti i sistemskih poremećaja.

Other epidemiological reports have found a positive association between periodontal disease indices and risk of respiratory diseases, mainly chronic obstructive pulmonary disease, however this association is varied and even contradictory among studies. Some of the mentioned studies, based on periodontal disease indices, observed that periodontal disease was considered a possible risk factor for chronic obstructive pulmonary disease (16,25-27) however, whether a causal relationship exists remains unclear. Significant associations have also been reported between periodontal disease indices and rheumatoid arthritis (16,30-33), respiratory allergy (16, 34,35), Sjögren's syndrome (5), obesity (6), menopause (7) and adverse pregnancy outcomes (3). Few studies investigated the possible link between chronic inflammation, such as periodontal inflammation and its disease indices and hypertension, producing inconsistent results and emphasizing the need for further research (15,36-39). The spectrum of the reports that investigate the possible association between periodontal disease and systemic diseases show extensive variations in design and methods of measurement of periodontal health status, and procedures of recording medical health data. Oral health status has been evaluated by using clinical and radiographic variables as well as different indices (probing pocket depth, clinical attachment loss, bleeding on probing, etc.). The alveolar bone height (40), number of missing teeth (31), oral hygiene (31), probing pocket depth (10,15,16,31, 41) and clinical attachment loss (10,16,31,34) are some of the indices that were used for recording of the prevalence and severity of periodontal disease. On the other hand, the major issues that have been deemed responsible for the inconsistency of the findings are the different methods and indices used to assess or define periodontal disease. This is mainly due to the fact that there is no uniform criteria to define periodontal disease, or to measure the extent and severity of it (42). Some investigations rely on probing pocket depth to define periodontal disease in combination with gingival bleeding scores and plaque scores in some of the cases,while others use clinical attachment level or loss as the basis for their definition, or choose a combination of probing pocket depth and clinical attachment loss. Moreover, it is worth mentioning that the definition thresholds used for bleeding on probing, probing pocket depth and clinical attachment loss as markers of periodontal disease are also different in most studies. Medical health data have been collected from clinical examinations by physicians and self-reported questionnaires (15, 16,40,41), medical records (41), as well as combinations of these. The age distributions of the individuals vary in different reports, and an advancing age of periodontal patients has been found to be significantly correlated to the prevalence of systemic disorders (10,34-36,41,43).

The aim of the current study was to investigate the occurrence of systemic diseases in out-patients referred to a specialist clinic and to explore possible relationships between periodontal disease indices and systemic disorders in an adult population of out-patients in Greece.

Ispitanici i postupci

U istraživanju je sudjelovalo 728 pojedinaca – 340 muškaraca i 388 žena u dobi od 40 do 70 godina. Svi su bili vanjski pacijenti *Klinike za neurokirurgiju 417 Glavne vojne bolnice u Ateni (General Military Hospital of Athens – N. I. M. T. S.).* Navedena bolnica, osim vojnom osoblju, pruža medicinske usluge i ostalim stanovnicima. Svi sudionici bili su na oralnom kliničkom pregledu i ispunili su zdravstveni upitnik. Istraživanje je provedeno između lipnja i prosinca 2012.

Kriteriji za odabir sudionika bili su dob od 40 do 70 godina i najmanje 20 zuba, jer prevelik manjak može pridonijeti precjenjivanju ili podcjenjivanju parodontnih varijabli i mogućih povezanosti s proučavanim varijablama.

Zbog dijagnoze kardiovaskularnih bolesti nisu dolazili u obzir vanjski pacijenti koji su patili od srčanih tegoba. Kako bi se izbjegli potencijalni dodatni utjecaji na potrebne parametre, iz istraživanja su bili isključeni vanjski pacijenti s malignim bolestima i akutnom infekcijom te oni pod terapijom glukokortikoidima. Iz istog razloga odbijena je suradnja pacijenata podvrgnutih parodontološkoj terapiji uklanjanja tvrdih i mekih naslaga u posljednjih šest mjeseci ili ako im je unutar šest tjedana propisan sistemski antibiotik ili protuupalni lijek.

Ti kriteriji primijenjeni su zbog mogućeg utjecaja na oralno tkivo. Treći kutnjaci i zaostali korijeni također su isključeni iz istraživanja.

Klinički pregled

Oralni klinički pregled obavljen je u Klinici za neurokirurgiju atenske bolnice, a pritom se rabio standardni krevet i osvjetljenje pogodno za pregled usne šupljine. Sudionike je pregledao iskusan doktor dentalne medicine.

Klinička mjerenja sastojala su se od sljedećih varijabli:

– sondiranja dubine sulkusa/džepa i mjerenja kliničkog pričvrstka Williamsovom sondom PCP 12 (PCP 10 – SE, Hu – Friedy Mfg. Co. Inc., Chicago, IL, SAD) na šest mjesta na zubu (disto-vestibularno, vestibularno, mezio-vestibularno, disto-oralno, oralno i mezio-oralno) na svima, osim na umnjacima i zaostalim korijenima; bilježile su se dubine sondiranja (zaokružene na najbliži cijeli milimetar) ≤ 5,00 milimetara te dublje od >5 milimetara (44); mjerenja su se zaokruživala na cijeli broj, primjerice 3,5 zaokružen je na 4,0, a 5,3 na 5,0 milimetara;
– gubitak kliničkog pričvrstka mjeren je kao udaljenost između cementno-caklinske granice i najapikalnijeg dijela do kojega sonda može dosegnuti; težina gubitka kliničkoga pričvrstka klasificirana je prema uputama Američke akademije za parodontologiju (American Academy of Periodontology) (45) kao blag (1 – 2,00 mm), umjeren (3 – 4,00 mm) i velik (5,00 mm);
– krvarenje iz sulkusa nakon sondiranja bilježilo se kao krvarenje ili nekrvarenje nakon sondiranja dna džepa na šest površina zuba (46);

Material and methods

The study population comprised 728 individuals, 340 males and 388 females, 40 to 70 years of age. All the participants were out-patients of a neurosurgery clinic of "417-General Military Hospital of Athens – N.I.M.T.S". The mentioned hospital provides medical services to the whole population, military personnel was included as well. All the out-patients underwent an oral clinical examination and completed a health administered questionnaire. The investigation was carried out between June to December 2012.

The selection criteria of the participants comprised age from 40 to 70 years old and a mean of 20 natural teeth, since large numbers of missing teeth could lead to over- or underestimation of the periodontal variables and the possible associations that are under consideration.

The diagnosis of cardiovascular disease included out-patients who suffer from medical conditions such as atherosclerosis coronary heart disease, and stroke. To avoid, as much as possible, potential confounding influences on the study parameters, out-patients with diseases such as malignant diseases, acute infections, and concurrent medication with general glucocorticoids, were also excluded from the study. For the same reason, out-patients who had received scaling and root planing procedures or periodontal treatment during the previous six months or received prescription of systemic antibiotics or anti-inflammatory drugs within the previous six weeks.

These criteria were applied because of potential effects on the oral tissues. The third molars and remaining roots were also excluded from the study.

Clinical examination

The oral clinical examinations were performed at the neurosurgery clinic of the mentioned military hospital, using a conventional examination bed and illumination coming from a digital lens suitable for oral cavity examination by otolaryngologists. One well-trained and calibrated dentist performed the oral examinations.

The clinical measurements concerned the following variables:

- on each tooth probing pocket depth and clinical attachment loss measured by a William's PCP 12 probe (PCP 10-SE, Hu-Friedy Mfg. Co. Inc., Chicago, IL, USA) at six sites per tooth (disto-facial, facial, mesio-facial, disto-lingual, lingual and mesio-lingual) of all teeth except for the 3rd molars and the remaining roots. Pockets were recorded if they were ≤ 5.00 mm or deeper (>5.00 mm) (44) and the probing depths are recorded to the nearest full millimetre. Round measurements to the next higher whole number; for example a reading of 3.5 mm is recorded as 4.0 mm and a 5.3 mm reading is recorded as 5.0 mm.

Clinical attachment loss was recorded as the distance between the cement-enamel junction and the most apical portion of the probe can reach. The severity of clinical attachment loss was classified according to the American Academy of Periodontology (45) as mild (1-2.00 mm), moderate (3-4.00 mm) and severe (5.00 mm). Bleeding on probing was

– zubne naslage smatrale su se prisutnošću/odsutnošću vidljivih naslaga na gingivnom rubu šest površina svakog zuba s odgovarajućim skorom 2 i 3 za indeks u sustavu naslaga prema Silnessu i Löeu (47).

Ako je cementno-caklinski spoj bio prekriven kamencem, skriven ispunom ili izgubljen zbog karijesa, njegova je lokalizacija procijenjena na temelju susjednog zuba.

recorded as the presence or absence of bleeding following probing at the bottom of the pocket at six surfaces per tooth (46). Dental plaque was recorded as the presence/absence of visible plaque at the gingival margin on six surfaces on each tooth corresponding to scores 2 and 3 of the plaque index system of Silness and Löe (47).

In cases in which the cement-enamel junction was covered by calculus, hidden by a restoration or loss due to caries or wear lesion, the location of such junction was estimated on the basis of the adjacent teeth.

Upitnik

Nakon kliničkog pregleda svi su vanjski pacijenti ispunili upitnik s pitanjima o dobi, spolu te pušačkom statusu (aktivni pušač/nepušač), a tražili su se i podatci o općoj medicinskoj anamnezi s naglaskom na korištenju lijekova i težim sistemskim poremećajima ili bolestima.

U kronične poremećaje bili su uključeni: respiratorne alergije, kardiovaskularne i respiratorne bolesti, hipertenzija, reumatoidni artritis, diabetes mellitus i ostale endokrine bolesti. Osnovno pitanje bilo je: *Je li vam liječnik bilo kada dijagnosticirao neko od patoloških stanja*?

Ako se ispitanici nisu mogli sjetiti detalja iz anamneze o traženim varijablama, dodatni podatci izvađeni su iz njihova osobnog medicinskog kartona.

Questionnaire

After the oral clinical examination, all out-patients filled in a self-administered questionnaire that included variables such as age, gender, smoking status (active smokers/no-smokers) and data regarding the general medical history of them with reference to medication and several chronic systemic disorders or diseases.

Chronic disorders included respiratory allergy, cardiovascular disease, rheumatoid arthritis, diabetes mellitus, other endocrine diseases, hypertension and respiratory diseases. The basic question was: "Have you ever had–*the term of the pathological condition* – diagnosed by a medical doctor?"

In cases where the participants could not remember details of their medical history concerned the mentioned variables, the additional data was collected from their own personal medical file.

Reproducibilnost

Nasumice odabran uzorak od 72 (10 %) vanjska pacijenta ponovno je pregledao isti liječnik dentalne medicine kako bi odredio istraživačku varijancu. Nakon uspoređivanja dobivenih podataka iz oba pregleda, nije pronađena razlika u kliničkoj procjeni *(Kappa Cohen's= 0,93)* .

Reproducibility

A randomly chosen sample of 72 (10%) outpatients was re-examined clinically by the same dentist in order to establish the intra-examiner variance. After consideration of the code numbers of the double examined individuals no differences were recorded between the 1st and the 2nd clinical assessment *(Kappa Cohen's= 0.93)* .

Etička pitanja

Istraživanje nije bilo eksperimentalno. Naime, u Grčkoj mjerodavni odbori moraju odobriti samo takva istraživanja (stomatološki fakulteti, Grčka dentalna udruga, Ministarstvo zdravlja i sl.). Pojedinci koji su pristali sudjelovati u istraživanju bili su obaviješteni o procjenama koje se traže, a potpisali su i pristanak.

Ethical considerations

The present study was not an experimental one. In Greece only experimental studies must be reviewed and approved by authorized committees (Dental Schools, Greek Dental Associations, Ministry of Health, etc.) Subjects who agreed to participate in the present study were informed about the evaluation to which they would be submitted and signed an informed consent form.

Statistička analiza

Kod svakoga pojedinca za šest točaka na zubu zabilježena je najveća dubina sondiranja, najveći gubitak kliničkog pričvrstka, krvari li nakon sondiranja te ima li zubne naslage na istim mjestima.

Za analizu varijable dubine sondiranja označene su nulom za pojedince kod kojih je dubina iznosila ≤ 5,00 mm, a jedinicom za one za većom dubinom (> 5,00 mm). Razina kliničkog pričvrstka označavana je nulom za pojedince s blagim do umjerenim gubitkom, a jedinicom za one s velikim gubitkom kliničkog pričvrstka. Ako nije bilo krvarenja nakon sondiranja, to se označavalo nulom, a ako jest - jedinicom. Pušački status imao je oznaku nula za nepušače i bivše pušače, a jedinicu za pušače. Muški spol kodiran je jedi-

Statistical analysis

For each individual the worst values of probing pocket depth at the six sites per tooth, the most severe value of clinical attachment loss at the six sites per tooth, bleeding on probing and dental plaque that concerned the same sites were recorded.

In the analyses, the variable probing pocket depth was recorded 0 for individuals if they showed periodontal pockets ≤ 5.00 mm and 1 for deeper (> 5.00 mm). Clinical attachment loss was recorded 0 for individuals with mild/moderate and 1 for individuals with severe clinical attachment loss. The absence of bleeding on probing and dental plaque was recorded 0 and the presence 1, respectively. Smoking status was coded 0 for non-smokers or former smokers and 1 for current

nicom, ženski nulom. Samo navedene bolesti zabilježene su kao binarne varijable (0: nema bolesti; 1: bolest je navedena).

Prva bivarijantna analiza prema spolu, pušačkom statusu i sistemskim bolestima korištena je za testiranje odnosa između dubine sondiranja/kliničkog pričvrstka/krvarenja nakon sondiranja/zubnim naslagama i proučavanim varijablama. Zato je kriterij za neovisne uzorke postavljen na 0,25. Omjer vjerojatnosti dodatno je postavljen na granice pouzdanosti od 95 posto (CI) te se rabio u procjeni bivarijantnog odnosa među procijenjenim varijantama.

Obavljena je i višestruka logistička regresijska analiza za procjenu odnosa među ovisnim varijablama, dubini sondiranja/kliničkog pričvrstka/krvarenja nakon sondiranja/zubnim naslagama te su određene neovisne varijable za ulaznu metodu (metoda 1.) u statistički paket, osim za neovisne varijable sa znatnom povezanošću unutar skupine manje od pet posto (p<0,05).

Dodatno je izračunata djelomična povezanost između proučavanih varijabli i korigiranog odnosa vjerojatnosti s granicama pouzdanosti od 95 posto (CI). Konačno su sve neovisne varijable uključene u višestruki logistički regresijski model te u Waldovu metodu analize (model 2.) kako bi se obavile postupne procjene varijabli koje su pokazale značajnu povezanost s ovisnim varijablama.

Podatci su analizirani statističkim paketom SPSS ver. 17,0 (SPSS Inc., Chicago, IL, SAD). Vrijednosti p manje od pet posto (p<0,05) smatrale su se statistički značajnima.

Rezultati

Za sudjelovanje u istraživanju pozvana su 863 vanjska pacijenta. No njih 22 nisu imala prebivalište u Ateni, pa nisu mogli sudjelovati. Dakle, ostao je 841 ispitanik, ali njih 75 nije zadovoljilo kriterije jer im je nedostajalo više od 20 zuba, ili im je bio za dulje razdoblje propisan antibiotik ili protuupalni lijek. Njih 38 odbilo je suradnju. Konačna veličina ispitivanog uzorka sastojala se od 728 pacijenata, znači da je stupanj odziva bio 84,3 posto. Srednja dob iznosila je 58,3 ± 2,4 posto, njih 36,7 posto izjavilo je da su pušači, a preostalih 62,3 napisalo je da ne puše. Relativna frekvencija pušača kod muškaraca bila je 35 posto, a kod žena 38,1 posto. U tablici 1. navedene su sistemske bolesti koje su naveli vanjski pacijenti. Najčešća je bila hipertenzija (36,1 %), a slijede respiratorne bolesti (36,0 %). Najnižu frekvenciju imao je reumatoidni artritis (10,2 %). Kardiovaskularne bolesti (38,5 %) i hipertenzija (35 %) bile su češće kod muškaraca, a kod žena respiratorne bolesti (39,2 %) i hipertenzija (37,1 %).

Ostali endokrini poremećaji uključivali su hipotiroidizam (53,3 %), hipertiroidizam (18,9 %) i osteoporozu (27,8 %). Bivarijantna analiza pokazala je da su proučavani parodontni parametri povezani s navedenim sistemskim bolestima kada se testiraju zajedno sa spolom i pušenjem kao usporedne varijable, osim dubine sondiranja i respiratorne alergije (tablica 2). Bivarijantne korelacije između proučavanih varismokers. Gender was coded 0 for female and 1 for male. All self-reported diseases were coded as dichotomous variables (0: no disease, 1: self-reported disease).

First, bivariate analysis was used to test the relationship between probing pocket depth/clinical attachment loss/bleeding on probing/dental plaque and the examined variables, gender, smoking status and systemic diseases. Thereby, the criterion for the independent variables to enter the model was set at 0.25.

In addition, odds ratios with 95% confidence interval (CI) were used to assess the bivariate relationships among the examined variables. Multiple logistic regression analysis was performed to model the associations between dependent variables, probing pocket depth/clinical attachment loss/bleeding on probing/dental plaque and independent variables were determined by the enter method(model 1) of the statistical package except for the independent variables that showed significant associations less than 5% (p<0.05) within that group.

In addition, partial correlations between investigated variables and adjusted odds ratios with 95% confidence interval (CI) were calculated. Finally, all the independent variables included to multiple logistic regression model and the Wald method analysis (model 2) was carried out to estimate gradually the variables that showed significant associations with the dependent ones.

The data analysis was performed using the statistical package of SPSS ver.17.0 (SPSS Inc., Chicago, IL, USA). A p value less than 5% (p<0.05) was considered to be statistically significant.

Results

The invitation to participate in the current study was addressed to 863 out-patients. 22 of them were not permanent inhabitants of Athens and excluded from the study sample. Thus, 841 out-patients were selected and 75 of them did not meet the mentioned inclusion criteria as they had more than 20 missing teeth or they had received prescription of systemic antibiotics or anti-inflammatory drugs for a longer period. Also, 38 out-patients refused to participate in the present study. Finally, the study sample consisted of 728 out-patients giving a response rate 84.3%. The mean age of the out-patients was 58.3 ± 2.4 and 36.7 % of them reported current smokers and 62.3 % were non-smokers. The relative frequency of male smokers was 35% , while 38.1 % of the females reported that they were smokers. Table 1 presents the self-reported systemic diseases of the out-patients'. The most frequent diseases were hypertension (36.1%) followed by respiratory diseases (36.0%)and the least frequent was rheumatoid arthritis(10.2%). The presence of cardiovascular disease and hypertension were more frequently reported by males,38.5% and 35.0%, respectively. In females, the more frequently reported diseases were respiratory diseases (39.2%) and hypertension (37.1%).

Other endocrine disorders included hypothyroidism (53,3 %), osteoporosis (27.8 %) and hyperthyroidism (18.9 %). The examined periodontal parameters were found to be

Tablica 1. Sistemske bolesti pregledanih vanjskih pacijenata
Table 1 Occurrence of systemic diseases in the examined out-patients

Sistemske bolesti • Systemic Disease	Muškarci • Males (%)	Žene • Females (%)	Ukupno • Total (%)
Respiratorne alergije • Respiratory Allergy	48 (14.1)	87 (22.4)	135 (18.5)
Respiratorne bolesti • Respiratory diseases	110 (32.3)	152 (39.2)	262 (36.0)
Kardiovaskularne bolesti • Cardiovascular diseases	131 (38.5)	116 (29.9)	247 (33.9)
Diabetes mellitus • Diabetes mellitus	62 (18.2)	120 (30.9)	182 (25.0)
Hipertenzija • Hypertension	119 (35.0)	144 (37.1)	263 (36.1)
Reumatoidni artritis • Rheumatoid arthritis	29 (8.5)	54 (13.9)	83 (11.4)
Ostale endokrine bolesti • Other endocrine diseases	36 (10.6)	59 (15.2)	95 (13.1)

Tablica 2. Povezanost parodontnih parametara i pušačkog statusa, spola i samoprijavljenih sistemskih bolesti dobivenih bivarijantnom analizom
Table 2 Associations between the periodontal parameters and smoking status, gender and the self-reported systemic diseases according to the bivariate analysis.

Parodontni parametri • Periodontal parameters	Dubina sondiranja • Probing Pocket Depth (PPD)			Klinički gubitak pričvrstka • Clinical Attachment Loss (CAL)			Krvarenje nakon sondiranja • Bleeding on Probing (BOP)			Zubne naslage • Dental Plaque (DP)		
Varijable • Variables	≤ 5 mm %	>5 mm %	p	Mild/ Mod. %	Sev. %	p	Abs. %	Pres. %	p	Abs %	Pres %	p
Spol • Gender												
muški • Males	26.4	26.0	**	26.8	26.5	*	15.2	37.4	*	32.8	21.4	NS
ženski • Females	28.7	18.9		27.6	19.1		18.0	29.4		30.8	15.0	
Pušački status • Smoking Status												
Pušači • Smokers	12.5	24.1	***	2.5	34.2	***	20.7	15.9	***	20.2	16.5	***
Nepušači • Non-smok.	42.6	20.8		51.9	11.4		12.5	50.8		43.4	19.9	
Resp. alergije • Respiratory Allergy												
ima • Presence	10.0	8.5	NS	14.0	4.5	***	7.4	11.1	NS	6.6	12.0	***
nema • Absence	39.4	42.1		40.4	41.1		25.8	55.7		4.0	77.4	
Resp. bolesti • Respiratory Disease												
ima • Presence	20.6	15.4	**	21.8	13.2	*	14.3	21.7	**	9.1	26.9	***
nema • Absence	28.8	35.2		32.6	31.5		19.0	45.0		1.5	62.5	
Vaskularne bolesti • C/vascular Diseases												
ima • Presence	19.2	14.7	**	21.0	12.9	**	12.9	21.0	*	6.0	27.9	***
nema • Absence	30.2	35.9		33.7	32.4		20.3	45.8		4.5	61.6	
Diabetes mellitus												
ima • Presence	6.3	18.7	***	8.1	16.9	***	1.8	24.6	***	4.8	20.2	***
nema • Absence	43.1	31.9		46.3	28.7		31.5	42.1		5.8	69.2	
Hipertenzija • H/tension												
ima • Presence	19.9	16.2	*	21.4	14.7	*	15.9	20.2	***	7.8	28.3	***
nema • Absence	29.5	34.4		33.0	30.9		17.3	46.6		2.7	61.2	
Reumatoid. artritis • Rheumatoid Arthritis												
ima • Presence	7.1	4.3	*	7.6	3.9	*	5.8	5.6	***	4.7	6.7	***
nema • Absence	42.3	46.3		46.8	41.7		27.5	61.1		5.9	82.7	
Endokrine bolesti • Endocrine Diseases												
ima • Presence	9.8	3.3	***	10.7	2.3	***	9.5	3.6	***	8.5	4.5	***
nema • Absence	39.7	47.2		43.7	43.3		23.6	63.3		2.1	84.9	

* : p<0.05 ** : p<0.01 *** : p<0.001 NS: nema statističke značajnosti • Not statistically significant

jabli po parovima nalaze se u tablici 3. Pronađena je značajna korelacija između pušača i navedenih sistemskih bolesti, a korelacija je bila pozitivna između žena i respiratornih te kardiovaskularnih bolesti i dijabetesa.

Rezultati modela stepeničaste regresijske analize i korištenje dubine sondiranja džepova kao ovisne varijable, pokaza-

significantly associated with the presence of all self-reported systemic diseases when put together with gender and smoking as co-variables except for probing pocket depth and respiratory allergy according to the bivariate analysis (Table 2). The pairwise bivariate correlations between investigated variables are presented in Table 3. A significant correlation

Tablica 3. Uparena bivarijantna korelacija između ispitivanih varijabli
Table 3 Pairwise bivariate correlations between investigated variables

	G	S.	R.AL	R.D	C/V.D.	DM	H.T	R.A	O.E.D
G	1	-0.033 (0.380)	-0.107* (0.004)	-0.071 (0.056)	-0.121* (0.001)	-0.144* (0.000)	-0.002 (0.054)	-0.065 (0.022)	-0.680 (0.065)
S.	-	1	0.495* (0.000)	0.795* (0.000)	0.744* (0.000)	0.545 (0.000)	0.597* (0.000)	0.391* (0.000)	0.365* (0.000)
R.AL	-	-	1	0.445* (0.000)	0.328* (0.000)	0.421* (0.000)	0.399* (0.000)	0.340* (0.000)	0.266* (0.000)
R.D	-	-	-	1	0.686* (0.000)	0.542* (0.000)	0.610* (0.000)	0.370* (0.939)	0.330* (0.000)
C/V.D	-	-	-	-	1	0.506* (0.000)	0.545 (0.000)	0.359* (0.000)	0.311* (0.528)
D.M	-	-	-	-	-	1	0.580* (0.000)	0.384* (0.000)	0.362* (0.000)
H.T	-	-	-	-	-	-	1	0.279* (0.000)	0.320* (0.000)
R.A	-	-	-	-	-	-	-	1	0.323* (0.000)
O.E.D	-	-	-	-	-	-	-	-	1

G: spol • gender, S.: pušenje • smoking, R.AL: respiratorne alergije • respiratory allergy, CV.D: kardiovaskularne bolesti • cardiovascular diseases, D.M: diabetes mellitus, H.T: hipertenzija • hypertension, R.D: respiratorne bolesti • respiratory diseases, O.E.D: druge endokrine bolesti • other endocrine diseases, R.A: reumatoidni artritis • rheumatoid arthritis
* : Statistički značajno • Statistically significant

Tablica 4. Rezultati modela stepeničaste regresijske analize korištenjem dubine sondiranja i gubitka kliničkog pričvrstka kao ovisnih varijabli
Table 4 Results of the stepwise regression analysis model using probing pocket depth and clinical attachment loss as dependent variables

Dubina sondiranja • Probing Pocket Depth **Neovisne varijable • Independent Variable**	**Koeficijent • Coefficient (B)**	**Standardna pogreška • Standard Error (SE)**	**P**	**OR**	**Interval pouzdanosti 95% • 95% Confidence Interval (CI)**
Pušenje • Smoking	2.221	0.215	0.000	9.216	6.044 – 14.053
Respiratorne alergije • Respiratory Allergy	1.078	0.308	0.000	2.940	1.609 – 5.371
Diabetes mellitus	2.451	0.463	0.000	11.595	4.681 – 28.723
Konstanta • Constant	-1.353	0.117	0.000	0.258	_____
Klinički gubitak pričvrstka • Clinical Attachment Loss **Neovisne varijable • Independent Variable**	**Koeficijent • Coefficient (B)**	**Standardna pogreška • Standard Error (SE)**	**P**	**OR**	**Interval pouzdanosti 95% • 95% Confidence Interval (CI)**
Pušenje • Smoking	3.407	0.417	0.000	30.176	13.338 – 68.273
Respiratorne alergije • Respiratory Allergy	1.623	0.380	0.000	5.066	2.403 – 10.678
Kardiovaskularne bolesti • Cardiovascular Disease	-0.729	0.410	0.076	0.482	0.216 – 1.078
Reumatoidni artritis • Rheumatoid Arthritis	1.030	0.520	0.048	2.800	1.011 - 7.756
Diabetes mellitus	2.044	0.457	0.000	7.725	3.157 – 18.903
Konstanta • Constant	-1.545	0.128	0.000	0.213	_____

li su da su pušenje i bolesti poput dijabetesa i respiratornih alergija možda u vezi s povećanjem dubine sondiranja džepova (tablica 4).

Kada se gubitak kliničkog pričvrstka rabio kao ovisni parodontni parametar, rezultati navedenog modela pokazali su da su pušenje i bolesti poput dijabetesa, respiratornih alergija i reumatoidnog artritisa vjerojatno povezane s većom težinom gubitka kliničkog pričvrstka, a pojava kardiovaskularnih bolesti negativno je povezana s povećanjem težine gubitka kliničkog pričvrstka jer je stupanj značajnosti bio preslab (tablica 4).

Slični rezultati dobiveni su, kada je parodontni parametar krvarenja nakon sondiranja uvršten kao ovisna varijabla,

was observed between smokers and all self-reported diseases, while correlations between females and the diseases were significant for respiratory diseases, cardiovascular disease and diabetes mellitus. The results of the stepwise regression analysis model, using the probing pocket depth parameter as the dependent variable, showed that smoking and diseases such as diabetes mellitus and respiratory allergy were positively associated with increasing probing pocket depth (Table 4).

When clinical attachment loss was used as the dependent periodontal parameter, the performance of the mentioned model showed that smoking and diseases such as diabetes mellitus, respiratory allergy and rheumatoid arthritis were positively associated with increasing severity of clinical

Tablica 5. Rezultati modela stepeničaste regresijske analize korištenjem krvarenja nakon sondiranja i zubnih naslaga kao ovisnih uzoraka
Table 5 Results of the stepwise regression analysis model using bleeding on probing and dental plaque as dependent variables

Krvarenje nakon sondiranja • Bleeding on Probing Neovisne varijable • Independent Variable	Koeficijent • Coefficient (B)	Standardna pogreška • Standard Error (SE)	P	OR	Interval pouzdanosti 95% • 95% Confidence Interval (CI)
Pušenje • Smoking	1.168	0.341	0.001	3.125	1.647 – 6.275
Respiratorne alergije • Respiratory Allergy	0.926	0.357	0.009	2.524	1.254 – 5.078
Kardiovaskularne bolesti • Cardiovascular Disease	1.214	0.321	0.000	3.367	1.797 – 6.311
Hipertenzija • Hypertension	-1.043	0.269	0.000	0.353	0.208 - 0.597
Reumatoidni artritis • Rheumatoid Arthritis	0.921	0.527	0.081	2.511	0.893 - 7.060
Diabetes mellitus	2.076	0.563	0.000	7.975	2.647 – 24.022
Konstanta • Constant	0.079	0.103	0.444	1.082	_____
Zubne naslage • Dental Plaque **Neovisne varijable • Independent Variable**	**Koeficijent • Coefficient (B)**	**Standardna pogreška • Standard Error (SE)**	**P**	**OR**	**Interval pouzdanosti 95% • 95% Confidence Interval (CI)**
Reumatoidni artritis • Rheumatoid Arthritis	0.751	0.610	0.048	1.120	0.642 – 2.000
Konstanta • Constant	1.934	0.124	0.000	6.919	13.338 – 14.053

Tablica 6. Omjer vjerojatnosti (OR) i 95-postotni interval pouzdanosti (CI) između parodontnih parametara i spola, pušačkog statusa i napisanih sistemskih bolesti
Table 6 Odds ratios (OR) and 95% Confidence Interval (CI) between the periodontal parameters and gender, smoking status and the self-reported systemic diseases

Parodontni parametri • Periodontal parameters	Dubina sondiranja • Probing Pocket Depth (PPD)		Klinički gubitak pričvrstka • Clinical Attachment Loss (CAL)		Krvarenje nakon sondiranja • Bleeding on Probing (BOP)		Zubne naslage • Dental Plaque (DP)	
Varijable • Variables	OR-95% CI (nekorigirana • unadjusted)	OR-95% CI (korigirana • adjusted)	OR-95% CI (nekorigirana • unadjusted)	OR-95% CI (korigirana • adjusted)	OR-95% CI (nekorigirana • unadjusted)	OR-95% CI (korigirana • adjusted)	OR-95% CI (nekorigirana • unadjusted)	OR-95% CI (korigirana • adjusted)
Spol • Gender	0.671 0.500 0.900	1.077 0.728- 1.594	0.699 0.521- 0.937	0.896 0.581- 1.381	0.667 0.489- 0.909	1.010 0.705- 1.445	1.341 0.989- 1.820	0.671 0.404- 1.114
Pušenje • Smoking	0.252 0.183- 0.347	12.074 5.545- 26.295	0.016 0.090- 0.027	32.754 12.608- 85.089	0.189 0.135- 0.264	3.422 1.589- 7.371	1.779 1.303- 2.428	0.791 0.299- 2.093
Resp. alergije • Respiratory Allergy	0.797 0.548- 1.159	2.782 1.498- 5.164	0.318 0.208- 0.486	4.957 2.324- 10.572	0.696 0.474- 1.024	2.587 1.283- 5.217	0.093 0.056- 0.156	0.700 0.334- 1.468
Resp. bolesti • Respiratory Disease	0.613 0.451- 0.831	1.117 0.573- 2.178	0.670 0.493- 0.912	0.762 0.343- 1.692	0.639 0.465- 0.878	0.965 0.493- 1.891	0.072 0.037- 0.139	0.776 0.317- 1.899
Vaskul. bolesti • C/vascular Diseases	0.644 0.473- 0.878	0.557 0.275- 1.129	0.638 0.466- 0.872	0.509 0.219- 1.183	0.723 0.524- 0.998	3.439 1.790- 6.607	0.340 0.210- 0.550	1.529 0.658- 3.553
Diabetes mellitus	4.001 2.750- 5.822	0.797 0.435- 1.460	3.362 2.357- 4.795	1.435 0.732- 2.814	10.271 5.702- 18.499	0.761 0.408- 1.419	0.350 0.216- 0.568	0.546 0.262- 1.137
Hipertenzija • H/tension	0.700 0.517- 0.948	1.391 0.822- 2.355	0.732 0.539- 0.993	0.979 0.542- 1.768	0.471 0.343- 0.647	0.382 0.217- 0.672	0.162 0.095- 0.277	1.218 0.582- 2.549
Reumatoid. artritis • Rheumatoid Arthritis	0.545 0.340- 0.872	1.095 0.505- 2.375	0.571 0.353- 0.923	2.711 0.956- 7.685	0.439 0.277- 0.696	2.619 0.926- 7.402	0.103 0.060- 0.176	2.933- 0.834- 10.318
Endokrine bolesti • Endocrine Diseases	0.284 0.174- 0.463	11.628 4.620- 29.266	0.220 0.127- 0.380	7.621 3.049- 19.049	0.142 0.087- 0.230	8.068 2.677- 24.314	0.013 0.007- 0.025	—— ——

za pušenje i bolesti poput dijabetesa, respiratornih alergija i kardiovaskularnih bolesti koje su možda pozitivno povezane s krvarenjem nakon sondiranja, a hipertenzija je bila negativno povezana (tablica 5).

Korišteni model pokazao je, kada su zubne naslage bile ovisna varijabla, da je reumatoidni artritis pozitivno povezan s vidljivim zubnim naslagama (tablica 5).

U tablici 6 nalaze se nekorigirani i korigirani omjeri vjerojatnosti (OR) i granica pouzdanosti od 95 posto (CI) između parodontnih parametara i spola, pušačkog statusa i navedenih sistemskih bolesti. Nakon raščlanjivanja uzorka ovisno o spolu, kod muškaraca je hipertenzija ostala i dalje značajno i negativno povezana s krvarenjem nakon sondiranja. Kardiovaskulana bolest ostala je pozitivno povezana s istim parodontnim parametrima (tablica 7). Kod žena su dijabetes i respiratorne alergije značajno i pozitivno povezane s dubinom sondiranja džepova, povećanom težinom kliničkog gubitka pričvrstka i krvarenjem nakon sondiranja, a stupanj značajnosti povećan je između reumatoidnog artritisa i vidljivih zubnih naslaga (<0,001 vs. 0,048) (tablica 7).

Nakon analize proučavanog uzorka, ovisno o pušenju i respiratornim alergijama, dijabetesu i reumatoidnom artritisu, te o spolu kod pušača poslije prilagodbe, ostali su značajno i pozitivno povezani s povećanjem dubine sondiranja džepova, povećanjem težine gubitka kliničkog pričvrstka i krvarenjem nakon sondiranja. Kod nepušača je hipertenzija dodatno negativno povezana s krvarenjem nakon sondiranja (tablica 8).

attachment loss, whereas the presence of cardiovascular disease was negatively associated with increasing severity of clinical attachment loss, however the significance level was too weak (Table 4).

Similarly, using the periodontal parameter, bleeding on probing as the dependent variable, the model showed that smoking and diseases such as diabetes mellitus, respiratory allergy and cardiovascular disease were positively associated with the occurrence of bleeding on probing, whereas the presence of hypertension was negatively associated (Table 5).

The performance of the model when dental plaque was used as the dependent periodontal parameter showed that the presence of rheumatoid arthritis was positively associated with the presence of visible dental plaque (Table 5).

Table 6 presents unadjusted and adjusted Odds Ratios (OR) and 95% Confidence Interval (CI) between the periodontal parameters and gender, smoking status and the self-reported systemic diseases After stratification of the sample according to gender, the presence of hypertension remained significantly and negatively associated with the presence of bleeding on probing in males. Similarly, the presence of cardiovascular disease remained significantly and positively associated with the same periodontal parameter (Table 7).

In females, diabetes mellitus and respiratory allergy remained significantly and positively associated with the increasing probing pocket depth, increasing severity of clinical attachment loss and the presence of bleeding on probing, while the significant level of the association between rheumatoid arthritis and the presence of visible dental plaque was increased (<0.001 vs 0.048) (Table 7).

Tablica 7. Rezultati modela stepeničaste regresijske analize nakon raščlanjivanja, ovisno o spolu (muškarci/žene)
Table 7 Results of the stepwise regression analysis model after stratification according to gender (males/females)

MUŠKARCI • MALES Krvarenje nakon sondiranja • Bleeding on Probing Neovisne varijable • Independent Variable	**Koeficijent • Coefficient (B)**	**Standardna pogreška • Standard Error (SE)**	**P**	**OR**	**Interval pouzdanosti 95% • 95% Confidence Interval (CI)**
Hipertenzija • Hypertension	-1.543	0.345	0.004	11.233	5.637 – 17.465
Kardiovaskularne bolesti • Cardiovascular Disease	1.327	0.421	0.008	0.753	0.436 – 1.675
konstanta • Constant	-1.015	0.282	0.000	0.438	_____
ŽENE • FEMALES Dubina sondiranja džepa • Probing Pocket Depth	**Koeficijent • Coefficient (B)**	**Standardna pogreška • Standard Error (SE)**	**P**	**OR**	**Interval pouzdanosti 95% • 95% Confidence Interval (CI)**
Diabetes mellitus	4.407	0.441	0.000	12.176	7.338 – 18.112
Respiratorne alergije • Respiratory Allergy	1.398	0.392	0.002	6.012	2.529 – 11.678
konstanta • Constant	1.402	0.187	0.000	0.128	_____
Klinički gubitak pričvrstka • Clinical Attachment Loss					
Diabetes mellitus	3.145	0.577	0.021	2.719	1.366 - 7.083
Respiratorne alergije • Respiratory Allergy	2.044	0.481	0.006	3.877	1.034 – 6.889
konstanta • Constant	1.512	0.221	0.000	0.306	_____
Krvarenje nakon sondiranja • Bleeding on probing					
Diabetes mellitus	1.498	0.321	0.028	3.011	1.255 – 6.273
Respiratorne alergije • Respiratory Allergy	2.277	0.425	0.011	3.995	1.644 – 6.836
konstanta • Constant	1.376	0.188	0.000	0.275	_____
Zubne naslage • Dental Plaque					
Reumatoidni artritis • Rheumatoid Arthritis	3.877	0.602	0.000	8.592	3.223 – 14.762
konstanta • Constant	1428	0.205	0.000	0.239	_____

Tablica 8. Rezultati modela stepeničaste regresijske analize nakon raščlanjivanja, ovisno o pušenju (pušač/nepušač)
Table 8 Results of the stepwise regression analysis model after stratification according to smoking (smokers/non-smokers)

PUŠAČI • SMOKERS Dubina sondiranja džepa • Probing Pocket Depth	Koeficijent • Coefficient (B)	Standardna pogreška • Standard Error (SE)	P	OR	Interval pouzdanosti 95% • 95% Confidence Interval (CI)
Respiratorne alergije • Respiratory Allergy	1.741	0.314	0.003	3.125	2.283 – 8.237
Diabetes mellitus	4.183	0.488	0.000	16.036	6.981 – 30.382
Reumatoidni artritis • Rheumatoid Arthritis	1.265	0.285	0.001	3.641	1.813 – 5.334
konstanta • Constant	1.573	0.121	0.000	0.201	_____
Klinički gubitak pričvrstka • Clinical Attachment Loss					
Respiratorne alergije • Respiratory Allergy	1.862	0.402	0.002	3.823	1.782 – 7.512
Diabetes mellitus	4.662	0.584	0.000	8.592	4.734 – 19.622
Reumatoidni artritis • Rheumatoid Arthritis	1.855	0.519	0.010	1.642	1.105 – 8.662
konstanta • Constant	1.423	0.143	0.000	0.264	_____
Krvarenje nakon sondiranja • Bleeding on Probing					
Respiratorne alergije • Respiratory Allergy	1.438	0.482	0.001	3.284	2.873 – 7.338
Diabetes mellitus	4.318	0.606	0.000	9.102	4.842 – 27.885
Reumatoidni artritis • Rheumatoid Arthritis	3.044	0.529	0.006	3.865	1.823 – 9.105
konstanta • Constant	1.175	0.126	0.001	0.212	_____
NEPUŠAČI • NON-SMOKERS Krvarenje nakon sondiranja • Bleeding on Probing	**Koeficijent • Coefficient (B)**	**Standardna pogreška • Standard Error (SE)**	**P**	**OR**	**Interval pouzdanosti 95% • 95% Confidence Interval (CI)**
Hipertenzija • Hypertension	-1.010	0.223	0.023	0.517	0.201 – 1.732
konstanta • Constant	1.374	0.157	0.000	0.231	_____

Rasprava

Prema rezultatima dobivenima u ovom istraživanju pušači su, u usporedbi s nepušačima, češće imali dublje parodontne džepove (> 5,00 mm) te teže stupnjeve gubitka kliničkog pričvrstka i krvarenja nakon sondiranja, što se slaže s ranijim istraživanjima u kojima se ističe da je pušenje poznat rizični čimbenik za parodontnu bolest (48,49).

Kardiovaskularne bolesti uključuju prirođene srčane greške, srčane aritmije, bolesti koronarnih arterija – uključujući aterosklerozu i infarkt miokarda, zatim bolesti srčanih zalistaka i moždani udar (50). U ovom istraživanju nije pronađena značajna povezanost između dobivenih parodontnih parametara kao dubine sondiranja i zubnih naslaga te pojave kardiovaskularnih bolesti, što se slaže s rezultatima dosadašnjih istraživanja čiji autori nisu uspjeli pronaći značajne poveznice između obje bolesti iako su se koristili s nekoliko promatranih parametara (17,18). U nekim drugim istraživanjima došlo se do konfliktnih rezultata o značajnoj povezanosti između obje bolesti (4,9-16) nakon što se primijenilo nekoliko parodontnih indeksa kako bi se istražili proučavani odnosi. Ustanovljena diskrepancija mogla bi se pripisati činjenici da sva istraživanja o povezanosti paro-

After stratification of the study sample according to smoking the presence of respiratory allergy, diabetes mellitus and rheumatoid arthritis remained significantly and positively associated with the increasing probing pocket depth, the increasingseverity of clinical attachment loss and presence of bleeding on probing in smokers after adjustment for gender. In addition, in non-smokers the presence of hypertension remained significantly and negatively associated with the presence of bleeding on probing (Table 8).

Discussion

According to the results of the current study, smokers showed a significantly higher frequency of deeper periodontal pockets (> 5.00 mm), higher severity of clinical attachment loss and bleeding on probing compared to non-smokers, observations that are in accordance with those from previous reports which have shown that smoking is an established risk factor of periodontal disease (48,49). Cardiovascular diseases are a group of diseases that include congestive heart failure, cardiac arrhythmias, coronary artery disease, including atherosclerosis and myocardial infarction, valvular heart disease and stroke (50). In the present study no significant associations were recorded between the examined periodontal parameters such as probing pocket depth and the presence of dental plaque and the occurrence of cardiovascular disease, findings that were in agreement with those of previous reports which failed to find any significant link between both-diseases using several examined parameters (17,18). However, other reports are conflicting and have recorded significant associations between both diseases (4,9-16) using several periodontal indices in order to investi- gate the examined association. This discrepancy could be attributed to the fact that all

dontne i kardiovaskularne bolesti nisu dala jasne rezultate i da se većina podataka temelji na epidemiološkim promatranjima (18). Istaknimo da Beck i Offenbacher (51) smatraju kako je potrebno brojčano više intervencijskih pokušaja kako bi se parodontna infekcija uvrstila u rizične čimbenike za kardiovaskularne bolesti. Različite definicije za parodontitis, neodgovarajuća prilagodba indeksa i različite metode za mjerenje rezultata terapija mogu djelomice pridonijeti mimoilaženjima u literaturi. Osim toga, posebne populacije možda nemaju iste rizične čimbenike za ta stanja – u ovom kontekstu trebalo bi uzeti u obzir specifične biološke, socijalno-ekonomske i okolišne faktore pojedinih populacija. Respiratorne bolesti, pod pojmom bolesti respiratornog sustava, uključujući pluća, pleuralnu šupljinu, bronhijalne tube, traheju, gornji respiratorni trakt i stanja koja ugrožavaju život kao bakterijska pneumonija ili kronična opstruktivna pulmonalna bolest, čest su uzrok smrti u cijelom svijetu. U ovom istraživanju proučavala se kronična opstruktivna bolest pluća i nije pronađena značajna povezanost s analiziranim parodontnim indeksima, pa ni s parodontnom bolešću. Ova opažanja slažu se s ostalim sustavnim preglednim radovima u kojima se proučavala veza parodontitisa i respiratornih bolesti te je zaključeno kako nema dovoljno dokaza za povezivanje parodontne bolesti i kronične opstruktivne pulmonalne bolesti (52), iako su se uporabljale različite metodologije za traženje mogućih odnosa. U nekim se, pak, istraživanjima za određivanje parodontnog zdravlja u kojima su se mjerili indeksi poput gubitka kostiju i zuba, dubina sondiranja, klinički gubitak pričvrstka, krvarenje nakon sondiranja i slično (16,27-9), zaključilo da je parodontna bolest usko povezana s kroničnom opstruktivnom bolešću. U nekim studijama istaknuta je i velika povezanost između indeksa zubnih naslaga kao pokazatelja lošeg parodontnog zdravlja i kronične opstruktivne pulmonalne bolesti (28,29).

Kako je već navedeno, pušenje je poznat čimbenik rizika kad je riječ o parodontnoj bolesti. Istaknimo da je izlaganje dimu cigarete razmjerno često te je zato pušenje vrlo značajna ulazna varijabla povezana s parodontnom bolešću i kardiovaskularnom bolešću/kroničnom opstruktivnom pulmonalnom bolešću. Ako se statistička analiza prilagodi pušenju, rezidualni utjecaj bivšeg pušenja u anamnezi ne zabrinjava jer je opisana slaba povezanost između parodontne i kardiovaskularne/kronične opstruktivne pulmonalne bolesti.

Diabetes mellitus značajno je pozitivno povezan sa svim ispitivanim parodontnim parametrima, osim sa zubnim naslagama, što upućuje na to da je ta bolest povezana s parodontnom. Do toga rezultata došlo se i u nekoliko ranijih istraživanja (1,2,15,16,19). Stojanović i suradnici (20) uočili su veliku povezanost između dubine sondiranja i pojave dijabetesa, a Hodge i njegovi kolege (21) ustanovili su vezu između kliničkog gubitka pričvrstka i šećerne bolesti. I Awartani (22) je istaknuo povezanost između dubine sondiranja > 4,0 mm i težine gubitka kliničkog pričvrska uz prisutnost dijabetesa, a Choi i suradnici (23) te Meng (24) pronašli su da su povećanje dubine sondiranja i pogoršanje gubitka kliničkog pričvrstka značajno povezani s pojavom šećerne bolesti. Francisco J. Silvestre i suradnici (25) zaključili su da su povestudies on the relationship of periodontal disease to cardiovascular disease are inconclusive and most of the data are based on epidemiological surveys (18). In addition, Beck and Offenbacher (51) suggest that more and larger intervention trials are necessary to consider periodontalinfection as a real risk factor in the cardiovascular disease. Different definitions of periodontitis, inadequate adjustment for confounders, different methods of measuring outcomes and endpoints may partially account for the divergence of findings in the literature. Furthermore, distinct populations may not share the same risk factors for these conditions ; in this context, the specific biological, socioeconomic and environmental factors of each population should be taken into account. Respiratory diseases is the term for diseases of the respiratory system, including lung, pleural cavity, bronchial tubes, trachea, upper respiratory tract and life threatening conditions such as bacterial pneumonia or chronic obstructive pulmonary disease, which are important causes of death worldwide. In the current study, the examined respiratory disease was chronic obstructive pulmonary disease and no significant association with the examined periodontal indices was observed and consequently, with the presence of periodontal disease. These observations are in accordance with other systematic reviews of the studies investigating the link between periodontitis and respiratory diseases concluded that there is no sufficient evidence to support an association between periodontal disease and chronic obstructive pulmonary disease (52), using different methodology in order to investigate thepossible association.

However, other reports in which several indices such as bone loss, teeth loss, probing pocket depth, clinical attachment loss, bleeding on probing, etc. were used in order to measure periodontal health (16,27-29) showed that periodontal disease was significantly associated with the presence of chronic obstructive pulmonary disease. In addition, a significant association between dental plaque as index of poor periodontal health and chronic obstructive pulmonary disease was recorded in previous studies (28,29).

As mentioned, smoking is an established risk factor of periodontal disease. Furthermore, cigarette smoking is a relatively common exposure. Therefore, smoking is a very important confounding variable in the association of periodontal disease and and cardiovascular disease/chronic obstructive pulmonary disease. Even if smoking is adjusted for in the statistical analysis, residual confounding by smoking history is of great concern, particularly since the reported associations between periodontal disease and cardiovascular disease/chronic obstructive pulmonary disease are weak.

Diabetes mellitus was positively and significantly associated with all examined periodontal parameters except for the presence of dental plaque, suggesting that it was associated with periodontal disease. This finding was also recorded in previous studies (1, 2, 15, 16, 19). Stojanovic et al. (20) observed a significant association between probing pocket depth and the occurrence of diabetes mellitus and Hodge et al. (21) found an association between clinical attachment loss and the occurrence of diabetes mellitus. Similarly, Awartani (22) recorded an association between probing pocket depth > 4.0 mm and the severity of clinical attachment loss

ćanje dubine sondiranja, pogoršanje težine kliničkog gubitka pričvrstka i krvarenje nakon sondiranja usko povezani s dijabetesom. Drugi stručnjaci potvrdili su obostranu povezanost parodontne i šećerne bolesti (4,26).

Prema rezultatima u ovom istraživanju, težina kliničkog gubitka značajno je pozitivno povezana s dijabetesom i negativno s kardiovaskularnom bolestima. Važno je istaknuti da – iako neke tradicionalne mjere i klinički znakovi parodontne bolesti, poput dubine sondiranja i kliničkog gubitka pričvrska, nisu povezani s težinom sistemskih bolesti i stanja – nisu kritični parametri za određivanje prave povezanosti (17). Reumatoidni artritis je autoimuna bolest koja pogađa nekoliko organa i sustava te je povezana i s razaranjem vezivnoga tkiva u zglobovima i kostima. Ta sličnost kliničkih i patoloških obilježja rezultirala je hipotezom o bilateralnoj povezanosti reumatoidnog artritisa i parodontitisa prema kojoj reumatoidni artritis utječe na patogenezu parodontitisa i obrnuto (30). U ovom istraživanju parodontnih indeksa, poput kliničkog gubitka pričvrstka, krvarenja nakon sondiranja i prisutnosti zubnih naslaga, pokazali su se značajno pozitivno povezanim s pojavom reumatoidnog artritisa, što se slaže s dosadašnjim izvještajima (31,33).

U ovom istraživanju zaključeno je da parodontni parametri, poput dubine sondiranja i kliničkog gubitka pričvrska, nisu značajno povezani s hipertenzijom, što se djelomice slaže s dosadašnjim istraživanjima (16,36). U nedavnom istraživanju odraslih Grka (15) uočeno je da je dubina parodontnih džepova pozitivno značajno povezana s hipertenzijom. Dodatno je i krvarenje nakon sondiranja povezano s hipertenzijom, što je na tragu nalaza Tsakosa i suradnika (38). Nije pronađena povezanost između promatranih parodontnih parametara i hipertenzije (37). Ta opažanja temelje se na činjenici da hipertenzija koegzistira s nekoliko sistemskih bolesti, poput dijabetesa, kardiovaskularnih bolesti i metaboličkog sindroma i teško ju je promatrati kao zaseban rizični čimbenik za parodontnu bolest. Tsioufis i njegovi kolege (39) zaključili su da, premda se u literaturi podupire navedena povezanost, treba obaviti prospektivna istraživanja i intervencijske postupke kako bi se odredio utjecaj parodontitisa na regulaciju krvi.

Povezanost između krvarenja nakon sondiranja i hipertenzije u ovom istraživanju ne stvara kritični parametar za otkrivanje prave povezanosti jer je parodontna bolest složenije patološko stanje. U ovom istraživanju potvrđena je povezanost između glavnih parodontnih parametara, poput dubine sondiranja, kliničkog gubitka pričvrstka i krvarenja nakon sondiranja s pojavom respiratorne alergije, što se djelomice slaže s rezultatima ostalih istraživanja u kojima je pronađena inverzna povezanost obiju bolesti (34,35) i težine kliničkog gubitka pričvrstka povezanog s respiratornom alergijom. U jednom od tih istraživanja (35) proučavala se moguća povezanost kod pacijenata s dijabetesom tipa I i na temelju njihovih nalaza neki istraživači smatraju da postoji bilateralna povezanost između parodontne i šećerne bolesti. Zato je moguće da navedena povezanost znatno utječe na rezultate ovog istraživanja. Nije pronađena povezanost između parodontnih indeksa, poput dubine sondiranja (15), kliničkog gubitka pričvrstka (16) i respiratorne alergije, no u istom je istraži-

with the presence of diabetes mellitus, Choi et al.(23) and Meng (24) recorded that the increasing of probing pocket depth and the increasing severity of clinical attachment loss were significantly associated with the occurrence of diabetes mellitus and Francisco-J Silvestre et al. (25) found that the increasing of probing pocket depth, the increasing severity of clinical attachment loss and the presence of bleeding indices were significantly associated with the presence of diabetes mellitus. Other investigators support the claim that the association between periodontal disease and diabetes mellitus is considered to be bidirectional (4,26).

According to the results of the present study, the severity of clinical attachment loss was positively and significantly associated to diabetes mellitus and negatively and significantly associated to cardiovascular disease. It is important to note that although clinical signs of periodontal disease such as pocket depth and clinical attachment loss may not be associated positively to the severity of systemic disease and conditions, these traditional measures are not critical parameters for discerning true association (17). Rheumatoid arthritis is an autoimmune disease that affects several organs and systems and it is also associated with destruction of joint connective tissue and bone. This similarity of clinical and pathologic features led to the hypothesis of a bidirectional-association between rheumatoid arthritis and periodontitis which involves rheumatoid arthritis affecting the pathogenesis of periodontitis and vice-versa (30). In the current study, periodontal indices such as clinical attachment loss, bleeding on probing and the presence of dental plaque were significantly and positively associated with the occurrence of rheumatoid arthritis, findings that are in agreement with those of previous reports (31-33).

The present study also showed that periodontal parameters such as probing pocket depth and clinical attachment loss were not significantly associated with the occurrence of hypertension, finding that was partially in agreement with the finding of previous studies (16,36). In a recent study in Greek adults (15), it was observed that the depth of periodontal pockets was significantly and positively associated with the occurrence of hypertension. In addition, the presence of bleeding on probing was significantly associated with the occurrence of hypertension, finding that was in line with the findings reported in a study by Tsakos et. al (38). However, no associations were observed in a relevant study between the examined periodontal parameters and the occurrence of hypertension (37). These observations could be attributed to the fact that hypertension coexists with several systemic diseases such as diabetes mellitus, cardiovascular disease, metabolic syndrome and it is difficult to be considered as a separate risk factor for periodontal disease. Tsioufis et al. (39) concluded that although the literature supports the mentioned association, designed prospective and interventional trials are necessary in order to determine the impact of periodontitis on blood regulation.The existence of an association between the presence of bleeding on probing and the occurrence of hypertension in the current study does not represent a critical parameter for discerning true association as periodontal disease and is a more complicated pathological con-

vanju (16) ustanovljena značajna povezanost između dubine parodontnih džepova i respiratornih alergija (16). Očito je da su potrebna nova istraživanja jer se malo zna o mogućoj povezanosti parodontne bolesti i respiratorne alergije.

Procijenjena prevalencija navedenih kardiovaskularnih bolesti iznosi 33,9 posto, a dijabetesa 25,0 posto, no odgovarajuće prevalencije u ranijim istraživanjima (40) bile su niže, a u dvama nedavnima više (15, 16). Isti autor (40) ustanovio je da su prevalencije reumatoidnog artritisa (9,68 %) i hipertenzije (29,51 %) niže u usporedbi s rezultatima ovog istraživanja i već spomenutih istraživanja (15,16). Usporedba prevalencije poremećaja između dvaju različitih istraživanja može se razlikovati zbog čimbenika kao što su različite dobne skupine, metode prikupljanja podataka, socijalno-ekonomski i obrazovni status, kulturološki čimbenici, životne navike i dr. Nekoliko je objašnjenja za povezanost između povećane dubine parodontnih džepova/težine kliničkog gubitka pričvrstka/krvarenja nakon sondiranja/prisutnosti zubnih naslaga i sistemskih bolesti. Neki od njih povezani su s ponašanjem, poput načina života i čestoće posjeta stomatologu radi redovitih dentalnih kontrola. Istaknuto je da je parodontna bolest usko povezana s lošom fizičkom kondicijom i ograničavajućim medicinskim statusom, što upućuje na to da je parodontna bolest povezana s lošim općim zdravljem. Spomenuto je kako ima dokaza da loše oralno zdravlje pogoduje respiratornoj bolesti, posebice u slučaju visokorizičnih pacijenata (53). Osim toga povećan je rizik od sveobuhvatnog mortaliteta kod pojedinaca s parodontnom bolešću (10).

Važno je istaknuti da je glavni zadatak ovog istraživanja bio istražiti moguće odnose između indeksa parodontne bolesti i sistemskih bolesti, a ne prevalencija indeksa parodontne bolesti kod pacijenata sa sistemskim bolestima. Prije usporedbe rezultata dobivenih u ovom istraživanju s drugim sličnim studijama, moraju se uzeti u obzir neka ograničenja. Kao prvo, većina proučavane populacije bili su Atenjani s različitim stupnjem obrazovanja i socijalno-ekonomskim statusom, a oni su uglavnom bili niski. Naime, u Grčkoj se pojedinci s višim obrazovnim i socijalno-ekonomskim statusom liječe u privatnim bolnicama. Kao drugo, u retrospektivnom istraživanju kao što je ovo, pouzdanost nije visoka kao u slučaju prospektivne studije zato što su drugačija unutaristraživačka varijabilnost i sistemska obilježja glede odabira uzorka, odziva na kontrole i usporednih nalaza više vjerojatnosti. Osim toga, rezultati u ovom istraživanju temelje se na podatcima sudionika o njihovu sistemskom zdravlju. Zato podatci iz ispunjenih upitnika mogu biti netočni. Naime, ispitanici mogu podcijeniti ili precijeniti podatke ili ih izostaviti. Unatoč tomu što se osobnim medicinskim kartonom pojedinaca taj problem može riješiti, ovaj čimbenik može voditi prema ograničenjima vrijednosti kada se interpretiraju rezultati ovog istraživanja. Dodatno se mora spomenuti da se u ovom istraživanju nisu procjenjivali neki indeksi parodontnog zdravlja, poput visine alveolarne kosti ili neki drugi klinički parametri, kao što je broj preostalih zuba. I na kraju, uzorak u ovom istraživanju nije odabran slučajnim odabirom iz populacije, nego je to učinjeno među pacijentima klinike.

dition. Significant and positive associations were observed in the present study between the main important parameters of periodontal disease such as probing pocket depth, clinical attachment loss and bleeding on probing and the occurrence of respiratory allergy, findings that were partially in line with the results of previous reports, in which an inverse association was recorded between both diseases (34, 35) and the severity of clinical attachment loss was associated with the occurrence of respiratory allergy. One of the mentioned studies (35) investigated the possible association in patients with type 1diabetes mellitus and based on the finding that some investigators have supported a bidirectional association between periodontal disease and diabetes mellitus, it is possible that the mentioned association could have a strong influence on the results of this study. No associations were recorded between periodontal indices such as probing pocket depth (15) and clinical attachment loss (16) and the occurrence of respiratory allergy, whereas in the same report (16) a significant and positive association was observed between the depth of periodontal pockets and the occurrence of respiratory allergy (16). It is obvious that more research is necessary on this issue as little is known about the possible relationship between periodontal disease and respiratory allergy.

The prevalence of self-reported cardiovascular disease and diabetes mellitus was estimated at 33.9% and 25.0%, respectively, while the corresponding prevalences in a previous report (40) were lower, and in two recent reports were higher (15, 16). The same author (40) found that the prevalence of rheumatoid arthritis (9.68%) and hypertension (29.51%) were lower compared to the results of the current study and the mentioned recent studies (15,16). However, comparisons of prevalence of disorders between different studies may be biased due to factors such as different age groups, methods of data collection, socio-economic and educational background, cultural factors, lifestyle habits, etc. There are several possible explanations for significant associations between the increased depth of periodontal pockets/severity of clinical attachment loss/presence of bleeding on probing/presence of visible dental plaque and systemic diseases. Some of those are behaviorally related factors, such as lifestyle factors and the frequency of dental visits for a regular dental follow-up. Periodontal disease has been reported to be significantly associated with low levels of physical fitness and an impaired medical status, which indicates that periodontal disease may be associated with poor general health. It has also been mentioned that there is increasing evidence that poor oral health can predispose to respiratory disease, especially in high risk patients (53). In addition, an increased risk of all-cause mortality has been found for individuals with periodontal disease (10).

It is important to highlight that the main aim of the current study was to investigate a possible association between periodontal disease indices and the presence of systemic diseases and not to investigate the presence and prevalence of periodontal disease indices or periodontal disease in patients with systemic diseases. The current study has some limitations that should be taken into account before any comparison with similar studies. First, the majority of the study

U sklopu rezultata potvrđeno je da je većina proučavanih varijabli međusobno povezana. Kako bi se provjerile te linearne ovisnosti, te utjecaji spola i pušenja, provedena je mnogostruka postupna regresijska analiza. Obavljeno je i grupiranje ovisno o spolu i pušenju, kako bi se proučavali mogući utjecaji tih čimbenika na istraživane sistemske bolesti.

Zaključak

Zaključak iz ovog istraživanja podupire povezanost parodontne bolesti, u obliku dubokih parodontnih džepova, težine kliničkog gubitka pričvrstka, krvarenja nakon sondiranja i vidljivih zubnih naslaga, sa sistemskim bolestima, poput kardiovaskularnih, dijabetesa, respiratornih alergija i reumatoidnog artritisa.

population were residents of Athens with different levels of educational and socioeconomic background which, in many cases, appeared to be low. In Greece, individuals with higher educational and socioeconomic background prefer and receive medical care from private hospitals. Secondly, in a retrospective study, such as the present one, the reliability is not as high as for prospective studies since the inter-examiner variability and the presence of systemic bias regarding sample selection, recall bias and confounders are most likely higher. Furthermore, the results of the current study were based on self-reported data of systemic health conditions and self-perceived well-being. The response outcomes to the questionnaire items may therefore suffer from inaccuracy. Respondents may under-report, over-report or choose not to report. Despite the fact that the personal medical file of the individuals could solve this problem, this factor may lead to limitations regarding the validity when interpreting the results in this study. In addition, in the current paper the alveolar bone height or other clinical parameters, such as the number of remaining teeth were not assessed as indices of measurement of periodontal health. In conclusion, the sample of the present study was not randomly selected from a normal population but, as mentioned, consisted of outpatients of a special hospital clinic.

According to the results, a great majority of the investigated variables were found to be significantly associated to each other. In order to control for these collinear relationships as well as for confounding effects of gender and smoking, a stepwise multiple regression analysis model was performed. Also, stratification according to gender and smoking was performed to explore a possible influence of these factors on the investigated systemic health diseases.

Conclusion

The observations of the current study support associations between periodontal disease as expressed in terms of deep periodontal pockets, severity of clinical attachment loss, presence of bleeding on probing, presence of visible dental plaque and systemic diseases such as cardiovascular diseases, diabetes mellitus, respiratory allergy and rheumatoid arthritis.

Abstract

Aim: The aim of the current investigation was to examine the occurrence of periodontal disease indices in out-patients referred to a specialist clinic for neurosurgery treatment and to explore possible associations between common systemic diseases and periodontal disease indices in a Greek out-patient adult population. **Materials and Methods:** The study population consisted of 728 out-patients, 340 males and 388 females aged 40 to 70 years. All individuals were clinically examined and filled in a health administered questionnaire. Multiple logistic regression analysis of the questionnaire items was performed to assess possible associations between systemic diseases as independent variables and the presence of periodontal pockets of 5.00 mm or more, mild/moderate or severe clinical attachment loss and the presence or absence of bleeding on probing and visible dental plaque, respectively, as dependent variables. **Results:** The depth of periodontal pockets was significantly and positively associated with the presence of respiratory allergy (P<0.001) and diabetes mellitus (P<0.001), whereas clinical attachment loss was significantly and positively associated with the presence of respiratory allergy (P<0.001), diabetes mellitus (P<0.001) and rheumatoid arthritis (P= 0.048). In addition, bleeding on probing was significantly and positively associated with the presence of respiratory allergy (P= 0.009), cardiovascular disease (P<0.001) and diabetes mellitus (P<0.001) and significantly and negatively associated with the presence of hypertension (P<0.001), whereas the presence of dental plaque was positively associated with the presence of rheumatoid arthritis (P= 0.048). **Conclusion:** Significant associations between investigated periodontal disease indices such as probing pocket depth, clinical attachment loss, bleeding on probing and dental plaque and systemic diseases such as respiratory diseases, diabetes mellitus, cardiovascular diseases and rheumatoid arthritis were recorded.

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Address for correspondence
Dr. Nikolaos Andreas Chrysanthakopoulos
35, Zaimi Street, PC 26 223, Patra, GREECE
Tel./Fax: 0030-2610-225288
nikolaos_c@hotmail.com

Key words
Periodontal Pocket; Periodontal Attachment Loss; Dental Plaque; Hypersensitivity; Diabetes Mellitus; Arthritis, Rheumatoid; Cardiovascular Diseases

References

1. Cullinan MP, Ford PJ, Seymour GJ. Periodontal disease and systemic health: current status. Aust Dent J. 2009 Sep;54 Suppl 1:S62-9.
2. Scannapieco FA, Dasanayake AP, Chhun N. "Does periodontal therapy reduce the risk for systemic diseases?". Dent Clin North Am. 2010 Jan;54(1):163-81.
3. Manjunath BC, Praveen K, Chandrashekar BR, Rani RM, Bhalla A. Periodontal infections: a risk factor for various systemic diseases. Natl Med J India. 2011 Jul-Aug;24(4):214-9.
4. Jepsen S, Kebschull M, Deschner J. Relationship between periodontitis and systemic diseases. Bundesgesundheitsblatt Gesundheitsforschung Gesundheitsschutz. 2011 Sep;54(9):1089-96.
5. Antoniazzi RP, Miranda LA, Zanatta FB, Islabão AG, Gustafsson A, Chiapinotto GA, Oppermann RV. Periodontal conditions of individuals with Sjögren's syndrome. J Periodontol. 2009 Mar;80(3):429-35.
6. Dalla Vecchia CF, Susin C, Rösing CK, Oppermann RV, Albandar JM. Overweight and obesity as risk indicators for periodontitis in adults. J Periodontol. 2005 Oct;76(10):1721-8.
7. Haas AN, Rösing CK, Oppermann RV, Albandar JM, Susin C. Association among menopause, hormone replacement therapy, and periodontal attachment loss in southern Brazilian women. J Periodontol. 2009 Sep;80(9):1380-7.
8. Fowler EB, Breault LG, Cuenin MF. Periodontal disease and its association with systemic disease. Mil Med. 2001 Jan;166(1):85-9.
9. Oe Y, Soejima H, Nakayama H, Fukunaga T, Sugamura K, Kawano H, et al. Significant association between score of periodontal disease and coronary artery disease. Heart Vessels. 2009 Mar;24(2):103-7.
10. Xu F, Lu B. Prospective association of periodontal disease with cardiovascular and all-cause mortality: NHANES III follow-up study. Atherosclerosis. 2011 Oct;218(2):536-42.
11. Davé S, Van Dyke T. The link between periodontal disease and cardiovascular disease is probably inflammation. Oral Dis. 2008 Mar;14(2):95-101.
12. Sfyroeras GS, Roussas N, Saleptsis VG, Argyriou C, Giannoukas AD. Association between periodontal disease and stroke. J Vasc Surg. 2012 Apr;55(4):1178-84.
13. Pinho MM, Faria-Almeida R, Azevedo E, Conceição Manso M, Martins L. Periodontitis and atherosclerosis: an observational study. J Periodontal Res. 2012 Dec 30. [Epub ahead of print]
14. Chopra R, Patil SR, Mathur S. Comparison of cardiovascular disease risk in two main forms of periodontitis. Dent Res J (Isfahan). 2012;9(1):74-9.
15. Chrysanthakopoulos NA, Chrysanthakopoulos PA. Periodontal disease as a risk factor for systemic diseases. Ach Iatr. 2013;32:27-37.
16. Chrysanthakopoulos NA. Periodontal disease status in an isolated greek adult population. J Dent (Tehran). 2012 Summer;9(3):195-206.
17. Teng YT, Taylor GW, Scannapieco F, Kinane DF, Curtis M, Beck JD, Kogon S. Periodontal health and systemic disorders. J Can Dent Assoc. 2002 Mar;68(3):188-92.
18. Beck JD, Eke P, Heiss G, Madianos P, Couper D, Lin D, et al. Periodontal disease and coronary heart disease: a reappraisal of the exposure. Circulation. 2005 Jul;112(1):19-24.
19. Taiyeb-Ali TB, Raman RP, Vaithilingam RD. Relationship between periodontal disease and diabetes mellitus: an Asian perspective. Periodontol 2000. 2011 Jun;56(1):258-68.
20. Stojanović N, Krunić J, Cicmil S, Vukotić O. Oral health status in patients with diabetes mellitus type 2 in relation to metabolic control of the disease. Srp Arh Celok Lek. 2010 Jul-Aug;138(7-8):420-4.
21. Hodge PJ, Robertson D, Paterson K, Smith GLF, Creanor S, Sherriff A. Periodontitis in non-smoking type 1 diabetic adults: a cross-sectional study. J Clin Periodontol. 2012 Jan;39(1):20-9.
22. Awartani F. Evaluation of the relationship between type 2 diabetes and periodontal disease. Odontostomatol Trop. 2009 Dec;32(128):33-9.
23. Choi YH, McKeown RE, Mayer-Davis EJ, Liese AD, Song KB, Merchant AT. Association between periodontitis and impaired fasting glucose and diabetes. Diabetes Care. 2011 Feb;34(2):381-6.
24. Meng HX. Association between periodontitis and diabetes mellitus. Beijing Da Xue Xue Bao. 2007 Feb;39(1):18-20.
25. Silvestre FJ, Miralles L, Llambes F, Bautista D, Solá-Izquierdo E, Hernández-Mijares A. Type 1 diabetes mellitus and periodontal disease: relationship to different clinical variables. Med Oral Patol Oral Cir Bucal. 2009 Apr;14(4):E175-9.
26. Taylor GW, Manz MC, Borgnakke WS. Diabetes, periodontal diseases, dental caries, and tooth loss: a review of the literature. Compend Contin Educ Dent. 2004 Mar;25(3):179-84. 186-8, 190;192.
27. Deo V, Bhongade ML, Ansari S, Chavan RS. Periodontitis as a potential risk factor for chronic obstructive pulmonary disease: a retrospective study. Indian J Dent Res. 2009 Oct-Dec;20(4):466-70.
28. Wang Z, Zhou X, Zhang J, Zhang L, Song Y, Hu FB, Wang C. Periodontal health, oral health behaviours, and chronic obstructive pulmonary disease. J Clin Periodontol. 2009 Sep;36(9):750-5.
29. Peter KP, Mute BR, Doiphode SS, Bardapurkar SJ, Borkar MS, Raje DV. Association Between Periodontal Disease and Chronic Obstructive Pulmonary Disease - A Reality or Just a Dogma. J Periodontol. 2013 Jan 23.
30. Ribeiro J, Leão A, Novaes AB. Periodontal infection as a possible severity factor for rheumatoid arthritis. J Clin Periodontol. 2005 Apr;32(4):412-6.
31. Joseph R, Rajappan S, Nath SG, Paul BJ. Association between chronic periodontitis and rheumatoid arthritis: a hospital-based case-control study. Rheumatol Int. 2013 Jan;33(1):103-9.

32. Ranade SB, Doiphode S. Is there a relationship between periodontitis and rheumatoid arthritis? J Indian Soc Periodontol. 2012 Jan;16(1):22-7.
33. Pischon N, Pischon T, Kröger J, Gülmez E, Kleber BM, Bernimoulin JP, et al. Association among rheumatoid arthritis, oral hygiene, and periodontitis. J Periodontol. 2008 Jun;79(6):979-86.
34. Friedrich N, Völzke H, Schwahn C, Kramer A, Jünger M, Schäfer T, et al. Inverse association between periodontitis and respiratory allergies. Clin Exp Allergy. 2006 Apr;36(4):495-502.
35. Friedrich N, Kocher T, Wallaschofski H, Schwahn C, Lüdemann J, Kerner W, et al. Inverse association between periodontitis and respiratory allergies in patients with type 1 diabetes mellitus. J Clin Periodontol. 2008 Apr;35(4):305-10.
36. Holmlund A, Holm G, Lind L. Severity of periodontal disease and number of remaining teeth are related to the prevalence of myocardial infarction and hypertension in a study based on 4,254 subjects. J Periodontol. 2006 Jul;77(7):1173-8.
37. Rivas-Tumanyan S, Campos M, Zevallos JC, Joshipura KJ. Periodontal disease, hypertension, and blood pressure among older adults in Puerto Rico. J Periodontol. 2013 Feb;84(2):203-11.
38. Tsakos G, Sabbah W, Hingorani AD, Netuveli G, Donos N, Watt RG, et al. Is periodontal inflammation associated with raised blood pressure? Evidence from a National US survey. J Hypertens. 2010 Dec;28(12):2386-93.
39. Tsioufis C, Kasiakogias A, Thomopoulos C, Stefanadis C. Periodontitis and blood pressure: the concept of dental hypertension. Atherosclerosis. 2011 Nov;219(1):1-9.
40. Dumitrescu AL. Occurrence of self-reported systemic medical conditions in patients with periodontal disease. Rom J Intern Med. 2006;44(1):35-48.
41. Pinho Noronha M, Ribeiro Oliveira RD, Novaes Jr AB, Voltarelli JC. Relationship Between Periodontitis and Rheumatoid Arthritis and the Effect of Non-Surgical Periodontal Treatment. Braz Dent J. 2009;20(5):355-64.
42. Papapanou PN. Periodontal diseases: epidemiology. Ann Periodontol. 1996 Nov;1(1):1-36.
43. Desvarieux M, Demmer RT, Jacobs DR Jr, Rundek T, Boden-Albala B, Sacco RL, Papapanou PN. Periodontal bacteria and hypertension: the oral infections and vascular disease epidemiology study (INVEST). J Hypertens. 2010 Jul;28(7):1413-21.
44. Lagervall M, Jansson L, Bergström J. Systemic disorders in patients with periodontal disease. J Clin Periodontol. 2003 Apr;30(4):293-9.
45. Wiebe CB, Putnins EE. The periodontal disease classification system of the American Academy of Periodontology--an update. J Can Dent Assoc. 2000 Dec;66(11):594-7.
46. Starkhammar Johansson C, Richter A, Lundström A, Thorstensson H, Ravald N. Periodontal conditions in patients with coronary heart disease: a case-control study. J Clin Periodontol. 2008 Mar;35(3):199-205.
47. Silness J, Loe H. Periodontal disease in pregnancy. II. correlation between oral hygiene and periodontal condtion. Acta Odontol Scand. 1964 Feb;22:121-35.
48. Bergström J. Periodontitis and smoking: an evidence-based appraisal. J Evid Based Dent Pract. 2006 Mar;6(1):33-41.
49. Paquette DW, Brodala N, Nichols TC. Cardiovascular disease, inflammation, and periodontal infection. Periodontol 2000. 2007;44:113-26.
50. Beck JD, Elter JR, Heiss G, Couper D, Mauriello SM, Offenbacher S. Relationship of periodontal disease to carotid artery intima-media wall thickness: the atherosclerosis risk in communities (ARIC) study. Arterioscler Thromb Vasc Biol. 2001 Nov;21(11):1816-22.
51. Beck JD, Offenbacher S. Systemic effects of periodontitis: epidemiology of periodontal disease and cardiovascular disease. J Periodontol. 2005 Nov;76 Suppl 11:2089-100.
52. Azarpazhooh A, Leake JL. Systematic review of the association between respiratory diseases and oral health. J Periodontol. 2006 Sep;77(9):1465-82.
53. Weidlich P, Cimões R, Pannuti CM, Oppermann RV. Association between periodontal diseases and systemic diseases. Braz Oral Res. 2008;22 Suppl 1:32-43.