Prevalence of Asymptomatic Apical Periodontitis and its Association with Coronary Artery Disease in a Brazilian Subpopulation

Introduction

Asymptomatic apical periodontitis (AAP) is defined as a chronic inflammation and destruction of apical periodontium caused in response to bacterial infection of the root canal system, which appears as an apical radiolucent area, and does not produce clinical symptoms (1). Epidemiological studies on the prevalence of AAP in different countries such as Canada (2), Japan (3), Colombia (4), Spain (5) and Nigeria (6) have revealed that this pathology is an oral health problem that affects significant proportions of people throughout the world.

In recent years, a growing number of studies have found evidence that there is an association between chronic oral infections and the development of adverse systemic health conditions (7). This topic has emerged as one of the main areas of research in Periodontics. Some studies have found links between chronic periodontal disease and coronary heart disease (8), stroke (9), acute myocardial infarct size (10), cerebro-
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Materijali i metode

Nakon odobrenja Etičkoga povjerenstva (Federalno sveučilište Pernambuco – UFPE, Recife, Brazil) prikupljene su informacije na temelju odgovarajućeg uzorka medicinskih kartona pacijenata koji su tražili pomoć specijalista endodoncije UFPE-a između travnja 2003. i ožujka 2010. Uključeni su samo zapisi koji su sadržavali detalje medicinske amanuze, kliničku procjenu parodontološkog statusa, uključujući sondiranje i nalaze kliničkog pregleda zuba na kojemu se trebalo obaviti endodontsko liječenje, a uključivao je test vitaliteta, perkusiju i palpciju te rendgenske snimke.

Iz svakog kartona izdvojene su sljedeće varijable: spol, broj endodontski kompromitiranih zuba, dijagnosticirana endodontska bolest i BKA. AAP je dijagnosticiran kao apikalna radiolucencija dvostruko veće širine od normalnoga parodontnog ligamenta oko asimptomatskoga nekrotičnog zuba (1, 23). Sve varijable bilježio je jedan istraživač. Tako bi se izbjegle dvojbe, iz istraživanja su bili isključeni pušači, pacijenti s dijagnosticiranom kroničnom parodontnom bolesti ili dijabetesom.

Dobivene informacije uvrštene su u tablicu te analizirane deskriptivnom statistikom i Pearsonovim hi-kvadrat testom s razinom značajnosti postavljenom na pet posto. Korišten je statistički paket za društvene znanosti, verzija 21 (SPSS, Chicago, IL, SAD).

Rezultati

Uključeno je ukupno 1600 endodontski kompromitiranih zuba 1346 pacijenata. Među njima je bilo 908 žena (67,5 %). AAP je otkriven na 641 zubu (40,1 %, tablica 1.), odnosno kod 574 pacijenata (42,6 %, tablica 2.). Oba spola (39,2 % muškaraca i 44,2 % žena, p = 0,082) i sve dobne skupine (p = 0,190, tablica 2.) bili su slično pogodjeni.

U gornjoj čeljusti sjekutići su bili najčešće (52,8 %) zahtjevani AAP-om (p < 0,001, tablica 1.), a u donjoj čeljusti cular disease (11), and development of atheromatous plaques (12). Despite numerous differences between chronic inflammatory diseases of periodontal and endodontic origins, both have important characteristics in common: they are chronic infections of the oral cavity; they share a common gram-negative anaerobic microbiota (13) and they are both accompanied by increased local levels of inflammatory markers which may extend to systemic levels (14, 15). It can, therefore, be assumed that AAP is associated with the same systemic disorders that are related to the periodontal disease (16).

The available scientific evidence shows that the periapical health status of patients may be directly related to their status of cardiovascular health (14, 16-22). However, the evidence remains limited. Therefore, the purpose of the present study was to evaluate the prevalence of AAP in a Brazilian subpopulation, as well as its association with coronary artery disease (CAD).

Materials and Methods

After approval by the Ethics Committee (Federal University of Pernambuco – UFPE, Recife, Brazil), information from a convenience sample of medical records of patients that had sought dental care in the Specialization Course in Endodontics of UFPE between April 2003 and March 2010 were collected. Only medical records containing full details of medical history and systemic health conditions that was self-reported during the process of medical history taking, and confirmed by an attached medical report; clinical assessments of periodontal status, including periodontal probing; and examination of the teeth referred for root canal treatment by means of pulp vitality tests, percussion and palpation, and periapical radiographs were included.

From each medical record, the following variables were recorded: gender, age, number of the endodontically compromised teeth, endodontic pathologies diagnosed, and history of CAD. AAP was diagnosed as an apical radiolucency over twice the width of the normal periodontal ligament in an asymptomatic necrotic tooth (1, 23). All variables were recorded by 1 observer. To exclude possible confounding factors, smoker patients, or those who were diagnosed with chronic periodontal disease or diabetes were excluded from the study.

The information obtained was tabulated and analyzed using descriptive statistics, applying the Pearson’s chi-square test, adopting the significance level of 5%. The Statistical Package for Social Sciences, version 21 (SPSS, Chicago, IL) was used.

Results

A total of 1600 endodontically compromised teeth of 1346 patients were evaluated. Of those, 908 individuals were female (67.5%). AAP was detected in 641 teeth (40.1%, Table 1) and in 574 patients (42.6%, Table 2). Both genders (39.2% male and 44.2% female, p = 0.082) and all age groups (p = 0.190, Table 2) were affected similarly.

In the upper arch, the incisors (52.8%) were the dental elements most affected by AAP (p < 0.001, Table 1), while in

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Tablica 1. Prevalencija asimptomatskoga apikalnog parodontitisa prema vrsti zuba

| Dental groups | Zubi • Teeth | S AAP-om • With AAP | Bez AAP-a • Without AAP | p vrijednost • p value |
|---------------|--------------|----------------------|--------------------------|------------------------|
| GORNJI • MAXILLARY | Svi zubi • All teeth | n | % | n | % |
| Sjekutić • Incisors | 320 | 169 | 52.8 | 151 | 47.2 |
| Očnjak • Canines | 62 | 28 | 45.2 | 34 | 54.8 |
| 1. prekutnjak • 1st Premolars | 160 | 63 | 39.4 | 97 | 60.6 |
| 2. prekutnjak • 2nd Premolars | 164 | 61 | 37.2 | 103 | 62.8 |
| 1. kutnjak • 1st Molars | 212 | 65 | 30.7 | 147 | 69.3 |
| 2. kutnjak • 2nd Molars | 78 | 16 | 20.5 | 62 | 79.5 |
| 3. kutnjak • 3rd Molars | 8 | 3 | 37.5 | 5 | 62.5 |
| Ukupno • Subtotal | 1004 | 405 | 40.3 | 599 | 59.7 |

DONJI • MANDIBULAR

| Zubi • Teeth | S AAP-om • With AAP | Bez AAP-a • Without AAP | p vrijednost • p value |
|---------------|----------------------|--------------------------|------------------------|
| Svi zubi • All teeth | n | % | n | % |
| Sjekutić • Incisors | 38 | 15 | 39.5 | 23 | 60.5 |
| Očnjak • Canines | 19 | 5 | 26.3 | 14 | 73.7 |
| 1. prekutnjak • 1st Premolars | 61 | 27 | 44.3 | 34 | 55.7 |
| 2. prekutnjak • 2nd Premolars | 93 | 43 | 46.2 | 50 | 53.8 |
| 1. kutnjak • 1st Molars | 246 | 99 | 40.2 | 147 | 59.8 |
| 2. kutnjak • 2nd Molars | 116 | 43 | 37.1 | 73 | 62.9 |
| 3. kutnjak • 3rd Molars | 23 | 4 | 17.4 | 19 | 82.6 |
| Ukupno • Subtotal | 596 | 236 | 39.6 | 360 | 60.4 |

UKUPNO • TOTAL | 1600 | 641 | 40.1 | 959 | 59.9 |

AAP: asimptomatski apikalni parodontitis • asymptomatic apical periodontitis
(*) statistički značajna razlika na razini 5.0 % • Significant association to the level of 5.0%
(a): Pearsonov hi-kvadrat test • Using Pearson’s chi-square test

Tablica 2. Prevalencija asimptomatskoga apikalnog parodontitisa prema dobnoj skupini

| Dobna skupina • Age group (godine • years) | Pacijenti • Patients | S AAP-om • With AAP | Bez AAP-a • Without AAP | p vrijednost • p value |
|------------------------------------------|----------------------|----------------------|--------------------------|------------------------|
| Svi pacijenti • All patients | n | % | n | % |
| ≤ 18 | 226 | 84 | 37.2 | 142 | 62.8 |
| 19 – 29 | 300 | 133 | 44.3 | 167 | 55.7 |
| 30 – 39 | 334 | 132 | 39.5 | 202 | 60.5 |
| 40 – 49 | 266 | 124 | 46.6 | 142 | 53.4 |
| 50 – 59 | 165 | 74 | 44.8 | 91 | 55.2 |
| ≥ 60 | 55 | 27 | 49.1 | 28 | 50.9 |

Ukupno • Total | 1346 | 574 | 42.6 | 772 | 57.4 |

AAP: asimptomatski apikalni parodontitis • asymptomatic apical periodontitis
(a): Pearsonov hi-kvadrat test • Using Pearson’s chi-square test

Tablica 3. Prevalencija bolesti koronarnih arterija u odnosu na asimptomatski apikalni parodontitis

| AAP | Pacijenti • Patients | S BKA-om • With CAD | Bez BKA • Without CAD | p vrijednost • p value | OR (IP 95 %) • OR (CI 95%) |
|------|----------------------|----------------------|------------------------|------------------------|------------------------|
| Sa • With | 574 | 16 | 2.8 | 558 | 97.2 | p<sub>a</sub> = 0.307 | 1.45 (0.71 – 2.95) |
| Bez • Without | 772 | 15 | 1.9 | 757 | 98.1 | 1.00 |

UKUPNO • TOTAL | 1346 | 31 | 2.3 | 1315 | 97.7 |

AAP: asimptomatski apikalni parodontitis • asymptomatic apical periodontitis
BKA • CAD: bolest koronarnih arterija • coronary artery disease
(a): Pearsonov hi-kvadrat test • Using Pearson’s chi-square test
OR: Odds ratio
IP • CI: interval pouzdanosti • Confidence Interval
drugi pretkutnjaci (46,2 %) \((p = 0,187)\). AAP s jednako
cuštaošću poguđa gornju i donju čeljust (40,3 % i 39,6 %, \(p = 0,770)\).

Prevalencija BKA iznosila je 2,3 posto. Pacijenti s AAP-
om imali su 1,45 veću vjerojatnost od obolijevanja od BKA
u usporedbi s pacijentima bez AAP-a \((p = 0,307, \text{ tabla 3}).\)

**Rasprava**

Primarna svrha ovoga presječnog istraživanja bila je, ana-
lizom medicinskih kartona pacijenata liječenih u klinici na
sjeveroistoku Brazila, opisati cuštaošću asimptomatskoga api-
kalog parodontitisa i njegovu povezanost s BKA-om u bra-
ziloj kojnoj urbanjoj subpopulaciji. Budući da pacijenti uključeni
u ovo istraživanje nisu slučajno uzorkovani, nego su odabrani
među onima koji su tražili liječenje, treba biti oprezan pri ek-
strapolaciji rezultata za braziloj populaciju u cijelji.

Prevalencija AAP-a u ovom istraživanju (40,1 % zuba) bi-
la je u skladu s istraživanjima provedenim u drugim popula-
cijama, kao u Rabatu u Maroku (24), Barceloni u Španjolskoj
(5) i Ile-Ifeu u Nigeriji (6), gdje se kretala između 38 i 63 posto.
No cuštaošću je bila veća nego u objavljenim istraživanjima
provedenima na engleskoj (4,1 %) (25) i štokskoj (5,8 %)
(26) te kosovskoj (12,3 %) populaciji.

Razlike uočene u rezultatima navedenih istraživanja mo-
gu se opravdati različitim stupnjevima društenog i
pogodarskog razvoja u tim zemljama te nedostatkom homog-
jenosti između analiziranih populacija, ali i nedostatak
standardizacije metoda evaluacije, što su čimbenici koji ote-
žavaju usporedbu rezultata različitih istraživanja.

Uzorak u našem istraživanju uglavnom su činile pacijen-
tice (67,5 %). U ranijim istraživanjima postignuti su slični re-
zultati, te je istaknuto da se spolna diskrepancija događa zato
što se žene više brinu o svojem zdravlju i izgledu negoli muš-
kari (28). S druge strane, u našem je istraživanju prevalenci-
ja AAP-a kod muškaraca i žena bila slična (39,2 % i 44,2 %, \(p = 0,082\)), što pokazuje da nije povezan sa spolom, kao što
je to prije bilo istaknuto u drugim istraživanjima (29 – 31).

Autors poput Kamberija i suradnika (27), Paesa da Silve
Ramosa Fernandes u njegovoj kolega (30) te Petersa i surad-
nika (31), pokazali su povećanu prevalenciju AAP-a u odno-
su na dob bolesnika. Iako su naši rezultati otkrili da ne po-
stoje statistički značajna razlika između dobnih skupina (\(p = 0,190\)), prevalencija AAP-a bila je veća ako je bolesnik bio
stariji od 60 godina (49,1 %), a pojedinci mladi od 18 godi-
ina imali su nižu (37,2 %). Prema Terčasu i suradnicima
(29) ovaj je rezultat očekivan s obzirom na to da je tijekom
godina zub izložen karijesu, periodontalnim bolestima, tjenju
i raznim operativnim postupcima koji povećavaju cuštaošću
upale pulpe.

Rezultati našeg istraživanja pokazuju da su središnji i gor-
nji bočni sjekutići najčešće pogodeni AAP-om (\(p < 0,001\)).
Ovi rezultati mogu se objasniti socijalno-ekonomskim statu-
son uzorka populacije (pacijent ne može platiti naknadu za
dugotrajno protetičko liječenje, pa je vjerojatno izabralo ek-
trakciju kompromitiranih stražnjih zuba, te zadržavanje gor-
njih prednjih zuba zbog estetskih razloga). Uz to, središnji

the lower jaw, the second premolars (46.2%) were the most
frequently affected teeth \((p = 0.187)\). AAP affects the maxilla
and the mandible with equal frequency \((40.3\% \text{ and } 39.6\%,
respectively, \(p = 0.770)\).

The prevalence of CAD was 2.3%. The patients with
AAP presented 1.45 times more chances of exhibiting CAD
compared to those without AAP \((p = 0.307, \text{ Table 3}).\)

**Discussion**

The primary objective of this cross-sectional study was
to describe the prevalence of asymptomatic apical periodon-
titis, as well as its association with CAD in a Brazilian ur-
ban subpopulation by analysis of medical records of pa-
tients treated in a walk-in clinic in the Northeast of Brazil.
Since the patients studied did not represent a random sample
of the population, but instead constituted individuals who
had sought dental treatment, the extrapolation of results for
the Brazilian population in general should be made with
cautin.

The prevalence of AAP in this study (40.1% of teeth) was
in accordance with studies conducted in other populations
such as in Rabat in Morocco (24), Barcelona in Spain (5) and
Ile-Ife in Nigeria (6), where AAP ranged from 38-63% of the
teeth examined. However, these scores were higher than those
reported in other surveys conducted in English (4.1%) (25),
Scottish (5.8%) (26), and Kosovan (12.3%) populations (27).

The discrepancies observed between the results of the
above-mentioned studies can be justified by different degrees
of social and economic development among populations, as
well as the lack of homogeneity among the analyzed popula-
tion, and the lack of standardization of evaluation methods,
factors that hamper the comparison of the results from dif-
f erent studies.

The sample in our survey was mostly composed of female
patients (67.5%). Previous research reported similar results,
stating that this gender discrepancy occurs because women
take care of their health and appearance better than men
(28). On the other hand, in our study, men and women ex-
hibited similar AAP prevalence (39.2% and 44.2%, respec-
tively, \(p = 0.082\)), showing that AAP is not related to gender,
as previously reported by other studies (29-31).

Some authors such as Kamberi et al. (27), Paes da Silva
Ramosa Fernandes et al. (30), and Peters et al. (31) have
demonstrated an increased prevalence of AAP with the advance
of patient age. Although our results revealed that there was no
statistically significant difference between the age groups
\((p = 0.190)\), the prevalence of AAP was higher in patients older
than 60 years (49.1%), while the individuals younger than 18
years had a lower prevalence (37.2%). According to Terčas et
al. (29), this result is expected since, with the advance of age,
the tooth is exposed to caries, periodontal disease, friction
and various surgical procedures that increase the incidence of
pulpal inflammation.

The results of our study showed that the central and later-
al upper incisors were the teeth which were most commonly
affected by AAP \((p < 0.001)\). These results can be explained by
the socioeconomic status of the population sample. Since

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Glavno ograničenje našeg istraživanja odnosi se na nedostatak pristupa detaljnim informacijama o kardiovaskularnom zdravlju uključenih pacijenata. Zato je vjerojatno broj osoba s BKA-om podcijenjen, bilo zbog neznanja dijela pacijenata o stvarnom stanju njihova kardiovaskularnog sustava, bilo zbog izostavljanja te informacije.

Zaključak

Na temelju rezultata ovog istraživanja može se zaključiti da je prevalencija AAP-a u obuhvaćenoj populaciji visoka i slična onoj u drugim zemljama. Bila su obuhvaćena oba spoja i sve dobre skupine. Gornji sjekutići bili su najčešće zahvaćeni AAP-om. Nadalje, pronađena je pozitivna korelacija između AAP-a i BKA, no statistički nije bila značajna.

Conclusions

From the results obtained in this study, we concluded that the prevalence of AAP in this population was high and similar to that observed in other countries. Both genders, and all age groups were affected indistinctly. Upper incisors were affected most frequently by AAP. Moreover, a positive but not statistically significant association was found between AAP and CAD.
Abstract

Objective: The aim of the present study was to determine the prevalence of asymptomatic apical periodontitis (AAP) and its association with coronary artery disease (CAD) in a Brazilian subpopulation, and to examine the correlation of AAP with gender, age and most frequently affected dental elements. Methods: The data were collected from medical records of the patients (n = 1346) treated at the Specialization in Endodontics Clinic of the Federal University of Pernambuco in the period between 2003 and 2010. From each patient, the following variables were recorded: gender, age, endodontically compromised teeth, endodontic diseases diagnosed and the history of CAD. The data were analyzed using Pearson’s chi-square test adopting a significance level of 5%. Results: AAP was diagnosed in 574 patients (42.6%), corresponding to 641 teeth (40.1%). Both genders (p = 0.082), and all age groups (p = 0.190) were affected similarly. The upper incisors (52.8%, p <0.001) had a higher prevalence of AAP. The patients with AAP showed 1.45 times more chance of exhibiting CAD (p = 0.307). Conclusions: The results pointed out that the prevalence of AAP in this population was high and similar to that observed in other countries. A positive association, but not statistically significant, between AAP and CAD was found. Keywords: Endodontics; Apical Periodontitis; Coronary Artery Disease; Epidemiology

Conflict of interest

The authors deny any conflicts of interest related to this study.

Acknowledgments

This study was supported by (THE) grants from Coordenação de Aperfeiçoamento de Pessoal de Nível Superior – CAPES – Brazil. The English version of this study has been revised by Sidney Pratt, Canadian, BA, MAT (The Johns Hopkins University), RSAdip (TEFL) University of Cambridge.

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