



## Original research

# Apical periodontitis and related risk factors: Cross-sectional study



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### ABSTRACT

**Objectives:** The aim of this cross-sectional study was to investigate an association between the prevalence of root-filled teeth (RFT) or apical periodontitis (AP) and some systemic conditions or smoking habits in an adult Portuguese population.

**Methods:** Medical histories, including age, gender, presence of cardiovascular disease (CVD), diabetes mellitus (DM), allergies, smoking status, and endodontic treatment data of 421 patients (10,540 teeth) were recorded. The prevalence of root filled teeth and the periapical status were assessed through panoramic radiographies. Periapical status was classified according to the Periapical index and AP was defined as PAI-score  $\geq 3$ . Statistic analysis was performed with PASW Statistics 20.0 using qui-square tests, odds-ratio and confidence intervals (95%).

**Results:** The overall prevalence of AP and RFT was 2.2% and 4.2%, respectively. RFT increased the possibility of having AP ( $p < 0.0001$ ). Men's group showed a higher percentage of teeth with AP ( $p < 0.0001$ ), less RFT ( $p = 0.05$ ) and more residual roots (2.3%). Smoking increased the probability of having AP ( $p = 0.002$ ) and RFT ( $p = 0.045$ ). A positive correlation was observed between RFT and DM ( $p = 0.040$ ). No statistically significant difference was found between AP and CVD, DM or allergies neither between RTF and CVD or allergies.

**Conclusions:** The higher prevalence of AP and/or RFT in smoker subjects and in diabetic patients can suggest a relationship between oral and systemic health. More epidemiological studies are required before definitive conclusions can be made.

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**Periodontite apical e fatores de risco associados: estudo transversal**

## R E S U M O

**Palavras chave:**

Periodontite apical  
Diabetes mellitus  
Fumar  
Fatores de risco

**Objetivos:** O objetivo deste estudo transversal foi investigar a associação entre a prevalência de dentes com tratamento endodôntico (RFT) ou periodontite apical (AP) e algumas condições sistêmicas ou hábitos tabágicos numa população adulta portuguesa.

**Métodos:** Histórias médicas, incluindo idade, género, presença de doenças cardiovasculares (CVD), diabetes mellitus, alergias e hábitos tabágicos, e registos dos tratamentos endodônticos de 421 pacientes (10.540 dentes) foram recolhidos. A prevalência de dentes com tratamento endodôntico e status apical foram avaliados através de radiografias panorâmicas. O status apical foi classificado de acordo com o índice periapical e a AP definida para valores  $PAI \geq 3$ . A análise estatística foi realizada através do PASW Statistics 20.0 utilizando os testes chi-quadrado, valores odds-ratio e intervalos confiança (95%).

**Resultados:** A prevalência da AP e RFT foi de 2,2% e 4,2%, respectivamente. RFT aumentou a possibilidade de ter AP ( $p < 0,0001$ ). Os homens revelaram uma maior percentagem de dentes com AP ( $p < 0,0001$ ), menos RFT ( $p = 0,05$ ) e mais raízes residuais (2,3%). Fumar aumentou a probabilidade de ter AP ( $p = 0,002$ ) e RFT ( $p = 0,045$ ). Uma relação positiva foi observada entre RFT e DM ( $p = 0,040$ ). Não se encontraram diferenças estatisticamente significativas entre AP e CVD, DM ou alergias nem entre RFT e CVD ou alergias.

**Conclusões:** Uma maior percentagem de AP e/ou RFT nos fumadores e nos pacientes com diabetes sugere uma relação entre a saúde oral e sistémica. Mais estudos epidemiológicos são necessários antes de se fazerem conclusões definitivas.

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**Introduction**

Apical periodontitis (AP) is “an acute or chronic inflammatory lesion around the apex of a tooth caused by bacterial infection of the pulp and root canal system”.<sup>1</sup> The inflammatory cells cause, among other effects, resorption of the adjacent supporting bone. The diagnosis is primarily based in the observation of a periradicular radiolucency, although it can be supported by patient’ symptoms or clinical signs in the acute phases.<sup>1,2</sup> AP is highly prevalent, and the estimated percentage of individuals with AP, in at least one tooth, is 34–70%<sup>3-7</sup>, which can rise in older patients.<sup>8-11</sup> Overall, the percentage of teeth with AP has been estimated to range between 1.7% and 6.6%.<sup>5,9,12</sup> However, amongst endodontically treated teeth the percentage is significantly higher.<sup>9,11,13-16</sup>

Root canal treatment is the most frequent therapeutic option for preserving teeth with AP and to restoring periradicular tissues’ health. Therefore, its prevalence can be linked to the presence of severe caries lesions or traumatic injuries that lead to pulp necrosis. The prevalence of individuals with, at least, one root canal treatment is between 41 and 87%.<sup>5,7,17,18</sup> The frequency of root-filled teeth varies between 2.2% and 9.39%.<sup>5,6,9,11,15,19</sup> This broad variation can be due to either different age stratification in the studies or variation within national health care services.

Several epidemiological studies have found an association between chronic dental infection, cardiovascular disease (CVD)<sup>20-25</sup>, diabetes mellitus (DM)<sup>26-29</sup> and smoking habits<sup>30,31</sup>, most of them relating to periodontal disease.

AP is, in many instances, very similar to periodontal disease regarding the microbial aetiology and the presence of elevated systemic cytokines.<sup>32,33</sup>

Patients with DM, hypertension or coronary heart disease might have decreased tissue resistance to bacterial infection and reduced ability of tissue repair after endodontic treatment. Wang et al.<sup>34</sup> found an increased risk of tooth extraction after nonsurgical endodontic treatment in patients with these diseases. Furthermore, the association of two of those conditions was a significant predictor of extraction or poorer outcome of the endodontic treatment<sup>32,35,36</sup>. However, limited data is available on the long-term prognosis of AP and root-filled teeth, in patients with systemic diseases and smoking habits.

DM, a syndrome characterized by abnormalities in carbohydrate, lipid and protein metabolism, also affects many functions of the immune system. For instance, up-regulation of pro-inflammatory cytokines from monocytes/polymorphonuclear leukocytes and down-regulation of growth factors from macrophages, resulting in dysregulated macrophage phagocytosis.<sup>37</sup> Consequently, there is delay in healing process and commitment of the immune response.<sup>38,39</sup> These events predispose to chronic inflammation, progressive tissue breakdown and diminished tissue repair capability.<sup>40-42</sup> DM has been considered as a possible modulating factor or disease modifier in endodontic infections, in the sense that diabetic individuals, especially when poorly controlled, could be more prone to developing AP.<sup>43,44</sup> The literature on the pathogenesis, progression and healing of endodontic pathology in diabetic patients is still scarce and show controversial results.<sup>29,43,45-47</sup>

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