

UNIVERSIDADE FEDERAL DE SANTA MARIA  
CENTRO DE CIÊNCIAS DA SAÚDE  
PROGRAMA DE PÓS-GRADUAÇÃO EM CIÊNCIAS  
ODONTOLÓGICAS

Janice Almerinda Marin

**PREVALÊNCIA DE PERIODONTITE APICAL DE POPULAÇÃO  
RURAL E DE SUBPOPULAÇÃO URBANA NO SUL DO BRASIL**

Santa Maria, RS  
2018

**Janice Almerinda Marin**

**PREVALÊNCIA DE PERIODONTITE APICAL DE POPULAÇÃO RURAL E  
DE SUBPOPULAÇÃO URBANA NO SUL DO BRASIL**

Tese apresentada ao Curso de Doutorado do Programa de Pós-Graduação em Ciências Odontológicas, Área de Concentração em Odontologia, ênfase em Endodontia, da Universidade Federal de Santa Maria (UFSM, RS), como requisito parcial para obtenção do grau de **Doutor em Ciências Odontológicas**.

Orientador: Prof. Dr. Carlos Alexandre de Sousa Bier

Santa Maria, RS  
2018

## FICHA CATALOGRÁFICA

Marin, Janice Almerinda    Prevalência de periodontite apical de população rural e de subpopulação urbana no Sul do Brasil / Janice Almerinda Marin.2018.

95 p.; 30 cm

Orientador: Carlos Alexandre de Sousa Bier  
Tese (doutorado) - Universidade Federal de Santa Maria, Centro de Ciências da Saúde, Programa de Pós Graduação em Ciências Odontológicas, RS, 2018

1. Periodontite periapical 2. Inquérito epidemiológico  
3. População rural 4. Radiografia dentária digital 5. Radiografia panorâmica I. Sousa Bier, Carlos Alexandre de II. Título.

Sistema de geração automática de ficha catalográfica da UFSM. Dados fornecidos pelo autor(a). Sob supervisão da Direção da Divisão de Processos Técnicos da Biblioteca Central. Bibliotecária responsável Paula Schoenfeldt Patta CRB 10/1728.

© 2018

Todos os direitos reservados a Janice Almerinda Marin. A reprodução de partes ou do todo deste trabalho só poderá ser feita mediante a citação da fonte.

E-mail: profjaniceendo@hotmail.com

**Janice Almerinda Marin**

**PREVALÊNCIA DE PERIODONTITE APICAL DE POPULAÇÃO RURAL E  
DE UMA SUBPOPULAÇÃO URBANA**

Tese apresentada ao Curso de Doutorado do Programa de Pós-Graduação em Ciências Odontológicas, Área de Concentração em Odontologia, ênfase em Endodontia, da Universidade Federal de Santa Maria (UFSM, RS), como requisito parcial para obtenção do grau de **Doutor em Ciências Odontológicas**.

**Aprovado em 15 de março de 2018:**

---

**Carlos Alexandre de Sousa Bier, Dr. (UFSM)**  
(Presidente da Banca/Orientador)

---

**Carlos Frederico Brillhante Wolle, Dr. (Uningá - Santa Maria)**

---

**Carina Michelin**

---

**José Luiz da Silva Lage-Marques, Dr. (USP) Parecer**

---

**Renata Dorneles Morgental, Dra. (UFSM)**

Santa Maria, RS  
2018

## **DEDICATÓRIA**

*Dedico este trabalho ao meu Pai (in memoriam) que nunca poupou esforços para eu me transformar no que sou, e que mostrou todos os valores de humanidade e dignidade todos os dias de sua vida. Dedico ainda aos meus filhos, que vieram para me mostrar o amor maior que um ser humano é capaz de sentir, e que iluminam todos os dias de minha vida.*

## AGRADECIMENTOS

A **Deus**, de Infinita bondade, que me proporcionou todas as dificuldades e alegrias que foram necessárias para eu evoluir e me transformar em um ser humano capaz de amar e respeitar o próximo.

A minha família, **Fabio, Mikael e Jamille**, que me deram amor incondicional e suporte em todos os momentos desta caminhada que se chama “Doutorado”, e a **Gabriela** pelo carinho e compreensão.

A meus irmãos **Joceli, Celeste, Miguel, Tiago** e, especialmente, a **Elisandra** que possuí, como eu, duas grandes paixões: a Especialidade em Endodontia e à Docência.

Aos meus companheiros do “Levantamento Epidemiológico-Radiologia” **Carlos Alexandre Bier, Fernando Broll Ribeiro** e, especialmente, a **Carlos Wolle** que me incentivou e não mediu esforços para que esta conquista fosse possível. Sem a ajuda de vocês não existiria este trabalho, sou muito grata por cada dia que estiveram em meu lugar quando eu não podia estar.

Ao meu orientador **Carlos Alexandre de Souza Bier** pela amizade, por ter acreditado que seria possível quando eu duvidei, e que me proporcionou a experiência fantástica que foi o levantamento epidemiológico

As Companheiras do Levantamento Epidemiológico **Alessandra Pascoal, Silvia de David** e, especialmente, **Ticiane Goes de Mario** pela coordenação e organização do trabalho; **Jociane Boligon** e **Maisa Casarim** pelo apoio e auxílio em todos os momentos, até a conclusão deste trabalho. Gratidão a todas pelo enfrentamento de todas as dificuldades, por toda a superação individual que esse trabalho exigiu de cada uma de cada uma de nós.

À minha banca examinadora, que, da melhor forma possível, contribuirá para aperfeiçoamento deste trabalho. Especialmente ao **Prof. Dr. Jose Luiz Lage-Marques** que me inseriu nesta paixão que é a docência em Endodontia, e que me inspirou, no Mestrado, a buscar e compartilhar conhecimento sem limites, e a me superar a cada nova aula. Meu respeito e sincero agradecimento.

À “família Unifra”: as queridas coordenadoras **Profª. Ana Maria Chagas** e **Profª. Raquel Pippe Antoniazzi** pela suporte e incentivo; **Tatiana Militz, Pinto, Bianca Zimmermam, Patricia Dotto, Graciela Vitalis, Simone Antoniazzi, Anne Becker, Leticia Machado** e demais colegas, possivelmente todos os colegas do Centro Universitário Franciscano, de alguma forma, me auxiliaram em algum momento, especialmente os colegas

da especialidade **Prof. Angelo Manfio, Prof. Julio Durand e Manuela Santini**. Sou grata a cada um de vocês.

À “família Uingá” que suportou tantas trocas de turnos, de ausências durante a realização do levantamento epidemiológico.

À “família Bussines&Dental” pela adaptação a constantes alterações de horários.

Aos professores da UFSM **Gustavo Dotto e Gabriela Salatino Liedke**, pelo auxílio no treinamento e calibragem na Radiologia.

Aos professores coordenadores do levantamento epidemiológico **Carlos Heitor Cunha Moreira, Thiago Machado Ardenghi e Fabricio Batistin Zanata**: sou grata pela oportunidade de participar.

Aos professores do Programa de Pós-Graduação da Odontologia **Carlos Heitor Cunha Moreira, Thiago Machado Ardenghi, Raquel Rocha, Fabio Zovico, Tatina Leinz e Angela Dullius**: sou grata pela compreensão durante as aulas, por entender meus “horários indisponíveis”.

À Prefeitura de Rosário do Sul, agentes de saúde, motoristas, e professoras das escolas, especialmente Sra. Gislaine e Sr. Alan Kardec que nos apoiaram e nos acolheram.

Aos amigos pelo incentivo e pela compreensão, especialmente **Ania Kliemam, Giovana e Ivan Dreyer**.

A **Cassia Klein e Ana Carolina Przychynski** pelo auxílio no segundo artigo.

Aos meus alunos que me inspiram sempre a ser uma docente melhor.

Aos voluntários que participaram da pesquisa, muito obrigada pela colaboração. Vocês tornaram possível a realização deste trabalho.

*Não fiz o melhor, mas fiz tudo para que o melhor fosse feito. Não sou o que deveria ser, mas não sou o que era antes.*

*Martin Luther King*



## RESUMO

### PREVALÊNCIA DE PERIODONTITE APICAL DE POPULAÇÃO RURAL E DE SOBPOPULAÇÃO URBANA NO SUL DO BRASIL

AUTORA: Janice Almerinda Marin  
ORIENTADOR: Carlos Alexandre De Sousa Bier

A presente tese é composta por dois artigos científicos com tema principal de periodontite apical (PA). Artigo 1: este trabalho teve por objetivo descrever a prevalência e a extensão da PA, prevalência de tratamentos endodônticos em uma população adulta a partir de uma amostra representativa. A coleta de dados teve como alvo a população da zona rural de Rosário do Sul - RS, no período de março de 2015 a maio de 2016. Foram coletadas variáveis sócio demográficas, além de realização de exame clínico e radiográfico. As imagens radiográficas foram obtidas por meio de sensor digital, sendo realizado levantamento periapical completo. Posteriormente, foram avaliadas pelo índice periapical (PAI), para análise estatística dicotomizada para ausência (índices 1 e 2) ou presença (3 a 5) de PA. Foram observadas frequência de resto radiculares, lesão endo-periodontal e reabsorção interna e externa associadas ao órgão dental. Análises descritivas foram realizadas por meio de médias, desvio padrão e frequências, para a obtenção de dados das características individuais, bem como das características radiográficas apresentadas. Foram incluídos 584 indivíduos, idade média da população de 47,30 anos (18 - 93) distribuídos igualmente entre homens (293) e mulheres (291). PA esteve presente em 352 (60,3%) dos sujeitos incluídos – mínimo de 1 e máximo de 12 dentes com PA por indivíduo. Foram examinados 11.600 dentes, 891 (5,4%) afetados pela PA em toda a amostra; a prevalência de tratamento endodôntico foi de 1,2% (191), e a alteração mais prevalente foi de restos radiculares (250). Conclui-se que a prevalência de PA, nessa comunidade rural, foi de 60,3% dos indivíduos; a faixa etária de 40 a 60 anos apresentou maior percentual; a PA afetou mais os dentes superiores. A prevalência de tratamentos endodônticos foi de 1,2% dos dentes. Artigo 2: o segundo artigo teve por objetivo descrever a prevalência de periodontite apical e de tratamento endodôntico em adultos, que realizaram radiografia panorâmica digital no serviço de radiologia do Centro Universitário Franciscano durante os anos de 2015 e 2016. Foram coletados dados como gênero, idade, dentes presentes e perdas dentais dos indivíduos. Os dentes foram classificados quanto à presença ou ausência de periodontite apical. Definiu-se periodontite apical o dente em que ocorreu o aumento do ligamento periodontal apical em duas vezes o diâmetro quando comparado com ligamento periodontal lateral do mesmo dente, ou destruição de lâmina dura, ou reabsorção de tecido ósseo. Foram verificadas outras alterações como restos radiculares, lesão endo-periodontal e reabsorções externa e interna associadas ao órgão dental. Análises descritivas foram realizadas por meio de médias, desvio padrão e frequências. A amostra foi composta de 660 radiografias panorâmicas digitais, correspondente a 393 mulheres e 267 homens, com média de idade de 41 (18 - 83) anos. A PA esteve presente em 339 (51,5%) dos indivíduos. Foram avaliados 15.627 dentes, dos quais 801 (4,3%) apresentaram periodontite apical, a frequência de tratamentos endodônticos foi de 841 (4,6%) de dentes. A associação de PA e endodontia foi observada em 191 dentes, totalizando 1% da amostra. Conclui-se que a prevalência de periodontite apical nessa amostra foi de 51,4%, sucedido em 339 sujeitos com pelo menos um dente com lesão; a PA esteve presente em 801 (4,3%) dentes avaliados, a faixa etária com maior prevalência foi dos 40 aos 60 anos, e afetou mais os molares inferiores, seguido dos molares superiores.

**Palavras-chaves:** Periodontite periapical. Inquérito epidemiológico. População rural. Radiografia dentária. Radiografia panorâmica.

## ABSTRACT

### PREVALENCE OF APICAL PERIODONTITIS OF RURAL PUPULATION AND URBAN SUBPOPULATION IN THE SOUTH OF BRAZIL

AUTHOR: Janice Almerinda Marin  
ADVISOR: Carlos Alexandre de Sousa Bier

This thesis is composed by two scientific articles whose main theme is apical periodontitis (AP). Article 1: this research aimed to describe the prevalence and the extent of AP and prevalence of endodontic treatment in an adult population from a representative sample. Data collection targeted the population from Rosário do Sul – RS rural area, from 2015 March to 2016 May. Sociodemographic variables were collected besides the execution of clinical and radiographic exam. The radiographic images were obtained through digital sensor with complete periapical levy. After this, they were evaluated through periapical index (PAI) to dichotomized statistical analysis for absence (indexes 1 and 2) or presence (3 to 5) of PA. The frequency of root remaining, endodontic-periodontal lesion and intern and extern reabsorption related to dental organ were also observed. Descriptive analysis were performed through means, standard deviate and frequencies to gather data about individual characteristics and about obtained radiographic characteristics. 584 individuals were included, population average age of 47.30 years (18 - 93), who were equally distributed between men (295) and women (293). PA was present in 352 (60.3%) of the included subjects – minimum of 1 and maximum of 12 teeth with PA for each subject. 11,600 teeth were evaluated, with an amount of 891 (5.4%) which were affected by the pathology in the entire sample; the prevalence of endodontic treatment was 1.2% (191), and the most prevalent alteration was root remnant (250). The conclusion is that the PA prevalence in this rural community was 60.3% from the subjects; the age from 40 to 60 years presented the highest percentage; and the pathology affected superior teeth more. Article 2: this survey aimed to describe the prevalence of apical periodontitis in adults who were submitted to digital panoramic radiograph at Centro Universitário Franciscano radiology department from 2015 to 2016. Data, as gender, age, present teeth and dental losses from the subjects, were collected. The teeth were classified about presence or absence of apical periodontitis. Apical periodontitis was defined as the tooth in which there was growth twice as large as the normal diameter of the lateral periodontal ligament in the same tooth, or loss of the hard blade, or reabsorption of bone tissue. Another alterations related to the teeth were observed. Descriptive analysis were performed through means, standard deviate and frequencies. The sample was composed by 660 digital panoramic radiographs, corresponding to 393 women and 267 men, with average age of 41 (18 - 83) years. PA was present in 339 (51.5%) of the subjects. 15,627 teeth were evaluated, in which 801 (4.3%) presented apical periodontitis, the frequency of endodontic treatment was 841 (4.6%) of the teeth. The association between PA and endodontics was observed in 191 teeth, totalizing 1% of the sample. The conclusion is that the prevalence of apical periodontitis, in this sample, presented the frequency of 51.4%, that is 339 subjects presented at least one lesioned tooth; PA was present in 801 (4.3%) of the evaluated teeth; the age from 40 to 60 years had the highest prevalence; and the pathology affected lower molar teeth more, followed by upper molars.

**Keywords:** Apical periodontitis. Health surveys. Rural population. Dental radiography. Panoramic radiography.

## LISTA DE FIGURAS

### ARTIGO 1

Figura 1 – Inclusion flowchart of subjects ..... 40

Figura 2 – Distribution of AP and changes in the teeth according to gender..... 41

### ARTIGO 2

Figura 1 – Graphic for distribution of individuals according age to gender and AP (n=660).. 56

## LISTA DE TABELAS

Tabela 1 – Prevalência de Periodontite apical em Estudos transversais .....	21
<b>ARTIGO 1</b>	
Tabela 1 – Clinical and sociodemographic characteristics of the sample .....	42
Tabela 2 – Distribution of individuals and teeth according to age and AP (n=584) .....	43
Tabela 3 – Distribution of AP and changes in the teeth according to location and teeth affected (n=11,600) .....	44
<b>ARTIGO 2</b>	
Tabela 1 – Distribution of frequency, percentage and AP according to the tooth type.....	55
Tabela 2 – Distribution of individuals and teeth according to age (n=660) .....	55

## SUMÁRIO

<b>1 INTRODUÇÃO.....</b>	<b>14</b>
<b>2 REVISÃO DE LITERATURA .....</b>	<b>16</b>
<b>3 ARTIGO 1 – PREVALENCE OF APICAL PERIODONTITIS: REPRESENTATIVE SERVEY ON A RURAL SOUTHEN BRAZILIAN POPULATION .....</b>	<b>26</b>
<b>4 ARTIGO 2 – PREVALÊNCIA DE PERIODONTITE APICAL EM RADIOGRAFIAS PANORÂMICAS DIGITAIS REALIZADAS EM INSTITUIÇÃO DE ENSINO SUPERIOR.....</b>	<b>45</b>
<b>5 DISCUSSÃO.....</b>	<b>57</b>
<b>6 CONCLUSÃO.....</b>	<b>60</b>
<b>REFERÊNCIAS.....</b>	<b>61</b>
<b>APÊNDICE A – TCLE MAIOR DE 18 ANOS .....</b>	<b>66</b>
<b>ANEXO A – PARECER CONSUBSTANCIADO DO CEP – ARTIGO 1.....</b>	<b>68</b>
<b>ANEXO B – PARECER CONSUBSTANCIADO DO CEP – ARTIGO 2.....</b>	<b>71</b>
<b>ANEXO C – NORMAS DO JOURNAL OF ENDODONTICS.....</b>	<b>73</b>
<b>ANEXO D – NORMAS DO INTERNATIONAL ENDODONTICS JOURNAL .....</b>	<b>84</b>

## 1 INTRODUÇÃO

O objetivo da endodontia é prevenir ou tratar as patologias periapicais. A periodontite apical (PA) é caracterizada por uma resposta imunológica do hospedeiro frente à infecção microbiana dos sistemas de canais radiculares que levam a destruição dos tecidos periapicais com objetivo de conter a infecção microbiana (NAIR, 2004). Essa resposta envolve mediadores intercelulares, metabólitos, moléculas e anticorpos humorais (COTTI et al., 2014; GOMES et al., 2013; MEHRAZARIN; ALSHAIKH; KANG, 2017). O fator etiológico da doença periapical foi definitivamente esclarecido com o trabalho de Kakehashi; Stanley; Fitzgerald (1965), os quais demonstraram em modelo animal, a associação entre a contaminação radicular e a patologia periapical.

A avaliação da frequência, localização e extensão da PA pode ser avaliada radiograficamente, como uma imagem radiolúcida associada a um elemento dental, por meio de radiografias periapicais (DOLCI et al., 2016; MERINI et al., 2017; WOLLE et al., 2013), panorâmicas (AL-NAZHAN et al., 2017; HUUMONEN; SUOMINEN; VEHKALAHTI, 2016; KIELBASSA; FRANK; MADDAUS, 2017) ou Tomografias computadorizadas de feixes cônicos (TCFC) (VAN DER VEKEN et al., 2016). As TCFC são normalmente indicadas apenas para áreas de interesse clínico e as radiografias periapicais e panorâmicas em levantamento completo em toda boca. A acurácia do instrumento de avaliação pode determinar a variação do resultado. Radiografias periapicais convencionais e digitais apresentam uma boa acurácia na identificação de PA, *in vitro*, e a TCFC apresentam uma excelente acurácia na identificação destas lesões, foi a conclusão de metanálise com apenas 6 artigos incluídos (LEONARDI DUTRA et al., 2016).

Como método de avaliação radiográfica, o Índice Periapical (PAI) oferece uma escala ordinal de 5 pontuações que variam conforme o tamanho da lesão de “saudável”, índices 1 e 2, para “doença”, índices 3, 4 e 5, este último considerado “periodontite severa”. Essa metodologia baseia-se no uso de radiografias de referência de incisivos superiores humanos com diagnósticos histológicos verificadas originalmente por Brynolf. Tal classificação foi idealizada para ser utilizado tanto em ensaios clínicos como em levantamentos epidemiológicos. Além disso, os pontos de corte na escala de 5 pontos podem ser usados para avaliação do resultado de tratamento endodônticos ou do estado de saúde, de forma dicotômica. (ØRSTAVIK; KEREEKES; ERIKSEN, 1986).

Um dos objetivos da epidemiologia é servir de base para políticas de saúde pública, de prevenção ou controle de doenças, fundamentadas na necessidade da população. Estudos

observacionais descrevem a população, identificam doenças, características e necessidade da população estudada. São instrumentos para fornecimento de bases racionais para implementação de políticas de prevenção ou controle de doenças, assim como para nortear novos estudos de acompanhamento longitudinal e ensaios clínicos (GORDIS, 2010).

A presente tese tem por objetivo avaliar a prevalência de periodontite apical em duas situações diferentes: o primeiro artigo em população rural, empregando radiografias periapicais, com amostra representativa da área rural de Rosário do Sul-RS, e o segundo artigo em uma subpopulação de pacientes que realizaram radiografias panorâmicas em uma instituição de Ensino Superior, em área urbana, Santa Maria- RS.

## 2 REVISÃO DE LITERATURA

A periodontite apical (PA), doença inflamatória que apresenta como fator etiológico a contaminação microbiana do canal radicular, foi definitivamente estabelecida por (KAKEHASHI, STANLEY, FITZGERALD 1965) quando comprovada a associação da contaminação endodôntica com as doenças periapicais. Desde então vários estudos buscam a identificação e caracterização da microbiota envolvida nesta infecção (DAHLÉN, 2002; MATUSOW; GOODALL, 1983; NAIR, 2006; PN, 2004; RÔÇAS et al., 2001; TROPE et al., 1988). É considerada, atualmente, como uma doença multifatorial que pode ser exacerbada pelo tabagismo e por certas doenças sistêmicas, e possui, ainda, uma clara predisposição genética (MEHRAZARIN; ALSHAIKH; KANG, 2017).

Contudo, a PA abrange todas as doenças periapicais, agudas e crônicas, com origem cronológica na inflamação do ligamento periodontal apical, estabelecida pelo desequilíbrio entre a defesa do organismo e o agente agressor, envolvendo células, mediadores intercelulares, metabólitos, moléculas efetoras e anticorpos humorais. Essa infecção inicial, classificada como primária, leva ao início da reabsorção de tecido ósseo e torna-se visível radiograficamente em estágios mais avançados, com diagnósticos prováveis de periodontite crônica fibrosa, granulomas e cistos periapicais. Contudo, apresenta características radiográficas semelhantes a cicatriz de tecido periapical que envolve o processo de reparo após a eliminação do agente agressor (CROITORU et al., 2016; GUTMANN et al., 2009; NAIR, 2006; PN, 2004). A infecção secundária ou persistente, em dentes tratados endodonticamente, normalmente, também é causada pela da microbiota do canal radicular, que persiste após o tratamento do mesmo (NAIR, 2004).

Os diagnósticos das doenças endodônticas são realizados clínica, radiográfica e histopatologicamente, sendo que o exame histopatológico está limitado a dentes nos quais serão realizadas cirurgias endodônticas ou extração. Doenças periapicais agudas (sintomatologia) geralmente, não apresentam imagem radiográfica, devido à ausência de reabsorção de tecido ósseo (CROITORU et al., 2016). Há grande variação na terminologia endodôntica, principalmente nos diagnósticos, em que há diversas classificações e nomenclaturas (GUTMANN et al., 2009).

Já a avaliação radiográfica da PA pode ser realizada por meio de radiografias panorâmicas e periapicais convencionais ou digitais, e tomografias computadorizadas. Em tomografias, são visualizadas patologias em estágio inicial, enquanto em periapicais e panorâmicas, em estágios



mais avançados (ESTRELA; BUENO, 2008; LEONARDI DUTRA et al., 2016). Radiografias periapicais são largamente utilizadas na prática clínica e em estudos epidemiológicos (DOLCI et al., 2016; KIELBASSA; FRANK; MADDAUS, 2017; VAN DER VEKEN et al., 2016), entretanto, diversos estudos com objetivo de avaliar a prevalência de PA são realizados em radiografias panorâmicas devido à facilidade de aquisição, especialmente em banco de dados radiológicos (AL-NAZHAN et al., 2017; DAWSON et al., 2016; HUSSEIN et al., 2016; HUUMONEN; SUOMINEN; VEHKALAHTI, 2016).

A metodologia de avaliação de PA amplamente utilizada em radiografias periapicais ou panorâmicas é o índice PAI que classifica a patologia em 5 escores, podendo ser dicotomizado para ausência (índices 1 e 2) ou presença (índices 3 a 5) de lesão, ou saúde/doença (DOLCI et al., 2016; DUGAS NN1, LAWRENCE HP, TEPLITSKY PE, PHAROAH MJ, 2003; KIELBASSA; FRANK; MADDAUS, 2017; LÓPEZ et al., 2014; RUIZ et al., 2017). Outro método dicotômico classifica em saudável sem alteração na região apical ou doença quando apresenta o ligamento periodontal apical alargado, maior que o dobro da largura do periodontal lateral de outras partes da raiz ou apresenta radiolucidez periapical observada (DAWSON et al., 2016; DE MOOR et al., 2000; VAN DER VEKEN et al., 2016). Ambos, os métodos são utilizados em estudos endodônticos.

Em um dos primeiros estudos epidemiológicos que avaliaram a PA, os autores utilizaram como parâmetro a de destruição de tecido ósseo na região apical, por meio de radiografias periapicais. A população estudada foi composta por 500 idosos (mais de 65 anos), não institucionalizados, de área urbana e rural, destes 46% eram edêntulos. Seus resultados expuseram a prevalência de PA de 10% dos dentes e 72% dos indivíduos, além disto obtiveram como desfecho secundário uma alta percentagem de tratamentos endodônticos (69%). Ainda, ressaltaram que a qualidade dos tratamentos endodônticos foram predominantemente inadequados pelos critérios, utilizados no estudo para esta população (ALLARD; PALMQVIST, 1986).

Uma década após, em estudo observacional com população urbana da Alemanha, incluindo 323 indivíduos, apresentado como desfecho primário a qualidade da endodontia e a prevalência de PA apical como desfecho secundário, obteve-se a frequência de 61% dos dentes com endodontia realizada com presença de PA como resultado deste estudo (WEIGER et al., 1997).

Logo após, Kirkevang; Ørstavik e Wenzel, em 2001, avaliaram a melhora na qualidade e tratamentos endodônticos, na Dinamarca, em duas subpopulações urbanas, avaliadas em

períodos distintos com 20 anos de diferença. Tais autores constataram que ocorreu a melhora na qualidade técnica das obturações, porém a percentagem de destruição de tecido ósseo não melhorou seus índices com o passar do tempo. Esse mesmo grupo de autores ainda realizou um levantamento epidemiológico com busca sistemática e representativa da população estudada, e observaram a prevalência de 3,4% dos dentes com PA; contudo, nos dentes com tratamento endodôntico, a percentagem foi de 52,2%. (KIRKEVANG et al., 2001).

Complementado estes estudos, foi realizada, em 2012, uma Revisão Sistemática que incluiu estudos transversais observacionais com objetivo de analisar a prevalência de PA em diversas populações com altos índices de desenvolvimento socioeconômico, realizados entre 1990 e 2000. Realizou-se uma metanálise com 330.861 dentes, resultando em uma prevalência de 5% dos dentes com patologias periapicais, equivalendo a 1 dente por pessoa incluída nesses estudos. Dentes com tratamento endodôntico corresponderam a 10 % da amostra, e destes dentes 36% apresentaram lesão apical (PAK; FAYAZI; WHITE, 2012).

Revisando o panorama brasileiro, as publicações contemplam amostras de conveniência, como banco de dados de curso de Odontologia (com banco de dados de endodontia) ou de banco de dados radiológicos, de populações urbanas. Foram realizados com diferentes metodologias e observaram índices muito variados de prevalência de PA (BERLINCK et al., 2015; HEBLING et al., 2014; PAES DA SILVA RAMOS FERNANDES et al., 2013; PEDRO et al., 2016).

Uma das primeiras publicações teve o objetivo de avaliar a qualidade dos tratamentos endodônticos e status periapical, em uma população do Rio de Janeiro, RJ (n = 2051 dentes) e apontou altos índices de PA, em torno de 60% dos dentes incluídos (SIQUEIRA et al., 2005). Entretanto, na mesma instituição de ensino, alguns anos após outro estudo avaliou a prevalência de PA em todo o banco de dados, não apenas em dentes tratados endodonticamente como no anterior. O desenho do estudo incluiu 1.126 indivíduos e 25.292 dentes avaliados, resultando na presença de 1.754 dentes com tratamento endodôntico, destes 293 apresentaram PA. Os autores observaram, ainda, que a prevalência de PA foi de 33,7% dos indivíduos (BERLINCK et al., 2015).

Ainda revisando publicações que abrangem a população brasileira, outro estudo incluiu indivíduos da região norte do Brasil, com o mesmo objetivo de avaliar a prevalência de PA, na população de São Luís, MA, com 200 pacientes, resultando em 135 (67,5%) sujeitos com PA. Dos 5.008 dentes avaliados, 849 (5,9%) apresentaram a patologia, observaram ainda, 533 (11%)

dentes com tratamento endodôntico, destes 42,5% foram afetados pela doença (TERÇAS et al., 2006).

Com o desfecho primário de avaliar dentes tratados endodonticamente, na região central do país, em 2008, na cidade de Goiânia-GO, pesquisadores incluíram 1.372 dentes tratados endodonticamente no estudo. Concluíram que o tratamento endodôntico com baixa qualidade é um fator de risco para PA (OR - 9,96). Demonstraram em seus resultados que a prevalência de PA varia conforme a qualidade do tratamento endodôntico (16,5% vs. 66,3%). E, nesse estudo, 591 (43,1%) obturações apresentaram baixa qualidade conforme os critérios exigidos pelo autor (ESTRELA et al., 2008).

Alguns anos após, com uma população (N = 300) da cidade de São Paulo, distinto estudo apresentou uma frequência de 51,4% dos indivíduos com PA, avaliado por tomografia (PAES DA SILVA RAMOS FERNANDES et al., 2013). Com frequência um pouco menor de presença de PA, justificada pela característica sociodemográfica da população estudada (que apresentava altos índices de perdas dentárias, faixa etária alta, idade média de 74 anos, ainda no mesmo estado, em uma população institucionalizada (N = 98 indivíduos), na cidade de Piracicaba) resultou que 42% da população dentada, estudada na instituição, apresentou PA. Foram avaliados 942 dentes, 114 (12%) dos dentes com a patologia (HEBLING et al., 2014).

O estudo mais recente que contempla a população do Brasil avaliou 1.398 radiografias panorâmicas digitais, em um banco de dados radiológicos, e teve por objetivo avaliar a qualidade dos tratamentos endodônticos e relacionar à PA. Avaliou 37.928 dentes e demonstrou a frequência de endodontia em 2.329 dentes. Observou, em seu estudo, a prevalência de PA apenas nestes dentes tratados endodonticamente, que foi de 52% (PEDRO et al., 2016).

Prosseguindo no cenário internacional, nos últimos anos, diversos estudos abordaram a prevalência de PA e foram publicados em revistas odontológicas (Tabela 1). Alguns desses artigos além de avaliar a frequência da PA, também avaliaram a frequência de tratamento endodôntico nas diferentes populações, na Arábia Saudita, na Suécia, no Brasil, na Finlândia, na Espanha, e na Austrália (AL-NAZHAN et al., 2017; DAWSON et al., 2014; HEBLING et al.,

2014; UUMONEN; SUOMINEN; VEHKALAHTI, 2016; LÓPEZ-LÓPEZ et al., 2012; TIMMERMAN; CALACHE; PARASHOS, 2017).

Tabela 1. Prevalência de Periodontite apical em Estudos transversais

<b>Autores</b>	<b>País</b>	<b>Tipo de imagem</b>	<b>Avaliação</b>	<b>N (sujeitos)</b>	<b>PA N (%)</b>	<b>N (dentes)</b>	<b>PA n (%)</b>	<b>PA e endodontia n (%)</b>
<i>Pak; Fayazi; White, 2012</i>	Revisão Sistemática	-	-	x	x	300861	<b>16288(5,4)</b>	10373(35,9)
<i>López- López et al 2012</i>	Espanha	PD	PAI	397	<b>135(34)</b>	9390	<b>259 (2,8)</b>	144 (23.8)
<i>Kirkevang , Vaeth , Wenzel . 2012</i>	Dinamarca	PEC; BW	PAI	327	<b>176(53,8)</b>	8512	<b>365(4,3)</b>	216(44,4)
<i>Abella et al. 2012</i>	Espanha	CBCT; PED*	2 x + LP	x	x	307**	<b>CBCT 42(13,7)</b> <b>PED 10(3,3)</b>	x
<i>Abella et al. 2014</i>	Espanha	CBCT; PED*	2 x + LP	155	x	340**	<b>CBCT 141(41,5)</b> <b>PED 129(37,9)</b>	x
<i>Paes da Silva et al. 2013</i>	Brasil	CBCT		300	x	5585	<b>192(3,4)</b>	34(89,5)
<i>Kalender et al. 2013</i>	Turquia	PD e PEC	PAI	1006	<b>684(68)</b>	24730	<b>1734(70)</b>	1364
<i>Mukhaimer, Hussein, Orafi., 2012</i>	Palestina	PC	2 x + LP	258	x	6482	<b>978(15,1)</b>	509(59)
<i>Jersa ; Kundzina 2013</i>	Letônia	PC	PAI	312	<b>224 (72)</b>	7065	<b>502(7)</b>	384(31)
<i>Abella et al. 2014</i>	Espanha	CBCT; PD	2 x + LP *	x	x	340**	<b>228(62,1)</b>	x
<i>Dutta; Smith-Jack; Saunders, 2014</i>	Escócia	CBCT	2 x + LP	245	<b>96</b>	3595	<b>209(5,81)</b>	81(47,37)

<i>Hebling et al. 2014</i>	Brasil	PEC	PAI	98	<b>42(42,9)</b>	942	<b>114(12,1)</b>	82(72)
<i>Nur et al. 2014</i>	Turquia	CBCT	2 x + LP	276	<b>x</b>	x	<b>x</b>	238(45,7)
<i>Berlinck et al. 2015</i>	Brasil	PEC	PAI	1126	<b>x</b>	25292	<b>1700</b>	293(16)
<i>Karabucak et al. 2016</i>	EUA	CBCT	2 x + LP	x	<b>x</b>	x	<b>676(59,5)¤</b>	x
<i>Dawson et al. 2016</i>	Suécia	PD	2 x + LP	440	<b>x</b>	11876	<b>x</b>	167(30)
<i>Pedro et al. 2016</i>	Brasil	PD	PAI	1398	<b>x</b>	37928	<b>x</b>	1218(52,3)
<i>Al-Nazhan et al 2017</i>	Arábia Saudita	PC	2 x + LP	926	<b>x</b>	25028	<b>1556(6,2)</b>	592
<i>Huumonen; Suominen; Vehkalahti, 2016</i>	Finlândia	PC	2 x + LP	5335****	<b>1440(27)</b>	120635	<b>4,2</b>	15,3
<i>Kielbassa; Frank; Madaus, 2017</i>	Áustria	PD	2 x + LP	1000	<b>605(60)</b>	22586	<b>1454(6,4)</b>	1307(55)
<i>Hussein et al. 2017</i>	Arábia Saudita	PED	PAI			6.409	<b>1,7</b>	72(22)
<i>Vengerfeldt et al. 2017</i>	Estônia	PD	Strinberg 1956	6552****	<b>3584 (54,7)</b>	181.495	<b>11438(6,3)</b>	6205(51,9) ¥
<i>El Merini et al. 2017</i>	Marrocos	PC; PEC	PAI	508	<b>230(45,3)</b>	12719	<b>526(4,2)</b>	359(66,7)
<i>Timmerman; Calache; Parashos, 2017</i>	Austrália	PC	PAI	695	<b>179(25,8)</b>	16936	<b>325(1,9)</b>	118(41,5)

PD (Panorâmicas Digitais); PC (Panorâmicas Convencionais); PED (Periapicais Digitais); PEC (Periapicais Convencionais); BW (Bitewing); CBCT Tomografias de feixe cônico: \* associou diagnóstico clínico; \*\* utilizou raízes como unidade; \*\*\* associação de doença periodontal; \*\*\*\* amostra representativa da população ¤ 250 (64,9) Molares 237, (64,2) Pré-molares; ¥ 76% dos dentes com endodontia/Incluso pulpotomia; x informação ausente no artigo

Além de avaliar a frequência, outros estudos observacionais apresentaram como objetivo avaliar a qualidade dos tratamentos endodônticos e relacionar com a prevalência de PA. Foi constatado, nestes estudos, que a baixa qualidade do tratamento endodôntico está relacionada ao aumento da prevalência de PA, e é, portanto, considerada fator de risco para presença de patologia. Além disso, foi percebido alta percentagem de tratamento endodôntico considerado inadequado pelos autores destes trabalhos, conforme critérios por eles estabelecidos, nas populações estudadas (ABELLA et al., 2012; ABELLA; PATEL; DUR, 2014; JERSA; KUNDZINA, 2013a; KALENDER et al., 2013; MUKHAIMER; HUSSEIN; ORAFI, 2012a; PEDRO et al., 2016)

Estudo recente corrobora estes resultados quando avaliou a PA como desfecho primário e associou o tratamento endodôntico e/ou a qualidade do mesmo à prevalência de doença. De tal modo os autores, com amostra de conveniência, em pacientes que compareceram para tratamento odontológico na Faculdade de odontologia da Universidade Casablanca- Espanha (n = 508), empregando radiografias panorâmicas e complementaram com periapicais, para utilizaram índice periapical (PAI) como metodologia de avaliação. Seus resultados demonstraram que 45,3% dos indivíduos apresentaram PA (4% dos dentes). Índice de 66,8% dos dentes com tratamento de endodôntico apresentaram PA, essa percentagem aumentou nos dentes com tratamentos endodônticos classificados como inadequado pelo autor (91,5%). O autor considerou como tratamentos adequados nesta amostra apenas 29,6%. Concluindo seu trabalho, demonstrou associação de frequência de PA e tratamento endodôntico inadequado (MERINI et al., 2017).

Com o mesmo propósito de avaliar a prevalência de PA como desfecho primário, também em banco de dados, igualmente com amostra de conveniência (n = 631), a população alvo foi indivíduos que realizaram TCFC no hospital da Bélgica. Os autores detectaram a prevalência de 5,9% dos dentes com a PA. Além disso, demonstraram que apenas 49% dos tratamentos endodônticos apresentaram dentes adequadamente obturados conforme os critérios definidos por eles. Desses dentes com tratamentos endodônticos, 32% apresentaram PA. Do mesmo modo concluíram que houve associação da PA a tratamentos endodônticos (VAN DER VEKEN et al., 2016).

São poucos estudos epidemiológicos que representam a população, pois são estudos mais caros, bem delineados e mais abrangentes, com amostra representativa da população. Com esse objetivo, estudo avaliou a população da Finlândia incluiu 6.101 radiografias panorâmicas de indivíduos com mais de 30 anos (Usou estratos da amostra e incluiu amostras aleatórias dentro de cada cluster). A amostra foi composta por indivíduos dentados com média de 22 dentes

aproximadamente. A PA esteve presente em 27% dos indivíduos (0,4% dos dentes), porém foi maior em dentes com tratamento endodôntico do que os que não apresentaram tratamento (39% vs. 10% dos indivíduos). Tratamentos endodônticos adequados foram encontrados em 52% dos dentes tratados (HUUMONEN; SUOMINEN; VEKALAHTI, 2016).

Com este mesmo objetivo epidemiológico, ampliar a generalização de suas conclusões, recente publicação que abordou 0,5% da população da Estônia como amostra (n = 6552), entretanto não estratificou por todo o país, com média de idade de 35 anos (3-93), revelou que 54,7% (3.584 indivíduos) apresentaram PA. A frequência de 58,2% (3.815 indivíduos) apresentaram tratamento endodôntico, sendo que nesse grupo, foi mais elevada a percentagem de dentes com PA quando comparados aos sem tratamento (76,5% vs. 30,8% dos indivíduos). Ainda, concluíram que os dentes mais afetados foram os molares inferiores (VENGERFELDT et al., 2017).

A dificuldade de acesso ao tratamento é outro fator associado a altas prevalências de doenças. A importância de avaliações em populações rurais se dá pela diferente oportunidade de renda e pela chance de acesso a tratamento odontológico desta população (GUNDUZ, 2011). Disparidades de saúde bucal persistem entre residentes dessas áreas, e a melhoria nas condições bucais está fortemente associada ao melhor acesso aos cuidados de saúde (AHN et al., 2011). A maioria dos estudos sobre avaliação de PA são realizados com populações urbanas, onde estão os grandes bancos de dados radiográficos. Uma vez que se conheça a realidade odontológica e suas necessidades, políticas públicas, que visem melhorar o acesso aos serviços odontológicos desses indivíduos, podem ser propostas e implementadas.

Em um dos poucos estudos realizados com indivíduos da zona rural, com propósito de avaliar a PA, autores avaliaram homens adultos, com idade de 18 a 32 anos, oriundos da zona rural na Turquia, e verificaram, além da frequência de PA, a qualidade dos tratamentos endodônticos destes indivíduos. Observaram, como os demais estudos, a relação direta da qualidade do tratamento endodôntico com a ausência de PA. A prevalência de PA na amostra foi em torno 688 (67,7%), seus autores justificam a alta taxa de PA pela diferente oportunidade de renda e de acesso a tratamento (GÜNDÜZ et al., 2011).

A presente tese apresenta dois estudos: um deles tem objetivo de avaliar a prevalência de periodontite apical de uma população rural, que apresenta dificuldade de acesso a tratamento de saúde, visto que na zona rural não há unidade de saúde, com amostra representativa daquela população, em radiografias periapicais digitais. O segundo artigo tem como propósito avaliar a



prevalência de PA em população urbana, em banco de dados de uma instituição de Ensino Superior em radiografias panorâmicas.

**3 ARTIGO 1 - PREVALENCE OF APICAL PERIODONTITIS: REPRESENTATIVE  
SERVEY ON A RURAL SOUTHEN BRAZILIAN POPULATION**

Trabalho realizado de acordo com as normas da revista Journal of Endodontics (Anexo C).  
Qualis A1, fator de impacto de 3.375.

## **ARTIGO 1: PREVALENCE OF APICAL PERIODONTITIS: REPRESENTATIVE SERVEY ON A RURAL SOUTHEN BRAZILIAN POPULATION**

Authors:

Janice Almerinda Marin<sup>1</sup>, Carlos Heitor Cunha Moreira <sup>1</sup>, Ticiane de Góes Mário <sup>1</sup>, Silvia Cardoso de David <sup>1</sup>, Jociana Boligon<sup>1</sup>, Máisa Casarin <sup>1</sup>, Alessandra Pascotini Grellmann <sup>1</sup>, Thiago Machado Ardenghi <sup>1</sup>, Carlos Alexandre de Souza Bier <sup>1</sup>

<sup>1</sup> Post-Graduation in Dentistry Sciences Program, Federal University of Santa Maria, Santa Maria, Brazil.

<sup>2</sup> Sobresp Graduation

**Short title:** Prevalence of apical periodontitis

### **Abstract**

**Introduction:** The aim of this study was to evaluate the prevalence of apical periodontitis (AP) in a representative sample of the rural population of Southen Brazilian.

**Methods:** This study is part of a epidemiological survey on the rural population of Rosário do Sul - RS (Brazil), which included 688 subjects age 15 years and older. Clinical and radiographic oral examinations were carried out, and sociodemographic data were collected, from March 2015 to May 2016 in the subject's own community. Full mouth Periapical radiographs were performed with a digital sensor. AP was assessed by the Periapical Index (PAI), followed by the dichotomization of the data for presence (3, 4 and 5) or absence of AP (1 and 2) to perform statistical analysis. The frequency of endodontics treatment, root remnants and other root-associated alterations was also recorded. Descriptive analysis was conducted.

**Results:** From the 688 subjects examined, 584 individuals were included in the study aged, between 18 and 93 years old – with an age media of 47.30 – and containing 291 (49.8%) women and 293 (50.2%) men. The prevalence of AP was 60.3% of individuals, with at least 1 tooth and up to 12 teeth with AP. 11,600 teeth were examined, and 891 (5.4%) teeth had AP. The frequency of endodontic treatments was 189 (1.2%) and of root remnant cases was 250 (1.5%).

**Conclusions:** The prevalence of apical periodontitis in the rural population is 60.3% of the individuals and it affected the maxilla the most.

**Key words:** epidemiologic, rural population, representative sample, apical periodontitis

**Disclosure of funding and conflicts of interest:** This study was funded by Rosário do Sul Prefecture and Post-Graduation in Dentistry Sciences Program. All authors declare they have no conflict of interest related to this study.

**Correspondence Author**

C.A.S. Bier

Federal University of Santa Maria

Rua Marechal Floriano Peixoto, n. 1184, 7º andar, Endodontia. CEP: 97015-372.

Santa Maria – RS – Brasil

E-mail: alexandrebiebier@hotmail.com

Telephone number: + 55 (55) 3220-9269

**Author's contribution:**

T. de G. Mário participated in study design and coordination, data collect and manuscript draft. T. M. Ardenghi and C. H. C. Moreira participated in study design and coordination and manuscript draft. J. A. Marin, S. C. de David, J. Boligon, M. Casarin, A. P. Grellmann participated in data collect and manuscript draft.

**Acknowledgements:**

The authors are grateful to the city of Rosário do Sul and its drivers and to the health agents from the locations of data collection. The researchers are also grateful to Gustavo Dotto and Gabriela Salatino Liedke for training and calibrating the examiners of radiology, José Mariano da Rocha for supporting during the data collection and Fernando Broll Centeno (FBC), Endodontist, for contributing during data collect.

**Introduction**

Apical periodontitis (AP) is an acute or chronic inflammatory lesion around the apex of the tooth, caused by microorganisms originated from the root canal system (NAIR, 2004). The etiological factor of periapical disease was definitively clarified by the paper of Kakehashi; Stanley; Fitzgerald (1965), in which they proved, in animals model, the association of root contamination with periapical pathology. This disease is characterized as an immune response of the host, in front of the microbial infection of the root canal and dissemination to the periapical tissues, causing the pathologies in this region (MEHRAZARIN; ALSHAIKH; KANG, 2017). This response is local and systemic and it involves intercellular mediators, metabolites, molecules, and humoral antibodies (COTTI et al., 2014; GOMES et al., 2013; MEHRAZARIN; ALSHAIKH; KANG, 2017).

A variety of epidemiological studies have demonstrated AP data from different evaluation methodologies from different populations, with results of 6.2%, 5%, 12.9%, 1.23% and 5.9% of total teeth with pathology (AL-NAZHAN et al., 2017; KIELBASSA; FRANK; MADAUS, 2017; PAK; FAYAZI; WHITE, 2012; UREYEN KAYA et al., 2013; VAN DER VEKEN et al., 2016). Other studies that evaluate endodontic quality and associate AP present higher values: 17.04%, 35.2%, 25.2% and 41%; in these, the higher percentage of the disease is associated with inadequate molars and fillings (DOLCI et al., 2016; GOMES et al., 2015; HOMMEZ; COPPENS; MOOR, 2002; MERINI et al., 2017).

The objective of this study was to evaluate the prevalence of apical periodontitis in the rural population of Rosário do Sul, RS - Brazil, which was an epidemiological research with a representative sample of the population.

## **Materials and Methods**

This study is part of an epidemiological survey that was carried out in the rural area of Rosário do Sul. Eligible subjects provided informed consent. This study was performed in accordance with the Declaration of Helsinki and it was approved by the Ethics Committee in Research of the Federal University of Santa Maria, RS, Brazil (CAAE: 37862414.5.0000.5346).

### **Selection of sample and inclusion criteria**

In this study, individuals with 15 years or more were the target population (TICIANE GOES MÁRIO, 2017). Briefly described, the survey included 17 of 30 eligible rural census tracts. A probabilistic multistage sample was used, in which the primary sampling units (rural census tracts) were randomly selected. The number of households and individuals to be evaluated in each selected sector was weighed by the total number of households and inhabitants, respectively, according to the Brazilian Institute of Geography and Statistics (IBGE) and considering population density and previous sample calculation ( $n = 667$ ). All individuals residing in eligible households were also considered eligible for the study, and they were at least 15 years old. Individuals with psychiatric problems, with alcoholic issues or in need of antimicrobial prophylaxis prior to the examination were not included. The sample calculations were performed according to the following parameters: apical periodontitis present in  $\geq 1$  dental element

27% (HUUMONEN; SUOMINEN; VEHKALAHTI, 2016), sample error of 5%, level confidence interval of 99%; obtaining a minimum sample of 523 individuals, 10% was added for possible losses, with an amount of approximately 575 individuals

### **Radiographic examination**

Four trained examiners (trained at UFSM radiology discipline) took turns to perform the x-rays in the period from March 2015 to May 2016. The use of a lead apron and biosafety standards were followed to perform the radiographic taking. The radiographic technique was the periapical of parallelism, with the use of a long cylinder. The X-ray machine used to make X-rays was the ProDental brand with 60 KvP and 10 mA. Exposure time ranged from 0.5 to 0.8 s. It was used a digital sensor RVG # 15100, Kodak (Carestream Dental, GA, USA), dimension of 22mx30mm, with image of 1200x1600 (pixels) with RINN XCP-DS periapical positioner (Dentsplay) and 30mm film focusing distance, which was used according to the manufacturer's indication (DENTSPLY, [s.d.]). The images were captured in the Kodak Dental System Imaging program and processed in an Acer Aspire 1410 notebook-installed software, 1166 resolution 1366x723 screen, 2GB of RAM, 250GB of hard drive and Windows 7 Home Premium 32 bit. The objective was to perform a periapical survey in patients with all teeth, the sensor was smaller than the conventional film (VERSTEEG; SANDERINK; VAN DER STELT, 1997). This number of radiographs varied according to the number, the disposition in mouth and the anatomy of the teeth of each patient. Radiographs that did not show the entire tooth and/or support structure were repeated. Third molars were excluded.

### **Radiographic assessment**

Gold standard was an experienced radiologist. The inter-rater Kappa ( $k$ ) coefficient was .8 and the intra-rater Kappa ( $k$ ) coefficient was .7. It was performed with the same database, the selection of 20 periapical surveys was chosen randomly (DAWSON et al., 2016). Allocation program for training was performed, followed by another selection for calibration. The radiographic analysis was performed on a 20-inch monitor, AOC (Manaus - AM) resolution 1600x900 60Hz, in a dark room by a single examiner after training and calibration.

Radiographic evaluation of the apical region, classified by the Periapical Index (16) into 5 scales, after dichotomization of the presence and absence of AP, was performed after digital radiographic examination. All available program resources - sharpness filter, change of brightness and contrast, negative, dentin-enamel filter, endodontics, periodontics and color change - were used according to the need of each radiograph. Remnant roots cases were also classified with the same evaluation index for the apical region. Teeth that did not have any visible apical structure were excluded from the analysis, as well as images that, even with the filters, presented lack of sharpness for evaluation. For multirouted teeth, the score assigned is that of the root with the highest PAI.

Each root was classified as:

1. Normal periapical structures;
2. Small changes in bone structure;
3. Changes in bone structure with some mineral loss;
4. Periodontitis with well-defined radiolucent area;
5. Severe periodontitis with exacerbating features.

### **Statistical analysis**

Statistical software SPSS Statistics 23 (Statistical Package for the Social Sciences, Chicago, USA) was used to analyze the data. Descriptive analyzes through means, standard deviation and frequencies were performed to provide data of the individual characteristics, as well as the radiographic characteristics presented.

### **Results**

From the 688 subjects examined in the epidemiological survey, 584 individuals were included in the study (figure 1) between 18 and 93 years of age, age media of 47,30 years. There were 291 (49.8%) women and 293 (50.2%) men that were reported about their color: 400 (68.5%) white and 184 (31.5%) nonwhite (brown, black, yellow, indigenous). As to the income the sample was stratified in 295 (50.5%) with income  $\leq$  R\$ 1,125.00, 286 (48.8%)  $>$  R\$ 1,125.00 and 4 (0.7%) did not answer. Others sociodemographic characteristics of the sample are described in table 1.

The prevalence of AP in the sample was 352 (60.3%) of the individuals who presented at least one lesioned tooth. Of these, the frequency of teeth with PA was the

following: 122 (20.9%) had only one tooth with PA, 96 (16.4%) had 2 teeth, 61 (10.4%) had 3 teeth, 32 (5.5%) had 4 teeth, 19 (3.3%) had 5 teeth, 10 (1.7%) had 6 teeth, 5 (0.9%) had 7 teeth, 4 (0.7%) had 8 teeth and one individual (0.2%) had 9, 11 or 12 teeth with pathology. Distribution of AP in age groups is described in table 2.

A total of 11,600 teeth were examined, and 891 (5.4%) of them presented the pathology. The study led to a realization that 4,752 (29.1%), teeth were absent and 715 (4.3%) teeth could not be evaluated for not presenting parts of the anatomy or for presenting image without evaluation conditions. There was still 103 (0.6%) teeth with periodontal endodontic lesion diagnosed radiographically, 54 (0.3%) teeth with external resorption and 3 teeth with internal resorption.

The frequency of endodontic treatments was 189 (1.2%), of these 96 (50.7%) presented AP, and 250 (1.5%) with root remnant cases, with 165 (66%) involved with apical lesion. The distribution of AP, non-evaluated teeth, dental losses and alterations associated with the most prevalent teeth was related to gender, location in the mandible and type of teeth which is described in table 3.

## **Discussion**

The frequency of AP in the study was 60.3% of patients presenting at least one tooth with a disease. It extended from 1 to 12 affected teeth in the individuals, and the average was 1.50 (SD 1.81) tooth with AP per subject. These results are similar to those of other authors (KALENDER et al., 2013; KIELBASSA; FRANK; MADDAUS, 2017; VENGERFELDT et al., 2017), but it contradicts results from an epidemiological survey of Finland (HUUMONEN; SUOMINEN; VEHKALAHTI, 2016) and a recently published study about Australia population (TIMMERMAN; CALACHE; PARASHOS, 2017). These results are explained by the sociodemographic characteristics of the population that participated of the study.

The results also demonstrated the pathology was equally distributed among men and women, contrary to other publications that reported that the disease was more prevalent in men than in women (HUUMONEN; SUOMINEN; VEHKALAHTI, 2016; KIELBASSA; FRANK; MADDAUS, 2017). The pathology affected more the maxilla (566) than the mandible (317), which makes it difficult to analyze, since individuals also present greater dental loss in the maxilla. The most frequent tooth with AP was the upper premolars followed by upper incisors differently from other studies that present a higher



prevalence in the posterior (HUSSEIN et al., 2016; PEDRO et al., 2016) and lower molars followed by upper premolars (MERINI et al., 2017).

The collected data demonstrated the age group with the highest AP frequency was between 40 and 59 years old, which is contradictory with other literature results: Nur et al., in 2014 (BILGE GÜLSÜM NUR, EVREN OK, MUSTAFA ALTUNSOY, MEHMET ÇOLAK, 2014) reported that the frequency was higher from 20 to 30 years, while Al-Nazhan (AL-NAZHAN et al., 2017) recently reported it was from 36 to 45 years; the epidemiological study with the population of Finland reported a lower percentage from 30 to 34 years, however in this study subjects included were over 30 years old, and the frequency raised with an increasing age. In addition, another study with a significant sample, recently published, which included subjects from 10 years old, also presented higher age groups with a higher percentage of AP (VENGERFELDT et al., 2017).

The collected data during the survey still support, after evaluating the 11,600 teeth, that the prevalence of AP in the tooth was 5.4%, which is similar to other literature results: 6.2% (AL-NAZHAN et al., 2017), 6.4% (KIELBASSA; FRANK; MADAUS, 2017), 5.8% (DUTTA; SMITH-JACK; SAUNDERS, 2014), 7% (JERSA; KUNDZINA, 2013b). It is important to note that most of these studies were performed in a database, with the objective of evaluate AP and endodontic quality. The recent publication of Vengerfeldt et al. observed the prevalence of AP of 6.3% of the teeth included in its sample (VENGERFELDT et al., 2017), this study reached 3,584 (0.5%) of the population subjects, and it was performed on digital panoramic radiographs. Another epidemiological study evaluated 5,335 (HUUMONEN; SUOMINEN; VEHKALAHTI, 2016) individuals, which was performed on conventional panoramic radiographs and it only reported the prevalence of AP in teeth with endodontic treatment, dividing in two rates: adequate treatments (10.5%) and teeth with inadequate endodontics, which was approximately double. However, this study showed that the prevalence in the individual was lower than the results from the research at Rosário do Sul.

The different evaluation tools are likely to justify controversial results. Panoramic radiographs underestimate AP results (ABELLA et al., 2012; ABELLA; PATEL; DUR, 2014; ESTRELA; BUENO, 2008), but they were used in epidemiological studies since cone beam computed tomography (CBCT) produce more reliable results. However, they are only indicated for some regions, not the whole mouth, and it is commonly used for evaluating the teeth with endodontic treatment (ABELLA et al., 2012; ABELLA; PATEL;

DUR, 2014; DUTTA; SMITH-JACK; SAUNDERS, 2014; KARABUCAK et al., 2016; PAES DA SILVA RAMOS FERNANDES et al., 2013). Yet periapical radiographs are the most used in clinical practice, especially in the complete periapical survey, as in the present study, which was performed by its authors. Digital radiography has the advantage of being subject to alterations in brightness, contrast and color that give a better evaluation.

One of the limitations of the present study – due to its design, observational study, and therefore not present follow-up – may have been to consider teeth with endodontic treatment and in the process of repair or bone scars such as teeth with lesion (NAIR, 2006) when the objective was to detect the presence of injury.

Another important data from our work was the frequency of endodontic treatments of 189 (1.2%) teeth. We also observed that it was more prevalent in women, maxilla, and anterior teeth. Our prevalence is much lower as frequencies reported in the literature. Pak et al., in 2012(6) reported the frequency of 6.4% of teeth with endodontic treatments when performing meta-analysis in a systematic review. Other recent studies point to similar results to the systematic review. Vengerfldt et al. (20) demonstrated a frequency of approximately 6.9% of the teeth, Pedro et al. (23) the frequency of 6.4%, Dawson et al. (18) of 5.6%, Al-Nazhan et al. (5) of 6.2%, Berlinck et al. (33) of 6.9%, Kielbassa et al. (7) resulted in an even greater frequency of 11.2% of the teeth with Endodontia.

However, the endodontically treated teeth, in the present study, revealed a high frequency of AP, 96 (50,%), results that are corroborated by the literature in which some authors suggest an association of AP and endodontics (BERLINCK et al., 2015; KIELBASSA; FRANK; MADAUS, 2017; KIRKEVANG; ØRSTAVIK; WENZEL, 2001; PEDRO et al., 2016). The low frequency of endodontic treatments in the present study is justified by the socioeconomic characteristics of the sample (table 1) and by the difficulty of access to dental treatments of rural populations due to the absence of a health unit in the rural area of Rosário do Sul.

The inclusion of remnant root in the sample is justified by the epidemiological approach and by the purpose of the work to investigate the periapical pathology, which is present strongly in remnant root. From the 250 (1.5%) root remnant, 165 (66%) presented apical lesion, representing 1.0% of the total teeth with AP. In this study

sample the remnant root is more frequent in men, they affect premolars more, followed by upper molars.

Epidemiological studies with representative samples are infrequent. One of the few studies in the rural population to evaluate the presence of AP, a composite sample of endodontically treated teeth, 688 (67.9%) of the teeth presented the pathology. This work, besides evaluating in panoramic radiographs, used periapical radiographs when the panoramic were inadequate for evaluations, and it also used the PAI index (ØRSTAVIK; KERESKES; ERIKSEN, 1986), but dichotomized only as healthy index 1, and scores 2-5 another relevant fact in this study is the target population that was only men between 18 and 32 years of age (36).

Epidemiological studies are necessary to know the need of the population, observational data show static data, without follow-up and present limitations. In cross-sectional studies, a significant association does not imply causality: for example, a periapical lesion that is categorized as AP in a tooth with endodontic treatment does not mean that it is a persistent infection; it may be an incomplete repair. In addition, the cross-sectional study design does not reflect the dynamic nature of the disease. Clinical trials would better observe the causality of the pathology.

However, the results from the present study evidenced data on the prevalence of AP compatible with other studies, but with a difference in the frequency of endodontic treatments, which may be justified by the sociodemographic characteristics of the population. This is related to the lack of access to dental treatment, since there is no health unit in the rural region, neither public nor private. We also believe that low income is reallocated, since half of the sample has an income lower than 1 local minimum wage ( $\leq$  R \$ 1,250.00) and, therefore, depend on the public treatment.

### **Conclusion:**

The prevalence of apical periodontitis in the rural population is 60.3% of individuals. 5.4% of teeth are affected by apical lesion, and this frequency increases to 50.7% in endodontically treated teeth and 66% in root remnant cases. The AP affected more the maxilla, and the teeth most affected were the premolars followed by incisors and canines; it also affects age ranges from 40 to 59 years old

### **References**

- ØRSTAVIK, D.; KEREEKES, K.; ERIKSEN, H. M. The periapical index: A scoring system for radiographic assessment of apical periodontitis. **Dental Traumatology**, v. 2, n. 1, p. 20–34, 1986.
- ABELLA, F. et al. Evaluating the periapical status of teeth with irreversible pulpitis by using cone-beam computed tomography scanning and periapical radiographs. **Journal of Endodontics**, v. 38, n. 12, p. 1588–1591, 2012.
- ABELLA, F.; PATEL, S.; DUR, F. An evaluation of the periapical status of teeth with necrotic pulps using periapical radiography and cone-beam computed tomography. p. 387–396, 2014.
- AHN, S. et al. Residential rurality and oral health disparities: Influences of contextual and individual factors. **Journal of Primary Prevention**, v. 32, n. 1, p. 29–41, 2011.
- AL-NAZHAN, S. A. et al. Prevalence of apical periodontitis and quality of root canal treatment in an adult Saudi population. **Saudi Medical Journal**, v. 38, n. 4, p. 413–421, 2017.
- ALLARD, U.; PALMQVIST, S. A radiographic survey of periapical conditions in elderly people in a Swedish county population. **Dental Traumatology**, v. 2, n. 3, p. 103–108, 1986.
- BERLINCK, T. et al. Epidemiological evaluation of apical periodontitis prevalence in an urban Brazilian population. **Brazilian oral research**, v. 29, n. 1, p. 51, 2015.
- BILGE GÜLSÜM NUR, EVREN OK, MUSTAFA ALTUNSOY, MEHMET ÇOLAK, E. G. Evaluation of technical quality and periapical health of root-filled teeth by using cone-beam CT. **Journal of Applied Oral Science**, v. 22, n. 6, p. 502–508, 2014.
- COTTI, E. et al. An overview on biologic medications and their possible role in Apical periodontitis. **Journal of Endodontics**, v. 40, n. 12, p. 1902–1911, 2014.
- CROITORU, I. C. et al. Clinical, imagistic and histopathological study of chronic apical periodontitis. **Romanian Journal of Morphology and Embryology**, v. 57, n. 2, p. 719–728, 2016.
- DAHLÉN, G. Microbiology and treatment of dental abscesses and periodontal-endodontic lesions. **Periodontology 2000**, v. 28, n. 1, p. 206–239, 2002.
- DAWSON, V. et al. Periapical status of non-root-filled teeth with resin composite, amalgam, or full crown restorations: a cross-sectional study of a Swedish adult population. **Journal of endodontics**, v. 40, n. 9, p. 1303–1308, 2014.
- DAWSON, V. S. et al. Periapical Status of Root-filled Teeth Restored with Composite, Amalgam, or Full Crown Restorations: A Cross-sectional Study of a Swedish Adult Population. **Journal of Endodontics**, v. 42, n. 9, p. 1326–1333, 2016.
- DE MOOR, R. J. et al. Periapical health related to the quality of root canal treatment in a Belgian population. **International endodontic journal**, v. 33, n. 2, p. 113–120, 2000.
- DENTSPLY. **RINN-Catalog-908203-9bhizhw-en-1508**.
- DOLCI, M. et al. Prevalence and distribution of endodontic treatments and apical periodontitis in an Italian population sample. **European Journal of Inflammation**, v. 14, n. 1, p. 48–53, 2016.
- DUGAS NN1, LAWRENCE HP, TEPLITSKY PE, PHAROAH MJ, F. S. Periapical health and treatment quality assessment of root-filled teeth in two Canadian populations. **Int Endod J.**, v. 36(3), p. :181-92., 2003.
- DUTTA, A.; SMITH-JACK, F.; SAUNDERS, W. P. Prevalence of periradicular periodontitis in a Scottish subpopulation found on CBCT images. **International Endodontic Journal**, v. 47, n. 9, p. 854–863, 2014.
- ESTRELA, C. et al. Prevalence and risk factors of apical periodontitis in endodontically

- treated teeth in a selected population of Brazilian adults. **Brazilian Dental Journal**, v. 19, n. 1, p. 34–39, 2008.
- ESTRELA, C.; BUENO, M. R. Accuracy of Cone Beam Computed Tomography and Panoramic and Periapical Radiography for Detection of Apical Periodontitis. v. 34, n. 3, p. 273–279, 2008.
- GOMES, A. C. et al. Influence of endodontic treatment and coronal restoration on status of periapical tissues: A cone-beam computed tomographic study. **Journal of Endodontics**, v. 41, n. 10, p. 1614–1618, 2015.
- GOMES, M. S. et al. **Can apical periodontitis modify systemic levels of inflammatory markers? A systematic review and meta-analysis** **Journal of Endodontics**, 2013.
- GORDIS, L. **EPIDEMIOLOGIA**. 4° ed. Rio de Janeiro -RJ: [s.n.].
- GÜNDÜZ, K. et al. Cross-sectional evaluation of the periapical status as related to quality of root canal fillings and coronal restorations in a rural adult male population of Turkey. **BMC oral health**, v. 11, n. 1, p. 20, 2011.
- GUTMANN, J. L. et al. Identify and Define All Diagnostic Terms for Periapical/Periradicular Health and Disease States. **Journal of Endodontics**, v. 35, n. 12, p. 1658–1674, 2009.
- HEBLING, E. et al. Periapical status and prevalence of endodontic treatment in institutionalized elderly. **Brazilian Dental Journal**, v. 25, n. 2, p. 123–128, 2014.
- HOMMEZ, G. M. G.; COPPENS, C. R. M.; MOOR, R. J. G. DE. 2002-680\_Periapical health related to the quality of coronal restorations and root fillings. n. 1961, p. 1–10, 2002.
- HUSSEIN, F. E. et al. Factors Associated with Apical Periodontitis: A Multilevel Analysis. **Journal of Endodontics**, v. 42, n. 10, 2016.
- HUUMONEN, S.; SUOMINEN, A. L.; VEHKALAHTI, M. M. Prevalence of apical periodontitis in root filled teeth: findings from a nationwide survey in Finland. **International endodontic journal**, p. 1–8, 2016.
- JERSA, I.; KUNDZINA, R. Periapical status and quality of root fillings in a selected adult Riga population. **Stomatologija / issued by public institution “Odontologijos studija” ... [et al.]**, v. 15, n. 3, p. 73–7, 2013a.
- JERSA, I.; KUNDZINA, R. Periapical status and quality of root fillings in a selected adult Riga population. **Stomatologija / issued by public institution “Odontologijos studija” ... [et al.]**, v. 15, n. 3, 2013b.
- KAKEHASHI, S; STANLEY, H. R.; FITZGERALD, R. J. The effects of surgical exposures of dental pulps in germ-free and conventional laboratory rats. **Oral Surgery, Oral Medicine, and Oral Pathology**, v. 20, n. 9, p. 340–9, 1965.
- KALENDER, A. et al. Influence of the quality of endodontic treatment and coronal restorations on the prevalence of apical periodontitis in a turkish cyprriot population. **Medical Principles and Practice**, v. 22, n. 2, p. 173–177, 2013.
- KARABUCAK, B. et al. Prevalence of apical periodontitis in endodontically treated premolars and molars with untreated canal: A cone-beam computed tomography study. **Journal of Endodontics**, v. 42, n. 4, 2016.
- KIELBASSA, A. M.; FRANK, W.; MADAUS, T. Radiologic assessment of quality of root canal fillings and periapical status in an Austrian subpopulation – An observational study. **Plos One**, v. 12, n. 5, p. e0176724, 2017.
- KIRKEVANG, L. L. et al. Frequency and distribution of endodontically treated teeth and apical periodontitis in an urban Danish population. **International endodontic journal**, v. 34, n. 3, p. 198–205, 2001.
- KIRKEVANG, L. L.; VÆTH, M.; WENZEL, A. Ten-year follow-up observations of

- periapical and endodontic status in a Danish population. **International Endodontic Journal**, v. 45, n. 9, p. 829–839, 2012.
- KIRKEVANG, L.; ØRSTAVIK, D.; WENZEL, A. A comparison of the quality of root canal treatment in two Danish subpopulations examined 1974 – 75 and 1997 – 98. **International endodontic journal**, v. 34, p. 607–612, 2001.
- LÓPEZ, F. U. et al. Accuracy of cone-beam computed tomography and periapical radiography in apical periodontitis diagnosis. **Journal of Endodontics**, v. 40, n. 12, p. 2057–2060, 2014.
- LEONARDI DUTRA, K. et al. Diagnostic accuracy of cone-beam computed tomography and conventional radiography on apical periodontitis: A systematic review and meta-analysis. **Journal of Endodontics**, v. 42, n. 3, p. 356–364, 2016.
- LÓPEZ-LÓPEZ, J. et al. Frequency and distribution of root-filled teeth and apical periodontitis in an adult population of Barcelona, Spain. **International Dental Journal**, v. 62, n. 1, p. 40–46, 2012.
- MATUSOW, R. J.; GOODALL, L. B. Anaerobic isolates in primary pulpal-alveolarcellulitis cases: Endodontic resolutions and drug therapy considerations. **Journal of Endodontics**, v. 9, n. 12, p. 535–543, 1983.
- MEHRAZARIN, S.; ALSHAIKH, A.; KANG, M. K. Molecular Mechanisms of Apical Periodontitis. **Dental Clinics of North America**, v. 61, n. 1, p. 17–35, 2017.
- MERINI, H. EL et al. Periapical Status and Quality of Root Canal Fillings in a Moroccan Subpopulation. v. 2017, 2017.
- MUKHAIMER, R.; HUSSEIN, E.; ORAFI, I. Prevalence of apical periodontitis and quality of root canal treatment in an adult Palestinian sub-population. **Saudi Dental Journal**, v. 24, n. 3–4, p. 149–155, 2012a.
- MUKHAIMER, R.; HUSSEIN, E.; ORAFI, I. Prevalence of apical periodontitis and quality of root canal treatment in an adult Palestinian sub-population. **Saudi Dental Journal**, v. 24, n. 3–4, p. 149–155, 2012b.
- NAIR, M. K.; NAIR, U. P. Digital and Advanced Imaging in Endodontics: A Review. **Journal of Endodontics**, v. 33, n. 1, p. 1–6, 2007.
- NAIR, P. N. R. **Pathogenesis of Apical Periodontitis and the Causes of Endodontic Failures**. [s.l: s.n.]. v. 15
- NAIR, P. N. R. on the Causes of Persistent Apical Periodontitis-a Review With Color Picture.Pdf. **International Dental Journal**, v. 39, n. 9, p. 249–281, 2006.
- PAES DA SILVA RAMOS FERNANDES, L. M. et al. Prevalence of apical periodontitis detected in cone beam CT images of a Brazilian subpopulation. **Dento maxillo facial radiology**, v. 42, n. 1, p. 80179163, 2013.
- PAK, J. G.; FAYAZI, S.; WHITE, S. N. Prevalence of periapical radiolucency and root canal treatment: A systematic review of cross-sectional studies. **Journal of Endodontics**, v. 38, n. 9, p. 1170–1176, 2012.
- PEDRO, F. M. et al. Status of endodontic treatment and the correlations to the quality of root canal filling and coronal restoration. **Journal of Contemporary Dental Practice**, v. 17, n. 10, p. 830–836, 2016.
- PN, N. R. Etreatment of E Ndodontic F Ailures : **Critical Reviews in Oral Biology & Medicine**., v. 15, n. 6, p. 348–381, 2004.
- RÔÇAS, I. N. et al. “Red complex” (*Bacteroides forsythus*, *Porphyromonas gingivalis*, and *Treponema denticola*) in endodontic infections: A molecular approach. **Oral Surgery, Oral Medicine, Oral Pathology, Oral Radiology, and Endodontics**, v. 91, n. 4, p. 468–471, 2001.
- RUIZ, X. F. et al. Development of Periapical Lesions in Endodontically Treated Teeth with and without Periodontal Involvement: A Retrospective Cohort Study. **Journal of**

**Endodontics**, v. 43, n. 8, p. 1246–1249, 2017.

SIQUEIRA, J. F. et al. Periradicular status related to the quality of coronal restorations and root canal fillings in a Brazilian population. **Oral Surgery, Oral Medicine, Oral Pathology, Oral Radiology and Endodontology**, v. 100, n. 3, p. 369–374, 2005.

TARCIN, B. et al. Radiologic Assessment of Periapical Health: Comparison of 3 Different Index Systems. **Journal of Endodontics**, v. 41, n. 11, p. 1834–1838, 2015.

TERÇAS, A. G. et al. Radiographic study of the prevalence of apical periodontitis and endodontic treatment in the adult population of São Luís, MA, Brazil. **Journal of applied oral science : revista FOB**, v. 14, n. 3, p. 183–7, 2006.

TICIANE GOES MÁRIO. **Aspectos metodológicos de um levantamento epidemiológico rural e descrição das condições periodontais em amostra representativa**. [s.l.] Universidade Federal de Santa Maria, 2017.

TIMMERMAN, A.; CALACHE, H.; PARASHOS, P. A cross sectional and longitudinal study of endodontic and periapical status in an Australian population. **Australian Dental Journal**, v. 62, n. 3, p. 345–354, 2017.

TROPE, M. et al. Darkfield microscopy as a diagnostic aid in differentiating exudates from endodontic and periodontal abscesses. **Journal of Endodontics**, v. 14, n. 1, p. 35–38, 1988.

TUON, A.; DE LACERDA, J.; TRAEBERT, J. Prevalência de cárie em escolares da zona rural de Jacinto Machado, SC , Brasil. **Pesq Bras Odontoped Clin Integr**, v. 7, n. 3, p. 277–84, 2007.

UREYEN KAYA, B. et al. A retrospective radiographic study of coronal-periapical status and root canal filling quality in a selected adult turkish population. **Medical Principles and Practice**, v. 22, n. 4, p. 334–339, 2013.

VAN DER VEKEN, D. et al. Prevalence of apical periodontitis and root filled teeth in a Belgian subpopulation found on CBCT images. **International Endodontic Journal**, p. 1–13, 2016.

VENGERFELDT, V. et al. Apical periodontitis in southern Estonian population: prevalence and associations with quality of root canal fillings and coronal restorations. **BMC oral health**, v. 17, n. 1, p. 147, 2017.

VERSTEEG, C. H.; SANDERINK, G. C.; VAN DER STELT, P. F. Efficacy of digital intra-oral radiography in clinical dentistry. **J Dent**, v. 25, n. 3–4, p. 215–224, 1997.

WEIGER, R. et al. Periapical status, quality of root canal fillings and estimated endodontic treatment needs in an urban German population. **Endodontics & dental traumatology**, v. 13, p. 69–74, 1997.

WOLLE, C. F. B. et al. Outcome of periapical lesions in a rat model of type 2 diabetes: Refractoriness to systemic antioxidant therapy. **Journal of Endodontics**, v. 39, n. 5, 2013.

## Supplementary material

Figura 1: Inclusion flowchart of subjects

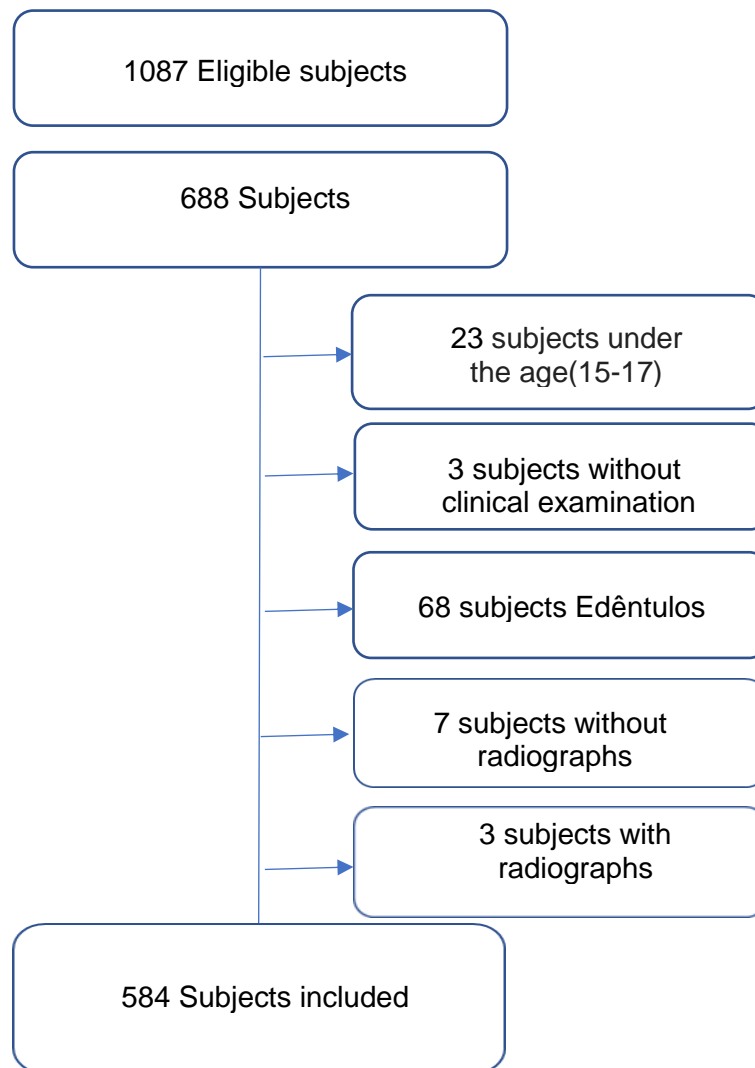




Figura 2: Grafico 1- Distribution of AP and changes in the teeth according to gender

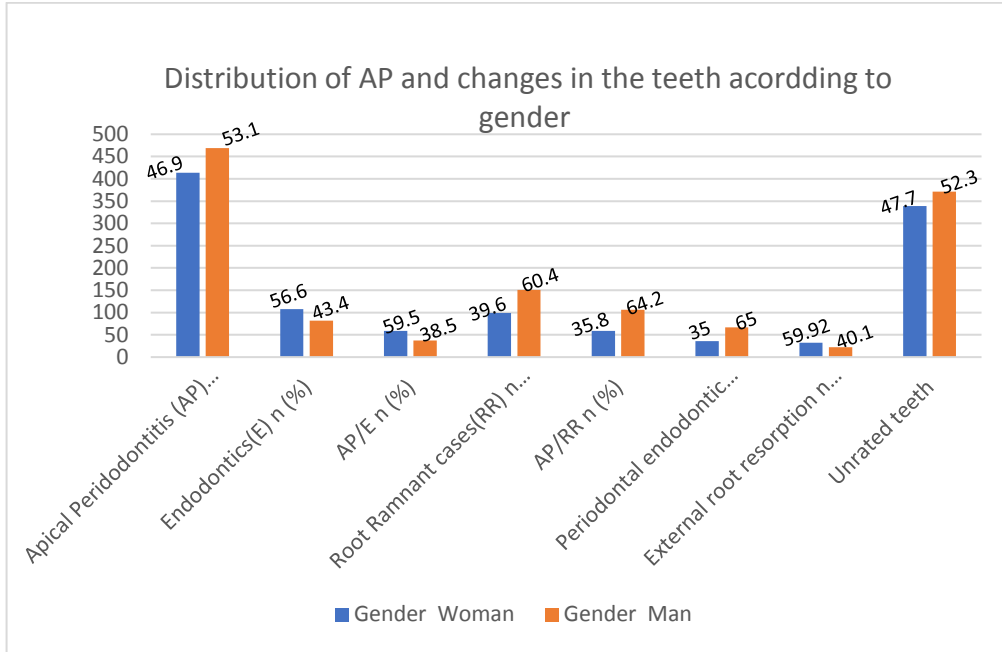


Table 1. Clinical and sociodemographic characteristics of the sample

Number of subjects				584
Age ( $\mu \pm SE$ )				47,30 $\pm$ 0.77
Gender n (%)	Male			293 (50.2)
	Female			291 (49.8)
Race n (%)	White			400 (68.5)
	Not white	Brow	111 (19)	
		Black	41 (7)	
		Yellow	11 (1.9)	
		Indigenous	21 (3.6)	288 (31.5)
Socioeconomic level ( $\mu \pm SE$ )				
	Income			***1431.,98 $\pm$ 79.61
Educational Level ( $\pm SE$ )				
	Years of study			6.03 $\pm$ 0.14
Tooth count* $\mu \pm SE$				19.28 $\pm$ 0.31
Tooth count in dentates** $\mu \pm SE$				20.98 $\pm$ 0.37
Tooth loss				8.7 $\pm$ 0.31

\*excluding third molars; \*\*including third molars. All clinical data are presented as means  $\pm$  standard error, SE. Demographic and socioeconomic data are presented as numbers (percentages).

\*\*\*Reais

Table 2. Distribution of individuals and teeth according to age and AP (n= 584)

Age	All individuals N(%)	Individuals with AP n (%)	All teth(N)	Teeth with AP n (%)
<b>18-29</b>	80 (13.7)	34 (42.5)	1.921	69 (3) (1-6)*
<b>30-39</b>	109 (18.7)	57 (52.3)	2.331	158 (5.3) (1-8)*
<b>40-49</b>	126 (21.6)	81 (64.3)	2.405	198 (5.6) (1-11)*
<b>50-59</b>	148 (25.3)	106 (71.6)	2.083	263 (6.3) (1-9)*
<b>≥60</b>	121 (20.7)	74 (61.2)	1.267	195 (5.8) (1-12)*
<b>Total</b>	584	352(60.3)	10007	883(5.4)

\* minimum and maximum values of teeth with AP per individual;

Table 3. Distribution of AP and changes in the teeth according to location and teeth affected (n= 16,352)

	Location in the jaw		Anteriors	Type of tooth		Total
	Upper	Lower		Premolars	Molars	
Apical Peridodontitis (AP) n (%)	566 (64.1)	317 (35.9)	330 (37.4)	353 (40)	200 (22.7)	883
Endodontics(E) n (%)	153 (81)	36 (19)	88 (46.6)	76 (40.2)	25 (13.2)	189
AP/E n (%)	77 (80.2)	19 (19.8)	42 (43.8)	40 (41.7)	14 (14.6)	96
Root Ramnant cases(RR) n (%)	167 (66.8)	84 (33.2)	27 (10.8)	142 (56.8)	81(32.4)	250
AP/RR n (%)	117 (70.9)	46 (29.1)	17 (10.3)	93 (56.4)	55 (33.3)	165
Periodontal endodontic lesion n (%)	44 (42.7)	59 (57.3)	47 (45.6)	35 (34)	21 (20.4)	103
External root resorption n (%)	30 (56.6)	24 (44.4)	31(57.4)	18 (33.3)	5 (20.4)	54
Unrated teeth n (%)*	348 (2.1)	362(2.2)	50 (0.3)	183 (1.1)	477 (2.9)	710
Tooth loss*	2666 (16.3)	2086 (12.8)	886 (5.4)	1563 (9.6)	2303 (14.1)	4752

\*Referente a toda amostra.

**4 ARTIGO 2 – PREVALENCE OF APICAL PERIODONTITIS AND  
TREATMENT ENDODONTICS IN SOUTHERN BRAZILIAN SUBPOPULATION**

Trabalho formatado de acordo com as normas da revista International Endodontic Journal (Anexo D).

Qualis A2, Fator de impacto: 3.015.

## **Prevalence of apical periodontitis and endodontics treatment in southern Brazilian subpopulation**

Authors:

Janice Almerinda Marin<sup>1</sup>, Ana Carolina Przychynski<sup>2</sup>, Cassia Oliveira Klein<sup>2</sup>, Maísa Casarin<sup>1</sup>, Patricia Dotto<sup>2</sup>, Carlos Alexandre Souza Bier<sup>1</sup>

<sup>1</sup> Post-Graduation in Dentistry Sciences Program, Federal University of Santa Maria, Santa Maria, Brazil.

<sup>2</sup> Graduation at Franciscan University Center, Santa Maria, Brazil.

**Short title:** Prevalence of apical periodontitis

**Disclosure of context and conflicts of interest:** this study was funded by copyright. All authors declare that they have no conflict of interest related to this study.

### **Abstract**

**Aim:** To assess the prevalence of apical periodontitis and endodontics treatment in subjects who underwent digital panoramic radiography at the Department of Radiology of a southern Brazilian University.

**Methods:** The investigation sample included 660 radiographic images, performed at the university (Franciscan University Center – Santa Maria- RS) during the years of 2015 and 2016. Teeth were classified according to the present or absence of apical periodontitis, considering present when there was enlargement a presenting of apical periodontal ligament, twice as large as lateral periodontal ligament, hard blade destruction or bone resorption. Other root-associated alterations were also recorded, such as internal resorption, endoperiodontal injury, hypercementosis, , fixed prosthesis. Image change tools were applied for improving evaluation. Descriptive analyzes was performed by analyzing means, standard deviation and frequencies. The Pearson chi-squared test was used

**Results:** The sample consisted of 393 women and 267 men, with ages from 18 to 83 years. The average patient age was 41 years old. Altogether, 18.480 teeth were analyzed, out of which, 801 (4.3%) presented apical periodontitis, and the most frequent alteration was previous endodontic treatment, with 841 (4.6%) treated endodontically teeth. Both conditions were observed in 191 teeth, accounting for 1% of the analyzed sample.

**Conclusion:** The prevalence of apical periodontitis was 51.4%, with 339 subjects and 801 (4.3%) teeth that presented, at least, one injured tooth. The prevalence of endodontic treatment was 51.2%, with 338 involved subjects who presented 841 (4.6%) endodontically treated teeth.

**Keywords:** Prevalence. Apical periodontitis. Endodontics. Epidemiology. Panoramic radiograph.

**Disclosure of funding and conflicts of interest:** All authors declare they have no conflict of interest related to this study.

**Correspondence Author**

C.A.S. Bier

Federal University of Santa Maria

Rua Marechal Floriano Peixoto, n. 1184, 7<sup>o</sup> andar, Periodontia. CEP: 97015-372.

Santa Maria – RS – Brasil

E-mail: alexandrebiebier@hotmail.com

Telephone number: + 55 (55) 3220-9269

**Author's contribution:**

J. A. Marin participated in study design and coordination, data collect and manuscript draft, A. C. Przychynski and C.O. Klein participated in data collect and manuscript draft and M. Casarin, P. Dotto, C. A. S. Bier participated in data analysis and manuscript writing.

**Acknowledgements:**

Authors thank the Franciscan University Center, where the data collection took place.

**Introduction**

Caused by microorganisms within the root canal system, following pulp necrosis the apical periodontitis (AP) is characterized as a chronic inflammation of the apical tissues. Normally, such inflammation does not show any symptom, and, in many cases, it is not easily detectable in 2D radiographic images either (FERNANDES et al., 2013)

According to Hollanda et al. (2008), several risks may affect the dental pulp and they may cause a sequel on the teeth. Dental caries diseases are the most important and prevalent changes in mouths, and a high level of endodontic treatment can be a plausible solution to such condition. If a correct treatment is not given, it can cause severe inflammation, due to the invasion of microorganisms and colonization of tissues on the apical region, which may turn into an AP (ESTRELA et al., 2008). Therefore, every time there is a loss of detail at the apex, as well as loss of continuity of the hard blade, it can be said there is an apical disease (FREITAS et al, 2004).

While evaluating the prevalence of AP in Scandinavian countries, Hummonen et al. (2017) revealed that 27% of Finland's population shows at least one tooth with apical disease. In their

study men have showed a higher prevalence in comparison with women. The same authors also argue that inadequate root canal fillings can increase the chances of AP.

The main purpose of this study is to assess the prevalence of apical periodontitis and endodontic treatment in patients who underwent digital panoramic radiography in a two-year-period at Franciscan University Center radiology service department, located in the city of Santa Maria, RS, Brazil.

## **Materials and methods**

### **Background**

A cross-sectional study was conducted with a convenience sample at Franciscan University Center, in the city of Santa Maria, RS, Brazil, from 2015 March to 2016 November, the radiographs were evaluated in the execution sequence, and any available bank of this period was used. This study received approval from the Ethics Committee of the same institution (CAAE: 59056216.5.0000.5306). The cross-sectional study was based on a total of 768 full-mouth radiographic images of adults older than 18 years age. Total edentulous radiographic images, third molars and subjects under 18 years old were excluded from the study. Baseline data were initially collected, such as gender and age, and they were then organized in Microsoft Excel tables. The images were identified according to their record numbers which were obtained through the *Cliniview Software*, where they had been previously stored. A pilot study was initially conducted, followed by the study with 100 randomly allocated images from *random.allocation* program with new data collected after this initial study.

### **Calibration of observers**

Two examiners, a professional endodontist and an academic student, took up training sessions beforehand and they discussed the interpretation criteria. A calibration technique was adopted to analyze 18 radiographic images of the some date base (DAWSON et al., 2016). The selected were randomly chosen by using the *random.allocation* software. The inter-rater Kappa ( $k$ ) coefficient was .81 and the intra-rater  $k$  coefficient was .61.

### **Apical periodontitis**



AP was evaluated during the first stage of the research. AP was defined as prevalent if subjects had at least one injury (HEBLING et al., 2014). The AP was considered present when the periodontal ligament (PL) space in the apical area was more than double in width ( if compared with the lateral PL in the same tooth), or if loss of lamina dura or a periapical radiolucent lesion was observed (DE MOOR et al., 2000; HUUMONEN; SUOMINEN; VEHKALAHTI, 2016). In the next stage, radiographic aspects of the present teeth were analyzed: teeth without alterations, presence of endodontic treatment, internal or external resorption, root remnants, fixed prosthesis, incomplete rhizogenesis, hypercementosis and periodontal endodontic injury.

### **Radiographic examination**

The images were obtained through the Orthopantomograph® apparatus OP300 (Instrumentarium Dental, Palo DEX Groups Ou Nahkelantie, Finland), using a CC 75-150 (KHz) high frequency generator, CMOS digital sensor with sensor and image pixel size of 100 one and image acquisition time of 16.1 seconds. The images were analyzed by means of the original software that comes with the apparatus (CLIN iView). Analyses were conducted in the institution imaging processing room in a Windows 7 Enterprise (Copyright® Microsoft Corporation) computer with Intel®Core™ i7-3770 CPU@ 3.40 6Hz processor, RAM (8 GB) memory and a 64-bits operational system. Brightness, contrast and color and other resources were adjusted for improving visualization of images.

### **Statistical analysis**

Descriptive analyses were performed as well as analyses of the frequency of predictive variables. An additional statistical analysis was performed by using the SPSS Statistics 23 (Statistical Package for the Social Sciences, Chicago, USA). The Pearson chi-squared test was used to determine whether there was a significant difference between the expected and the observed frequencies. A significance of  $P < 0.05$  was declared.

### **Results**

The total number of images in the selected period was 768, 108 images were deleted from the study since 106 were under age and 2 were total edentulous patients. Thus, 660 valid digital images were assessed, being 393 females (59.5%) and 267 males (40.5%). The patients age ranged from 18 to 83 years old (mean 41.59).

AP was observed in 339 (51.4%) subjects as follows: 145 subjects had at least one affected tooth, during the analyzed period, and only one subject showed 15 lesions, mean 1.18 lesion for subjects. However, 321 subjects did not show any AP evidence. Endodontic treatment was verified in 338 (51.2%) subjects with the following condition: 144 patients had previously undergone only one endodontic treatment whereas 4 subjects had previously undergone 10 endodontic treatments (mean 1.25).

AP prevalence was observed in 801 (4.3%) teeth from the valid sample. Lastly, endodontic treatment and apical periodontitis were verified in 191 teeth (1%). The total number of the analyzed teeth was 15.627 and the following associated alterations were observed by the examiners: endodontic treatment was observed in 841 (4.6%) teeth, followed by 103 (0.6%) root remnant cases and 17 (0.1%) fixed prosthesis teeth. Other associations such as internal or external resorption, periodontal endodontic lesion, hypercementosis and incomplete rhizogenesis did not composed any significant statistical results. In addition, absent teeth accounted for 2,853 cases (15.40%), 77 cases (74.7%) presented root remnants with apical periodontitis.

The teeth frequency assessment revealed 25 categories, in which the lowest frequency was two teeth in one single patient and the highest was 28 teeth in 210 patients (mean 23.67). Teeth categories, frequency and respective percent are shown in Table 1.

## **Discussion**

The percentage of AP was 51.4% in the analyzed sample, considering 339 subjects with 801 (4.3%) teeth involved. The study showed that periapical lesions in teeth with incomplete fillings are often observed. Besides, when the root canal fillings are close to the apex, the chance of having an apex alteration decreases (PERŠIĆ et al., 2011). In this context, an agreement was reached between this analysis and previous studies by De Cleen et al. (1993): 6% according to Lupi-Pegurier et al. (2002), 7.3% as reported by Diogo et al. (2013), 6.2% from Al- Nazhan et al. 2017, 4.4% as written by El Merini et al. 2017. All of them presented AP prevalence similar to the results in the present study.

In this study, the prevalence of endodontic treatment and AP was 1.00% of the sample, as 191 (22.7%) teeth presented both conditions out of a total sample of 15,627. Dolci et al. (2016) reported 17.04% apical lesions in endodontically treated teeth. So, future researchers may hypothesize that the endodontic treatment in those patients were considered plausible solutions for the detected conditions, presenting a low significance of AP associated with healthy tissues

in the apical region. Thus, a higher quality endodontic treatment may contribute in such cases due to a more complete root filling, which results in less apical lesions (PERŠIĆ et al., 2011).

Endodontic treatment rate was 51.2% considering that 338 subjects showed such condition in 841 (4.6%) teeth. For this reason, half of the analyzed sample presented an average of 1.25 treatments. According to Pak et al. (2012), many disorders do not usually manifest any evidence in the apex. Therefore, it is easier to detect a pulp disease and its prevalence is higher when compared with apical alterations. A recent study by Shahravan and Haghdoost (2014) described the high prevalence of root canal therapy with almost two endodontic treatments detected per patient. Endodontic treatments are associated with AP, especially those with low quality (HUSSEIN et al., 2016; MERINI et al., 2017; VENGERFELDT et al., 2017).

The assessment of the valid sample was performed by means of digital panoramic images. Such method is considered faster, more accessible and does not emit a high burden of radiation on the involved subjects. On the other hand, Fernandes et al (2013) recommend the Cone Beam CT – CBCT as being more accurate due to the high definition of the images to detect AP. Estrela et al. (2008) showed the prevalence and the risk factors of AP in endodontically treated teeth in a selected population of Brazilian adults using periapical radiographs. AP showed a higher rate (66.3%) in teeth with poor endodontic treatment as well as it presented an elevated percentage (52.1%) in teeth with dental defects in the coronal restoration. However, due to the latest technological developments in the radiology area, the facility to handle digital images offers a better way to improve visualization of radiographic images (HUUMONEN et al., 2016).

This study alerts to the numbers of subjects of each gender. The total number of women was 393 (59.5%) and of men was 267 (40.5%), which is described in figure 1 about the differences of AP in the age ranges according to gender. Such difference in gender might be associated with a higher level of interest of women when compared with men. Fernandes et al. (2013) studied the prevalence of AP by means of cone beam CT images of a Brazilian subpopulation and detected that men and women presented similar results of AP prevalence, which means that the gender is not a dependent based outcome. Some authors such as Berlinck et al. (2014) have shown that females were more affected than males when comparing the frequency of AP. They detected a higher AP rate in subjects whose age ranged from 30 to 49.

The sample of the present survey includes observations from 660 subjects whose age ranged from 18 to 83 years, and 15.627 teeth had their images analyzed. AP was more prevalent in individuals whose age ranged from 40 to 59. The majority of the analyzed patients, from 18 to

29, showed no evidence of AP. A considerable number of absent teeth was noticed in patients over 60 years of age.

The complete distribution of age and the respective percentage of AP for each age group was also assessed in this study (Table 2). It was important to obtain a clear view of the age range as well as the number of AP cases because such information provided us the opportunity to conduct further data analysis and discussion. Patients from 40 to 59 years of age were the most affected by AP, totaling 413 (51.5%) cases. At this point of the discussion, it is possible to state that the older the patient the more affected by AP. The least affected ones were patients whose age ranged from 18 to 29, with 98 valid cases.

This study shows a significant association between AP and molar teeth as well as AP and age range of 40 to 59 years. The prevalence of AP in each tooth category was also assessed in this study. The vast majority of AP cases were detected in inferior molars (23.1%) and superior molars (18.4%).

### **Conclusion**

In conclusion, the major contribution of this study was the assessment of prevalence of AP and endodontic treatment in a sample of 660 patients, comprising 15.627 teeth. Results point out to 801 (4.3%) lesions of AP in 339 subjects (51.4%) and 841 (4.6%) procedures of endodontic treatment in 338 subjects (51.2%). The most affected teeth were the molars. Future research, based on rigorous statistical methods, can enable confirmation of these results and test of theories that enrich the understanding of the prevalence of important dental pathologies and procedures such as AP and endodontic treatment.

### **References**

AL-NAZHAN, S. A. et al. Prevalence of apical periodontitis and quality of root canal treatment in an adult Saudi population. **Saudi Medical Journal**, v. 38, n. 4, p. 413–421, 2017

BERLINCK, Teresa; TINOCO, J.M.M.; CARVALHO, F.L.F.; SASSONE, L.M.; TINOCO, E.M.B. Epidemiological evaluation of apical periodontitis prevalence in an urban Brazilian population. **Brazilian oral research**, v. 29, n. 1, p. 1-7, 2015.

DAWSON, Victoria S., et al. Periapical status of root-filled teeth restored with composite, amalgam, or full crown restorations: A cross-sectional study of a Swedish adult population. **Journal of endodontics**, v. 42, n. 9, p. 1326-1333, 2016.

DE CLEEN, M.J.H., SCHUURS, A.H.B., WESSELINK, P.R., WU, M.K. Periapical status and prevalence of endodontic treatment in an adult Dutch population. **International Endodontic Journal**. v. 26, n. 2, p. 112-119, 1993.

DE MOOR, R.J.; HOMMEZ, E.M; DE BOEVER, J.G.; DELMÉ, K.I.; MARTENS, G.E. Periapical health related to the quality of root canal treatment in a Belgian population. **International Endodontic Journal**, v. 33, n. 2, p. 113-120, 2000.

DIOGO, P.; PALMA, P.; CAMELO, F.; MARQUES, J.M. Estudo da prevalência de periodontite apical numa população adulta portuguesa. **Elsevier**. v. 55, n. 1, p. 36-42, 2013.

DOLCI, M.; MIGLIAU, G.; BESHARAT, Z.M.; BESHARAT, L.K.; GALLOTTINI, L. Prevalence and distribution of endodontic treatments and apical periodontitis in an Italian population sample. **European Journal of Inflammation**, v. 14, n. 1, p. 48-53, 2016.

ESTRELA, C.; LELES, C.R.; HOLLANDA, A.C.; MOURA, M.S.; PÉCOR, J.D. Prevalence and risk factors of apical periodontitis in endodontically treated teeth in a selected population of Brazilian adults. **Brazilian dental journal**, v. 19, n. 1, p. 34-39, 2008.

FERNANDES, L.M.P.S.R; ORDINOLA-ZAPATA, R; DUARTE, H.M.A; CAPELOZZA, A.A.L. Prevalence of apical periodontitis detected in cone beam CT images of a Brazilian subpopulation. **Dentomaxillofacial Radiology**, v. 42, n. 1, p. 80179163-80179163, 2013.

FREITAS, A.D.; ROSA, J.E.; SOUZA, I.F. **Radiologia odontológica**. 6. Ed, Artes Médicas, 2004.

HEBLING, E.; COUTINHO, L.A.; FERRAZ, C.C.R.; CUNHA, F.L.; QUELUZ, D.P. Periapical status and prevalence of endodontic treatment in institutionalized elderly. **Brazilian dental journal**, v. 25, n. 2, p. 123-128, 2014

HOLLANDA, A.C.B.; ALENCAR, A.H.G.; ESTRELA, C.R.A.; BUENO, M.R.; ESTRELA, C. Prevalence of endodontically treated teeth in a Brazilian adult population. **Brazilian dental journal**, v. 19, n. 4, p. 313-317, 2008.

HUUMONEN, S.; SUOMINEN, A.L.; VEHKALAHTI, M.M. Prevalence of apical periodontitis in root filled teeth: findings from a nationwide survey in Finland. **International endodontic journal**, v. 50, n. 3, p. 229-236, 2016.

HUSSEIN, F. E. et al. Factors Associated with Apical Periodontitis: A Multilevel Analysis. **Journal of Endodontics**, v. 42, n. 10, 2016.

LUPI-PEGURIER, L.; BERTRAND, M.; MULLER-BOLLA, M.; ROSSA, J.P. Periapical status, prevalence and quality of endodontic treatment in an adult French population, **International Endodontic Journal**. v. 35, n. 8, p. 690-697, 2002.

McHUGH, Mary L. Interrater reliability: the kappa statistic. **Biochemia medica**, v. 22, n. 3, 2012.

PAK, Jaelyn G.; FAYAZI, Sara; WHITE, Shane N. Prevalence of periapical radiolucency and root canal treatment: a systematic review of cross-sectional studies. **Journal of endodontics**, v. 38, n. 9, p. 1170-1176, 2012.

PERŠIĆ, R.; KGIKU, L.; BRUMINI, G.; HUSETIC, M.; PEZELJ-RIBARIC, S.; PRSO, I.B.; STÄDTLER, B. Difference in the periapical status of endodontically treated teeth between the samples of Croatian and Austrian adult patients. **Croatian medical journal**, v. 52, n. 6, p. 672-678, 2011.

SHAHRAVAN, Arash; HAGHDOOST, Ali Akbar. Endodontic epidemiology. **Iranian endodontic journal**, v. 9, n. 2, p. 98, 2014.

VENGERFELDT, V. et al. Apical periodontitis in southern Estonian population: prevalence and associations with quality of root canal fillings and coronal restorations. **BMC oral health**, v. 17, n. 1, p. 147, 2017.

## Supplementary material

Table 1 – Distribution of frequency, percent and AP according to the tooth type

Tooth group	Frequency	%	AP(n)	AP (%)
<b>Maxille</b>				
Molars	2.086	11.30	147 <sub>a</sub>	18.40
Pre molars	2.067	11.20	108 <sub>b</sub>	13.50
Canines	1.212	6.60	44 <sub>cdef</sub>	5.50
Incisors	2.293	12.40	101 <sub>bef</sub>	12.60
Subtotal	7.658	41.5	400	50
<b>Mandible</b>				
Molars	1.729	9.40	185 <sub>g</sub>	23.10
Pre molars	2.365	12.80	111 <sub>bdf</sub>	13.90
Canines	1.300	7.00	33 <sub>c</sub>	4.10
Incisors	2.537	13.70	72 <sub>c</sub>	9.00
Subtotal	7.931	42,9	401	50.0
Non evaluated	38	.20		
Absent	2.853	15.40		
Total	18.480	100.00	841	100.00

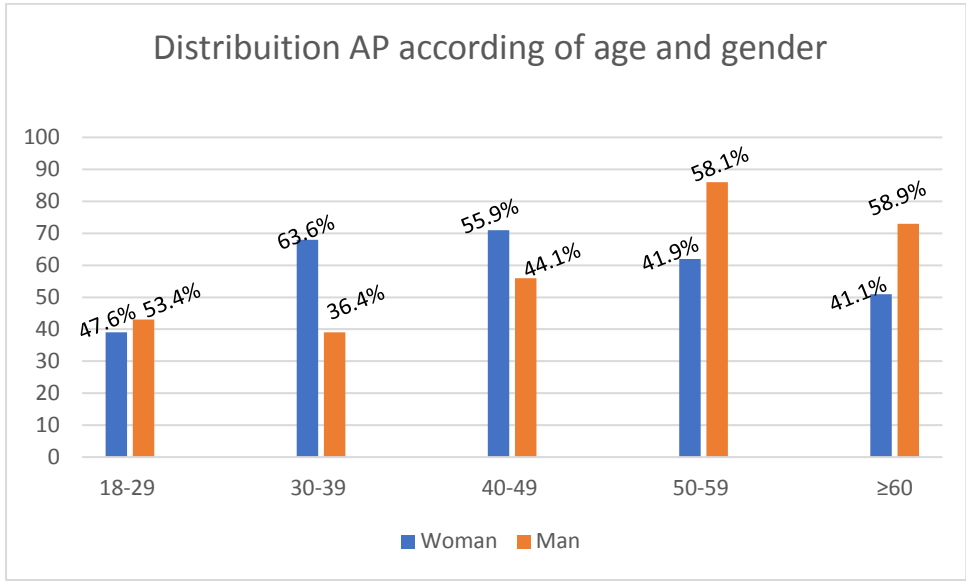
Cross tabulation of teeth and PA categories. The Pearson chi-squared test  
Subscript letter indicates a subset whose proportion does not differ statistically from one another

Table 2. Distribution of individuals and teeth according to age (n=660)

Age	All individuals N(%)	Individuals with AP N (%)*	All teeth (n)	Teeth with AP n (%)
18-29	200 (30,3)	43 (21.50)	5.600	98 (1.8) a
30-39	94 (14.20)	39 (41.48)	2.631	121 (4.6) b
40-49	128 (19.40)	86 (67.18)	3.584	182 (5.1) b,c
50-59	143 (21.70)	95 (66.43)	4.005	231 (5.8) c,d
≥60	95 (14.40)	76 (80)	2.660	169 (6.4) d

\* Percentage relative to the group. Cross tabulation of teeth and PA categories. The Pearson chi-squared test. Subscript letter indicates a subset whose proportion does not differ statistically from one another

Figura 1: Graphic for distribution of individuals according age to gender and AP (n= 660)





## 5 DISCUSSÃO

Esta tese apresentou dois estudos sobre a prevalência de periodontite apical (PA). O primeiro artigo, com uma amostra representativa de uma população residente na área rural de Rosário do Sul, e o segundo artigo com uma amostra de conveniência, de um banco de radiografia de uma instituição de Ensino Superior. Os dois estudos apresentam diferenças metodológicas significativas no instrumento e na metodologia de avaliação, além da diferença na coleta de algumas variáveis. No estudo epidemiológico foram coletadas variáveis sócio demográficas que não foram possíveis de serem coletadas no estudo do banco de dados, por não estarem presentes no referido registro.

Quanto ao instrumento de avaliação, no primeiro artigo, foram radiografias periapicais digitais, realizadas pelos próprios autores do trabalho; no segundo, foram radiografias panorâmicas digitais do banco de dados. Isto é uma limitação para comparações dos resultados entre eles, visto que Estrela et al., em 2008, identificaram quantidade menor de lesões em radiografias panorâmicas do que em radiografias periapicais. Outros autores ainda concluíram que lesões menores apresentam dificuldade de diagnóstico em radiografias periapicais e mais ainda em panorâmicas. As tomografias de feixes cônicos são considerada a excelência no diagnóstico da patologia (TARCIN et al., 2015).

Quanto à metodologia de avaliação nas radiografias periapicais digitais, foi utilizado o índice periapical (PAI) que é composto por 5 escores – que se estendem do escore 1 para saúde até escore 5, definido como periodontite severa – e após dicotomizado para saúde/doença. Amplamente utilizado em estudos de prevalência de PA desde a publicação em 1986 (ØRSTAVIK; KERKES; ERIKSEN, 1986), é o método empregado em radiografias periapicais em panorâmicas digitais ou convencionais (BERLINCK et al., 2015; HEBLING et al., 2014; JERSA; KUNDZINA, 2013b; KALENDER et al., 2013; KIRKEVANG; VÆTH; WENZEL, 2012; LÓPEZ-LÓPEZ et al., 2012; MERINI et al., 2017; PEDRO et al., 2016; TIMMERMAN; CALACHE; PARASHOS, 2017).

Contudo, no segundo artigo, o instrumento de avaliação foi a radiografia panorâmica digital. O método consistiu em avaliar o diâmetro do ligamento periodontal apical, comparado com o ligamento normal do mesmo dente. Foi considerado como doença quando, na região apical, apresentava o diâmetro de duas vezes maior que o ligamento considerado normal, ou quando apresentava destruição de lâmina dura, ou reabsorção de tecido ósseo na região contígua à raiz (DE MOOR et al., 2000). É mais frequentemente utilizado em panorâmicas e tomografias

de feixes cônicos (ABELLA; PATEL; DUR, 2014; AL-NAZHAN et al., 2017; DAWSON et al., 2014; HUUMONEN; SUOMINEN; VEHKALAHTI, 2016; MUKHAIMER; HUSSEIN; ORAFI, 2012b).

Em ambos os estudos, avaliaram-se radiografias digitais, as quais, além de requererem menor dose de exposição do paciente à radiação (NAIR; NAIR, 2007), ainda proporcionam manipulações reversíveis nas imagens, através de filtros, que fornecem melhor visualização das regiões do dente, e, com isto, melhor diagnóstico. Além de facilidade de armazenamento e localização para análise, especialmente no levantamento periapical, a execução do trabalho tornou-se mais facilitada.

A prevalência de PA foi elevada nos dois estudos: 60,3% dos indivíduos no primeiro estudo e 54,1% no segundo. Possivelmente, o estudo com radiografias panorâmicas esteja subestimado, devido ao instrumento de avaliação, contudo os resultados são corroborados pela literatura já citada ao longo da tese. Entretanto, radiografias digitais são passíveis de alterações de programas que facilitam a visualização da região em que são utilizadas, o que provavelmente justifica a elevada prevalência. Utilizou-se o aumento (*zoom*), sempre que entendido que fosse necessário, assim como outras alterações que facilitaram a avaliação.

A prevalência de PA indubitavelmente está associada à doença cárie, e áreas rurais apresentam maiores prevalência dessa doença (TUON; DE LACERDA; TRAEBERT, 2007); este fato pode explicar as elevadas perdas dentais (29%), no estudo da área rural, que aumenta com o avanço da idade. As perdas também podem interferir na prevalência, levando à especulação sobre ser mais elevada se houvesse uma perda dentária menor, visto que a maior perda ocorreu nos molares (14,1%); a maioria dos dentes ausentes eram molares. Esse percentual é aproximadamente metade dos molares presentes em boca, excluindo terceiros molares, dentes os quais a literatura associa a PA (HUSSEIN et al., 2016; KIRKEVANG et al., 2001). Adiciona-se a isto, ainda, a frequência de dentes não avaliados, que foram predominantemente posteriores: 67% dos dentes não avaliados foram molares, e isto corresponde a aproximadamente 2,9% dos dentes da amostra.

Uma das limitações de ambos os estudos pelo seu desenho (estudo observacional transversal), e, portanto, não apresentar seguimento, pode ter sido considerar dentes com tratamento endodôntico e em processo de reparo ou cicatriz óssea como lesão. Outra limitação do trabalho com radiografias panorâmicas foi a ausência de características sócio demográficas no banco de dados. Assume-se que é de uma população urbana devido à localização, porém, pela cidade (Santa Maria) ser um centro de referência, possivelmente pode estar incluído algum

paciente residente na área rural. Contudo, esses indivíduos, se foram incluídos, não devem comprometer o escopo do trabalho, visto que a amostra apresenta um número significativo de indivíduos incluídos.

Um dos poucos estudos em população rural com objetivo de avaliar a presença de PA, teve amostra composta de dentes tratados endodonticamente, com 688 (67,9%) dos dentes com presença de patologia. O autor, além de avaliar em panorâmicas, utilizou periapicais quando as panorâmicas eram inadequadas para avaliações; também utilizou o índice PAI, porém, ao dicotomizar, usou apenas o primeiro escore como saudável (índice 1) e os demais como patologia, em que avaliou uma população adulta jovem, com somente homens de 18 a 32 anos (GÜNDÜZ et al., 2011). Há muitas diferenças metodológicas a serem contrapostas com o estudo referido no segundo artigo.

Estudos epidemiológicos são necessários para conhecimento de necessidade da população e para delineamento de políticas públicas de saúde. Os observacionais mostram dados estáticos, sem seguimento, e apresentam limitações: em estudos transversais, uma associação significativa não implica causalidade. O primeiro artigo é o primeiro estudo representativo a avaliar PA como desfecho primário em indivíduos residentes da área rural. Além de demonstrar elevadas prevalências de PA, apresentou prevalência elevada de perdas dentárias e baixa prevalência de tratamento endodôntico, o que pode indicar a necessidade de implementação de políticas públicas que visem a melhorar o acesso a serviço odontológico especializado para estes indivíduos.

## 6 CONCLUSÃO

A prevalência de PA nas duas populações foi elevada. Afetou mais as faixas etárias dos 40 aos 60 anos.

Conclusão para artigo 1:

A prevalência de PA na população rural foi de 60,3% dos indivíduos, com pelo menos um dente com lesão.

Os molares superiores foram os dentes mais afetados pela patologia.

A população apresentou altas perdas dentárias (29%), e os dentes mais ausentes foram os molares, com aproximadamente 50 % deles perdidos.

A população rural apresentou uma baixa prevalência de tratamentos endodônticos (1,2%).

Conclusão para artigo 2:

A prevalência de PA na população urbana foi de 51, 5% dos indivíduos.

Os molares inferiores foram os dentes mais afetados pela patologia.

## REFERÊNCIAS

ØRSTAVIK, D.; KERÉKES, K.; ERIKSEN, H. M. The periapical index: A scoring system for radiographic assessment of apical periodontitis. **Dental Traumatology**, v. 2, n. 1, p. 20–34, 1986.

ABELLA, F. et al. Evaluating the periapical status of teeth with irreversible pulpitis by using cone-beam computed tomography scanning and periapical radiographs. **Journal of Endodontics**, v. 38, n. 12, p. 1588–1591, 2012.

ABELLA, F.; PATEL, S.; DUR, F. An evaluation of the periapical status of teeth with necrotic pulps using periapical radiography and cone-beam computed tomography. p. 387–396, 2014.

AHN, S. et al. Residential rurality and oral health disparities: Influences of contextual and individual factors. **Journal of Primary Prevention**, v. 32, n. 1, p. 29–41, 2011.

AL-NAZHAN, S. A. et al. Prevalence of apical periodontitis and quality of root canal treatment in an adult Saudi population. **Saudi Medical Journal**, v. 38, n. 4, p. 413–421, 2017.

ALLARD, U.; PALMQVIST, S. A radiographic survey of periapical conditions in elderly people in a Swedish county population. **Dental Traumatology**, v. 2, n. 3, p. 103–108, 1986.

BERLINCK, T. et al. Epidemiological evaluation of apical periodontitis prevalence in an urban Brazilian population. **Brazilian oral research**, v. 29, n. 1, p. 51, 2015.

BILGE GÜLSÜM NUR, EVREN OK, MUSTAFA ALTUNSOY, MEHMET ÇOLAK, E. G. Evaluation of technical quality and periapical health of root-filled teeth by using cone-beam CT. **Journal of Applied Oral Science**, v. 22, n. 6, p. 502–508, 2014.

COTTI, E. et al. An overview on biologic medications and their possible role in Apical periodontitis. **Journal of Endodontics**, v. 40, n. 12, p. 1902–1911, 2014.

CROITORU, I. C. et al. Clinical, imagistic and histopathological study of chronic apical periodontitis. **Romanian Journal of Morphology and Embryology**, v. 57, n. 2, p. 719–728, 2016.

DAHLÉN, G. Microbiology and treatment of dental abscesses and periodontal-endodontic lesions. **Periodontology 2000**, v. 28, n. 1, p. 206–239, 2002.

DAWSON, V. et al. Periapical status of non-root-filled teeth with resin composite, amalgam, or full crown restorations: a cross-sectional study of a Swedish adult population. **Journal of endodontics**, v. 40, n. 9, p. 1303–1308, 2014.

DAWSON, V. S. et al. Periapical Status of Root-filled Teeth Restored with Composite, Amalgam, or Full Crown Restorations: A Cross-sectional Study of a Swedish Adult Population. **Journal of Endodontics**, v. 42, n. 9, p. 1326–1333, 2016.

DE MOOR, R. J. et al. Periapical health related to the quality of root canal treatment in a Belgian population. **International endodontic journal**, v. 33, n. 2, p. 113–120, 2000.

DENTSPLY. **RINN-Catalog-908203-9bhizhw-en-1508.**

DOLCI, M. et al. Prevalence and distribution of endodontic treatments and apical periodontitis in an Italian population sample. **European Journal of Inflammation**, v. 14, n. 1, p. 48–53, 2016.

DUGAS NN1, LAWRENCE HP, TEPLITSKY PE, PHAROAH MJ, F. S. Periapical health and treatment quality assessment of root-filled teeth in two Canadian populations. **Int Endod J.**, v. 36(3), p. :181-92., 2003.

DUTTA, A.; SMITH-JACK, F.; SAUNDERS, W. P. Prevalence of periradicular periodontitis in a Scottish subpopulation found on CBCT images. **International Endodontic Journal**, v. 47, n. 9, p. 854–863, 2014.

ESTRELA, C. et al. Prevalence and risk factors of apical periodontitis in endodontically treated teeth in a selected population of Brazilian adults. **Brazilian Dental Journal**, v. 19, n. 1, p. 34–39, 2008.

ESTRELA, C.; BUENO, M. R. Accuracy of Cone Beam Computed Tomography and Panoramic and Periapical Radiography for Detection of Apical Periodontitis. v. 34, n. 3, p. 273–279, 2008.

GOMES, A. C. et al. Influence of endodontic treatment and coronal restoration on status of periapical tissues: A cone-beam computed tomographic study. **Journal of Endodontics**, v. 41, n. 10, p. 1614–1618, 2015.

GOMES, M. S. et al. **Can apical periodontitis modify systemic levels of inflammatory markers? A systematic review and meta-analysis** **Journal of Endodontics**, 2013.

GORDIS, L. **EPIDEMIOLOGIA**. 4° ed. Rio de Janeiro -RJ: [s.n.].

GÜNDÜZ, K. et al. Cross-sectional evaluation of the periapical status as related to quality of root canal fillings and coronal restorations in a rural adult male population of Turkey. **BMC oral health**, v. 11, n. 1, p. 20, 2011.

GUTMANN, J. L. et al. Identify and Define All Diagnostic Terms for Periapical/Periradicular Health and Disease States. **Journal of Endodontics**, v. 35, n. 12, p. 1658–1674, 2009.

HEBLING, E. et al. Periapical status and prevalence of endodontic treatment in institutionalized elderly. **Brazilian Dental Journal**, v. 25, n. 2, p. 123–128, 2014.

HOMMEZ, G. M. G.; COPPENS, C. R. M.; MOOR, R. J. G. DE. 2002-680\_Periapical health related to the quality of coronal restorations and root fillings. n. 1961, p. 1–10, 2002.

HUSSEIN, F. E. et al. Factors Associated with Apical Periodontitis: A Multilevel Analysis. **Journal of Endodontics**, v. 42, n. 10, 2016.

HUUMONEN, S.; SUOMINEN, A. L.; VEHKALAHTI, M. M. Prevalence of apical periodontitis in root filled teeth: findings from a nationwide survey in Finland. **International endodontic journal**, p. 1–8, 2016.

JERSA, I.; KUNDZINA, R. Periapical status and quality of root fillings in a selected adult Riga

population. **Stomatologija / issued by public institution “Odontologijos studija” ... [et al.]**, v. 15, n. 3, p. 73–7, 2013a.

JERSA, I.; KUNDZINA, R. Periapical status and quality of root fillings in a selected adult Riga population. **Stomatologija / issued by public institution “Odontologijos studija” ... [et al.]**, v. 15, n. 3, 2013b.

KAKEHASHI, S; STANLEY, H. R.; FITZGERALD, R. J. The effects of surgical exposure of dental pulps in germ-free and convetional laboratory rats. **Oral Surgery, Oral Medicine, and Oral Pathology**, v. 20, n. 9, p. 340–9, 1965.

KALENDER, A. et al. Influence of the quality of endodontic treatment and coronal restorations on the prevalence of apical periodontitis in a turkish cypriot population. **Medical Principles and Practice**, v. 22, n. 2, p. 173–177, 2013.

KARABUCAK, B. et al. Prevalence of apical periodontitis in endodontically treated premolars and molars with untreated canal: A cone-beam computed tomography study. **Journal of Endodontics**, v. 42, n. 4, 2016.

KIELBASSA, A. M.; FRANK, W.; MADAUS, T. Radiologic assessment of quality of root canal fillings and periapical status in an Austrian subpopulation – An observational study. **Plos One**, v. 12, n. 5, p. e0176724, 2017.

KIRKEVANG, L. L. et al. Frequency and distribution of endodontically treated teeth and apical periodontitis in an urban Danish population. **International endodontic journal**, v. 34, n. 3, p. 198–205, 2001.

KIRKEVANG, L. L.; VÆTH, M.; WENZEL, A. Ten-year follow-up observations of periapical and endodontic status in a Danish population. **International Endodontic Journal**, v. 45, n. 9, p. 829–839, 2012.

KIRKEVANG, L.; ØRSTAVIK, D.; WENZEL, A. A comparison of the quality of root canal treatment in two Danish subpopulations examined 1974 – 75 and 1997 – 98. **International endodontic journal**, v. 34, p. 607–612, 2001.

LÓPEZ, F. U. et al. Accuracy of cone-beam computed tomography and periapical radiography in apical periodontitis diagnosis. **Journal of Endodontics**, v. 40, n. 12, p. 2057–2060, 2014.

LEONARDI DUTRA, K. et al. Diagnostic accuracy of cone-beam computed tomography and conventional radiography on apical periodontitis: A systematic review and meta-analysis. **Journal of Endodontics**, v. 42, n. 3, p. 356–364, 2016.

LÓPEZ-LÓPEZ, J. et al. Frequency and distribution of root-filled teeth and apical periodontitis in an adult population of Barcelona, Spain. **International Dental Journal**, v. 62, n. 1, p. 40–46, 2012.

MATUSOW, R. J.; GOODALL, L. B. Anaerobic isolates in primary pulpal-alveolarcellulitis cases: Endodontic resolutions and drug therapy considerations. **Journal of Endodontics**, v. 9, n. 12, p. 535–543, 1983.

MEHRAZARIN, S.; ALSHAIKH, A.; KANG, M. K. Molecular Mechanisms of Apical Periodontitis. **Dental Clinics of North America**, v. 61, n. 1, p. 17–35, 2017.

MERINI, H. EL et al. Periapical Status and Quality of Root Canal Fillings in a Moroccan Subpopulation. v. 2017, 2017.

MUKHAIMER, R.; HUSSEIN, E.; ORAFI, I. Prevalence of apical periodontitis and quality of root canal treatment in an adult Palestinian sub-population. **Saudi Dental Journal**, v. 24, n. 3–4, p. 149–155, 2012a.

MUKHAIMER, R.; HUSSEIN, E.; ORAFI, I. Prevalence of apical periodontitis and quality of root canal treatment in an adult Palestinian sub-population. **Saudi Dental Journal**, v. 24, n. 3–4, p. 149–155, 2012b.

NAIR, M. K.; NAIR, U. P. Digital and Advanced Imaging in Endodontics: A Review. **Journal of Endodontics**, v. 33, n. 1, p. 1–6, 2007.

NAIR, P. N. R. **Pathogenesis of Apical Periodontitis and the Causes of Endodontic Failures.** [s.l: s.n.]. v. 15

NAIR, P. N. R. on the Causes of Persistent Apical Periodontitis-a Review With Color Picture.Pdf. **International Dental Journal**, v. 39, n. 9, p. 249–281, 2006.

PAES DA SILVA RAMOS FERNANDES, L. M. et al. Prevalence of apical periodontitis detected in cone beam CT images of a Brazilian subpopulation. **Dento maxillo facial radiology**, v. 42, n. 1, p. 80179163, 2013.

PAK, J. G.; FAYAZI, S.; WHITE, S. N. Prevalence of periapical radiolucency and root canal treatment: A systematic review of cross-sectional studies. **Journal of Endodontics**, v. 38, n. 9, p. 1170–1176, 2012.

PEDRO, F. M. et al. Status of endodontic treatment and the correlations to the quality of root canal filling and coronal restoration. **Journal of Contemporary Dental Practice**, v. 17, n. 10, p. 830–836, 2016.

PN, N. R. Etreatment of E Ndodontic F Ailures : **Critical Reviews in Oral Biology & Medicine.**, v. 15, n. 6, p. 348–381, 2004.

RÔÇAS, I. N. et al. “Red complex” (*Bacteroides forsythus*, *Porphyromonas gingivalis*, and *Treponema denticola*) in endodontic infections: A molecular approach. **Oral Surgery, Oral Medicine, Oral Pathology, Oral Radiology, and Endodontics**, v. 91, n. 4, p. 468–471, 2001.

RUIZ, X. F. et al. Development of Periapical Lesions in Endodontically Treated Teeth with and without Periodontal Involvement: A Retrospective Cohort Study. **Journal of Endodontics**, v. 43, n. 8, p. 1246–1249, 2017.

SIQUEIRA, J. F. et al. Periradicular status related to the quality of coronal restorations and root canal fillings in a Brazilian population. **Oral Surgery, Oral Medicine, Oral Pathology, Oral Radiology and Endodontology**, v. 100, n. 3, p. 369–374, 2005.



TARCIN, B. et al. Radiologic Assessment of Periapical Health: Comparison of 3 Different Index Systems. **Journal of Endodontics**, v. 41, n. 11, p. 1834–1838, 2015.

TERÇAS, A. G. et al. Radiographic study of the prevalence of apical periodontitis and endodontic treatment in the adult population of São Luís, MA, Brazil. **Journal of applied oral science : revista FOB**, v. 14, n. 3, p. 183–7, 2006.

TICIANE GOES MÁRIO. **Aspectos metodológicos de um levantamento epidemiológico rural e descrição das condições periodontais em amostra representativa**. [s.l.] Universidade Federal de Santa Maria, 2017.

TIMMERMAN, A.; CALACHE, H.; PARASHOS, P. A cross sectional and longitudinal study of endodontic and periapical status in an Australian population. **Australian Dental Journal**, v. 62, n. 3, p. 345–354, 2017.

TROPE, M. et al. Darkfield microscopy as a diagnostic aid in differentiating exudates from endodontic and periodontal abscesses. **Journal of Endodontics**, v. 14, n. 1, p. 35–38, 1988.

TUON, A.; DE LACERDA, J.; TRAEBERT, J. Prevalência de cárie em escolares da zona rural de Jacinto Machado, SC , Brasil. **Pesq Bras Odontoped Clin Integr**, v. 7, n. 3, p. 277–84, 2007.

UREYEN KAYA, B. et al. A retrospective radiographic study of coronal-periapical status and root canal filling quality in a selected adult turkish population. **Medical Principles and Practice**, v. 22, n. 4, p. 334–339, 2013.

VAN DER VEKEN, D. et al. Prevalence of apical periodontitis and root filled teeth in a Belgian subpopulation found on CBCT images. **International Endodontic Journal**, p. 1–13, 2016.

VENGERFELDT, V. et al. Apical periodontitis in southern Estonian population: prevalence and associations with quality of root canal fillings and coronal restorations. **BMC oral health**, v. 17, n. 1, p. 147, 2017.

VERSTEEG, C. H.; SANDERINK, G. C.; VAN DER STELT, P. F. Efficacy of digital intra-oral radiography in clinical dentistry. **J Dent**, v. 25, n. 3–4, p. 215–224, 1997.

WEIGER, R. et al. Periapical status, quality of root canal fillings and estimated endodontic treatment needs in an urban German population. **Endodontics & dental traumatology**, v. 13, p. 69–74, 1997.

WOLLE, C. F. B. et al. Outcome of periapical lesions in a rat model of type 2 diabetes: Refractoriness to systemic antioxidant therapy. **Journal of Endodontics**, v. 39, n. 5, 2013.

## APÊNDICE A – TCLE MAIOR DE 18 ANOS

**Universidade Federal de Santa Maria**  
**Centro de Ciências da Saúde**  
**Programa de Pós-Graduação em Ciências Odontológicas**

### TERMO DE CONSENTIMENTO LIVRE E ESCLARECIDO

**Título do projeto:** Levantamento epidemiológico na área rural de Rosário do Sul-RS  
**Pesquisador responsável:** Carlos Heitor Cunha Moreira  
**Instituição/Departamento:** Universidade Federal de Santa Maria / Programa de Pós-Graduação em Ciências Odontológicas.  
**Telefone para contato (inclusive a cobrar):** (55) 9106-4673  
**Pesquisadores participantes:** Jociana Boligon e Ticiane de Góes Mário.  
**Telefone para contato (inclusive a cobrar):** (55) 9978-0866 e (55) 9903-5101

❖ V  
 Você está sendo convidado(a) para participar, como voluntário, em uma pesquisa. Você precisa decidir se quer participar ou não. Por favor, não se apresse em tomar a decisão. Leia cuidadosamente o que se segue e pergunte ao responsável pelo estudo qualquer dúvida que você tiver. Após ser esclarecido sobre as informações a seguir, no caso de aceitar fazer parte do estudo, assine ao final deste documento, que está em duas vias. Uma delas é sua e a outra é do pesquisador responsável. Em caso de recusa você não será penalizado de forma alguma.

❖ E  
 Essa pesquisa justifica-se pela necessidade de conhecimento das condições periodontais e saúde geral de uma população que, pela localização geográfica, extensão territorial, diversidades socioeconômica e cultural, tem dificuldade de acesso à assistência médica e odontológica integral.

❖ A  
 Sua participação nesse estudo será no sentido de permitir a avaliação da sua boca, de suas medidas corporais e de responder a alguns questionários. Serão anotados dados sobre a quantidade de dentes perdidos, restaurados, obturados e cariados; a presença de placa (tecido amolecido amarelo-esbranquiçado) e cálculo dentário (tecido duro de cor mais escura) formados sobre seus dentes; a ocorrência de sangramento ou pus na sua gengiva e medidas de perda de osso ao redor dos seus dentes, quando encostamos um instrumento odontológico (sonda periodontal milimetrada) entre essas duas estruturas e se há alteração na gengiva após esta ser corada com uma substância inofensiva à sua saúde. Você responderá a questionários, de rápida execução, sobre consultas ao dentista, presença de doenças ou alterações em seu organismo, uso de remédios, hábitos alimentares e comportamentais, nível de educação, renda familiar e qualidade de vida. Seu peso e sua altura serão medidos para análise do seu Índice de Massa Corporal. Também mediremos a circunferência da sua cintura e verificaremos sua pressão arterial, e um técnico em enfermagem capacitado (de um laboratório conveniado da prefeitura do município) coletará amostras de sangue para melhor avaliarmos sua saúde geral.

❖ V  
 Você poderá se sentir cansado e ter algum desconforto nos exames em que um instrumento odontológico é passado entre sua gengiva e seus dentes, além de haver um risco mínimo de se machucar com o instrumento caso ocorra um movimento brusco de sua parte ou do examinador. Após os exames você poderá ficar com dor leve em sua gengiva. Desconforto também poderá ser sentido durante a coleta de material sanguíneo. Além disso, você poderá se sentir constrangido ou cansado em responder as questões dos questionários ou, ainda durante medição do seu peso e altura. Caso haja dano odontológico com a pesquisa você terá direito a assistência odontológica gratuita garantida pelos pesquisadores.

❖ O  
 O benefício direto a você, participante, será um relatório odontológico detalhado sobre a condição de sua boca e, se necessário, encaminhamento para tratamento odontológico no Serviço de Saúde Municipal ou nas Clínicas Odontológicas da Universidade Federal de Santa Maria e uma avaliação complementar do seu estado de saúde geral.

❖ V  
 ocê terá acesso aos profissionais responsáveis pela pesquisa para esclarecimento de eventuais dúvidas em qualquer etapa do estudo. É garantido o livre acesso a todas as informações e, sendo de seu interesse, você será mantido atualizado sobre os resultados finais da pesquisa após a publicação da mesma.

❖ S  
 e você concordar em participar do estudo, seu nome e identidade serão mantidos em sigilo. A menos que requerido por lei ou por sua solicitação, somente a equipe do estudo e o Comitê de Ética terão acesso a suas informações. As informações do estudo serão divulgadas apenas em eventos ou publicações científicas sem identificação dos voluntários. As fichas clínicas e os questionários, após analisados, ficarão guardados na Clínica de Periodontia da UFSM Santa Maria/RS. (Antigo Prédio da Reitoria, Rua Marechal Floriano Peixoto, número 1184, 7º andar, sala 710) por 5 anos, a fim de possibilitar esclarecimentos posteriores ao término do estudo, conforme nova resolução do CNS 466/12, e, depois, imediatamente destruídos por incineração. Exames de sangue serão fornecidos ao paciente, nós ficaremos com uma cópia do mesmo, que será armazenada como descrito acima.

❖ V  
 ocê pode se recusar a participar do estudo, ou retirar seu consentimento e sair da pesquisa a qualquer momento, mesmo durante o exame, sem precisar justificar.

Eu, \_\_\_\_\_, de nacionalidade \_\_\_\_\_, com \_\_\_\_\_ anos de idade, estado civil \_\_\_\_\_, profissão \_\_\_\_\_, residente em \_\_\_\_\_, RG nº \_\_\_\_\_, abaixo assinado, concordo em participar do estudo como sujeito. Fui suficientemente informado (a) a respeito das informações que li ou que foram lidas para mim, descrevendo o estudo **“Levantamento epidemiológico na área rural de Rosário do Sul-RS”**. Eu discuti com a pesquisadora \_\_\_\_\_ sobre a minha decisão em participar nesse estudo. Ficaram claros para mim quais são os propósitos do estudo, os procedimentos a serem realizados, seus desconfortos e riscos, as garantias de confidencialidade e de esclarecimentos permanentes. Estou totalmente ciente de que não há nenhum valor econômico, a receber ou pagar, por minha participação. Ficou claro também que minha participação é isenta de despesas. Concordo voluntariamente em participar deste estudo e poderei retirar o meu consentimento a qualquer momento, antes ou durante o mesmo, sem penalidades ou prejuízo.

Rosário do Sul, \_\_\_\_ de \_\_\_\_\_ de 201\_\_.

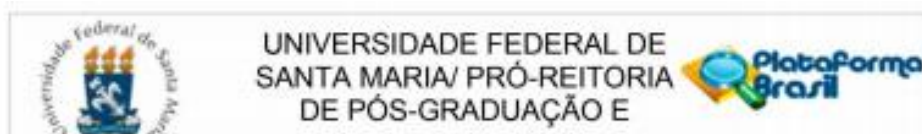
\_\_\_\_\_  
 Nome e Assinatura do sujeito

Declaro que obtive de forma apropriada e voluntária o Consentimento Livre e Esclarecido deste sujeito de pesquisa ou representante legal para a participação neste estudo:

\_\_\_\_\_  
 Nome e assinatura do pesquisador responsável

Se você tiver alguma consideração ou dúvida sobre a ética da pesquisa, entre em contato: Comitê de Ética em Pesquisa – UFSM - Cidade Universitária - Bairro Camobi, Av. Roraima, nº1000 - CEP: 97.105.900 Santa Maria – RS. Telefone: (55) 3220-9362 – Fax: (55)3220-8009 Email: comiteeticapesquisa@smail.ufsm.br. Web: www.ufsm.br/cep

## ANEXO A – PARECER CONSUBSTANCIADO DO CEP- ARTIGO 1



**PARECER CONSUBSTANCIADO DO CEP**

**DADOS DO PROJETO DE PESQUISA**

**Título da Pesquisa:** LEVANTAMENTO EPIDEMIOLÓGICO NA ÁREA RURAL DE ROSÁRIO DO SUL/RS

**Pesquisador:** CARLOS HEITOR CUNHA MOREIRA

**Área Temática:**

**Versão:** 1

**CAAE:** 37862414.5.0000.5346

**Instituição Proponente:** Universidade Federal de Santa Maria/ Prò-Reitoria de Pós-Graduação e

**Patrocinador Principal:** Financiamento Próprio

**DADOS DO PARECER**

**Número do Parecer:** 869.323

**Data da Relatoria:** 10/11/2014

**Apresentação do Projeto:**

Doenças periodontais compreendem condições infecciosas e inflamatórias resultantes da interação entre biofilme bacteriano e resposta do hospedeiro. Essa relação é modulada por uma variedade de fatores, dentre eles, diabetes e fumo, capazes de alterar o início e a progressão dessas afecções. A doença periodontal também pode acarretar alterações sistêmicas, como na doença cardiovascular e no controle da glicemia, e comprometimento funcional e estético. O entendimento de uma pequena quantidade de fatores de risco pode ter potencial impacto no encargo de muitas doenças, com custo reduzido e maior eficiência e efetividade que abordagens específicas para cada condição isolada. Assim, esse projeto objetiva avaliar condições bucais, parâmetros inflamatórios e microbiológicos associados, indicadores e fatores de risco às doenças periodontais, impacto desses parâmetros na qualidade de vida, além de questões relacionadas à saúde geral, como obesidade, diabetes e hipertensão, na zona rural de Rosário do Sul - RS.

Realizaremos um censo das crianças de 10 a 14 anos, para avaliação de cárie e fluorose. E uma amostra representativa dos indivíduos, maiores de 15 anos, residentes na área rural desse município (N= 828) receberá exame bucal completo (periodonto, dentes, mucosas, saliva e análise microbiológica de biofilme), avaliações antropométricas (pressão

<b>Endereço:</b> Av. Roraima, 1000 - prédio da Reitoria - 2º andar		
<b>Bairro:</b> Camobi		<b>CEP:</b> 97.105-970
<b>UF:</b> RS	<b>Município:</b> SANTA MARIA	
<b>Telefone:</b> (55)3220-9362		<b>E-mail:</b> cep.ufsm@gmail.com



Continuação do Parecer: 889.323

arterial, peso, altura, circunferência da cintura) e exames sanguíneos (hemograma completo, hemoglobina glicada, proteína C-reativa ultrasensível e creatinina plasmática).

Adicionalmente, os moradores que aceitarem participar do estudo, mediante a assinatura de termo de consentimento livre e esclarecido, responderão a questionários sobre qualidade de vida, características médicas e sociodemográficas e hábitos de higiene bucal.

Esperamos que, através do conhecimento gerado após a análise dos resultados desse projeto, medidas de controle e/ou erradicação dos problemas encontrados possam ser adotadas, visando melhorias na saúde dos indivíduos dessa área. Caso essas estratégias sejam implementadas, avaliações posteriores poderão ser realizadas a fim de verificar a efetividade das mesmas. Além disso, com a obtenção de resultados positivos/benéficos, há a possibilidade de extensão para outras populações, na tentativa de melhorar as condições globais de saúde.

**Objetivo da Pesquisa:**

Objetivo geral: realizar um levantamento epidemiológico em uma amostra representativa da população rural de Rosário do Sul/ RS.

**Objetivos específicos**

- Avaliar a condição periodontal (prevalência, extensão e gravidade de doença) dessa população;
- Buscar associações entre condição periodontal e parâmetros inflamatórios e microbiológicos;
- Avaliar a presença de fatores de risco (fumo e diabetes) para as doenças periodontais;
- Verificar possíveis indicadores de risco para doença periodontal;
- Investigar o impacto da utilização de protocolos de exame parciais em comparação com exames de toda a boca em prevalência, gravidade e extensão de doença periodontal;
- Avaliar prevalência, extensão e gravidade de recessão gengival (RG);
- Avaliar a associação de potenciais indicadores de risco com a ocorrência de RG;
- Avaliar prevalência, extensão e gravidade de abrasão gengival (AG);
- Avaliar a associação de potenciais indicadores de risco com a ocorrência de AG;
- Verificar a associação entre AG e RG, identificando se o aumento na prevalência de AG pode gerar aumento na prevalência de RG;
- Verificar a associação entre fatores demográficos (sexo, renda, idade e raça), comportamentais (fumo, presença de cálculo...) e as condições de abrasão e recessão gengivais encontradas;

Endereço: Av. Roraima, 1000 - prédio da Reitoria - 2º andar  
 Bairro: Camobi CEP: 97.105-970  
 UF: RS Município: SANTA MARIA  
 Telefone: (55)3220-9362 E-mail: cep.ufsm@gmail.com



UNIVERSIDADE FEDERAL DE  
SANTA MARIA/ PRÓ-REITORIA  
DE PÓS-GRADUAÇÃO E



Continuação do Parecer: 889.323

Avaliar o impacto da periodontite como condição clínica preditora de uma pior qualidade de vida relacionada à saúde bucal (OHRQoL);

Investigar as condições clínicas associadas a uma pior OHRQoL;

Avaliar a correlação entre dois instrumentos sócio-dentais, OHIP-14 e GOHAI, para avaliação da OHRQoL;

Avaliar o efeito da avaliação periodontal em boca reduzida realizada por meio de diferentes protocolos parciais nas medidas de associação com a OHRQoL.

Avaliar a condição cariológica das crianças e jovens com idades compreendidas entre 10 e 14 anos;

Buscar associação entre a presença de lesões cáries ativas e o grau eruptivo dos segundos molares permanentes,

Avaliar os indicadores de risco para cárie dentária;

Avaliar a presença de fluorose dentária.

**Avaliação dos Riscos e Benefícios:**

Previstos de modo suficiente.

**Comentários e Considerações sobre a Pesquisa:**

.

**Considerações sobre os Termos de apresentação obrigatória:**

Termos apresentados.

**Recomendações:**

Veja no site do CEP - <http://coral.ufsm.br/cep> - SITE NOVO - na aba "orientações gerais", modelos e orientações para apresentação dos documentos. Acompanhe as orientações disponíveis, evite pendências e agilize a tramitação do seu projeto.

**Conclusões ou Pendências e Lista de Inadequações:**

.

Endereço: Av. Roraima, 1000 - prédio da Reitoria - 2º andar  
 Bairro: Camobi CEP: 97.105-970  
 UF: RS Município: SANTA MARIA  
 Telefone: (55)3220-9362 E-mail: cep.ufsm@gmail.com

## ANEXO B– PARECER CONSUBSTANCIADO DO CEP -ARTIGO 2



### PARECER CONSUBSTANCIADO DO CEP

#### DADOS DO PROJETO DE PESQUISA

**Título da Pesquisa:** PREVALÊNCIA DE PERIODONTITE APICAL EM PACIENTES QUE REALIZARAM RADIOGRAFIA PANORÂMICA DIGITAL EM INSTITUIÇÃO DE ENSINO SUPERIOR

**Pesquisador:** JANICE ALMERINDA MARIN **Área Temática:**

**Versão:** 1

**CAAE:** 59056216.5.0000.5306

**Instituição Proponente:** Centro Universitário Franciscano - UNIFRA

**Patrocinador Principal:** Financiamento Próprio

#### DADOS DO PARECER

**Número do Parecer:** 1.724.261

#### Apresentação do Projeto:

Doenças pulpares e periapicais são inflamações de etiologia microbiana. A periodontite apical (PA) caracteriza-se pela resposta imunológica do hospedeiro em face da infecção microbiana, sendo esta última originada no canal radicular e disseminada para os tecidos periapicais. Este trabalho tem por objetivo avaliar a prevalência de periodontite apical (PA) em pacientes adultos que realizaram radiografia panorâmica digital no serviço de radiologia do Centro Universitário Franciscano. A amostra deste estudo será por conveniência. Serão incluídas todas as radiografias panorâmicas digitais, de adultos maiores de 18 anos, que se encontram armazenadas no banco de dados do serviço de Radiologia, do curso de odontologia do Centro Universitário Franciscano, realizadas no período compreendido entre quatro de março de dois mil e quinze a vinte e dois de novembro de dois mil e dezesseis. Todas as radiografias serão classificadas quanto à ausência ou presença de PA, identificados os dentes associados a doença e após relacionados aos fatores de risco locais. Será realizada uma análise descritiva dos dados obtidos, bem como uma análise da frequência das variáveis preditoras e desfechos primários e secundários.

#### Objetivo da Pesquisa:

**Objetivo Primário:**

Avaliar a prevalência de periodontite apical em pacientes que realizaram radiografia panorâmica

**Endereço:** R. dos Andrada, 1614 - Prédio da Reitoria - Campus I - 7º andar  
**Bairro:** Centro **CEP:** 97.010-032  
**UF:** RS **Município:** SANTA MARIA  
**Telefone:** (55)3220-1200 **Fax:** (55)3222-6484 **E-mail:** cep@unifra.br



Página 01 de

Continuação do Parecer: 1.724.261

digital no serviço de radiologia do Centro Universitário Franciscano.

**Objetivo Secundário:**

Associar a periodontite apical à presença ou ausência de tratamento endodôntico. Associar a prevalência de periodontite apical ao gênero (masculino e feminino) e à idade dos pacientes.

**Avaliação dos Riscos e Benefícios:**

**Riscos:**

Risco de associação de dados da radiografia aos pacientes por pesquisadores.

**Benefícios:**

Dados epidemiológicos da população estudada.

**Comentários e Considerações sobre a Pesquisa:**

O projeto analisado apresenta elementos necessários para o desenvolvimento de uma pesquisa científica.

**Considerações sobre os Termos de apresentação obrigatória:**

O projeto apresenta todos os Termos e documentos preconizados pela Resolução CNS nº466/12.

**Recomendações:**

Não há

**Conclusões ou Pendências e Lista de Inadequações:**

O projeto encontra-se aprovado.

**Considerações Finais a critério do CEP:**

Toda e qualquer alteração do Projeto, assim como os eventos adversos graves, deverão ser comunicados imediatamente a este Comitê. O pesquisador deve apresentar relatório final da pesquisa, ao CEP/UNIFRA, via Plataforma Brasil, no mês de novembro/2018, conforme determinação do CONEP.

**Este parecer foi elaborado baseado nos documentos abaixo relacionados:**

Tipo Documento	Arquivo	Postagem	Autor	Situação
<b>Endereço:</b> R. dos Andrada, 1614 - Prédio da Reitoria - Campus I - 7ª andar <b>Bairro:</b> Centro <b>CEP:</b> 97.010-032 <b>UF:</b> RS <b>Município:</b> SANTA MARIA <b>Telefone:</b> (55)3220-1200 <b>Fax:</b> (55)3222-6484 <b>E-mail:</b> cep@unifra.br				



## ANEXO C - NORMAS DA REVISTA JOURNAL OF ENDODONTICS

The *Journal of Endodontics* is owned by the American Association of Endodontists. Submitted manuscripts must pertain to endodontics and may be original research (eg, clinical trials, basic science related to the biological aspects of endodontics, basic science related to endodontic techniques, case reports, or review articles related to the scientific or applied aspects of endodontics). Clinical studies using CONSORT methods (<http://www.consort-statement.org/consort-statement/>) or systematic reviews using meta-analyses are particularly encouraged. Authors of potential review articles are encouraged to first contact the Editor during their preliminary development via e-mail at *JEndodontics@UTHSCSA.edu*. Manuscripts submitted for publication must be submitted solely to *JOE*. They must not be submitted for consideration elsewhere or be published elsewhere.

*Language (usage and editing services)*

Please write your text in good English (American or British usage is accepted, but not a mixture of these). Authors who feel their English language manuscript may require editing to eliminate possible grammatical or spelling errors and to conform to correct scientific English may wish to use the [English Language Editing service](#) available from Elsevier's WebShop.

### Submission

Our online submission system guides you stepwise through the process of entering your article details and uploading your files. The system converts your article files to a single PDF file used in the peer-review process. Editable files (e.g., Word, LaTeX) are required to typeset your article for final publication. All correspondence, including notification of the Editor's decision and requests for revision, is sent by e-mail.

*Submit your article*

### Essential title page information

- **Title.** Concise and informative. Titles are often used in information-retrieval systems. Avoid abbreviations and formulae where possible.
- **Author names and affiliations.** Please clearly indicate the given name(s) and family name(s) of each author and check that all names are accurately spelled. You can add your name between parentheses in your own script behind the English transliteration. Present the authors' affiliation addresses (where the actual work was done) below the names. Indicate all affiliations with a lower-case superscript letter immediately after the author's name and in front of the appropriate address. Provide the full postal address of each affiliation, including the country name and, if available, the e-mail address of each author.
- **Corresponding author.** Clearly indicate who will handle correspondence at all stages of refereeing and publication, also post-publication. This responsibility includes answering any

future queries about Methodology and Materials. **Ensure that the e-mail address is given and that contact details are kept up to date by the corresponding author.**

- **Present/permanent address.** If an author has moved since the work described in the article was done, or was visiting at the time, a 'Present address' (or 'Permanent address') may be indicated as a footnote to that author's name. The address at which the author actually did the work must be retained as the main, affiliation address. Superscript Arabic numerals are used for such footnotes.

### **Structured abstract**

A structured abstract, by means of appropriate headings, should provide the context or background for the research and should state its purpose, basic procedures (selection of study subjects or laboratory animals, observational and analytical methods), main findings (giving specific effect sizes and their statistical significance, if possible), and principal conclusions. It should emphasize new and important aspects of the study or observations.

#### *Abstract Headings*

Introduction, Methods, Results, Conclusions

### **Keywords**

Immediately after the abstract, provide a maximum of 6 keywords, using American spelling and avoiding general and plural terms and multiple concepts (avoid, for example, 'and', 'of'). Be sparing with abbreviations: only abbreviations firmly established in the field may be eligible. These keywords will be used for indexing purposes.

#### *Acknowledgements*

Collate acknowledgements in a separate section at the end of the article before the references and do not, therefore, include them on the title page, as a footnote to the title or otherwise. List here those individuals who provided help during the research (e.g., providing language help, writing assistance or proof reading the article, etc.).

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

### **Original Research Article Guidelines**

#### *Title Page*

The title describes the major emphasis of the paper. It must be as short as possible without loss of clarity. Avoid abbreviations in the title because this may lead to imprecise coding by electronic citation programs such as PubMed (eg, use sodium hypochlorite rather than NaOCl). The author list must conform to published standards on authorship (see authorship

criteria in the Uniform Requirements for Manuscripts Submitted to Biomedical Journals at [www.icmje.org](http://www.icmje.org)). Include the manuscript title; the names and affiliations of all authors; and the name, affiliation, and full mailing address (including e-mail) of the corresponding author. This author will be responsible for proofreading page proofs and ordering reprints when applicable. Also highlight the contribution of each author in the cover letter.

### *Abstract*

The Abstract concisely describes the purpose of the study in 250 or fewer words. It must be organized into sections: Introduction, Methods, Results, and Conclusions. The hypothesis is described in the Abstract Introduction. The Abstract describes the new contributions made by this study. The Abstract word limitation and its wide distribution (eg, PubMed) make it challenging to write clearly. This section is written last by many authors. Write the abstract in past tense because the study has been completed. Provide 3-5 keywords.

### *Introduction*

The introduction briefly reviews the pertinent literature in order to identify the gap in knowledge that the study is intended to address and the limitations of previous studies in the area. Clearly describe the purpose of the study, the tested hypothesis, and its scope. Many successful manuscripts require no more than a few paragraphs to accomplish these goals; therefore, do not perform extensive literature review or discuss the results of the study in this section.

### *Materials and Methods*

The Materials and Methods section is intended to permit other investigators to repeat your experiments. There are 4 components to this section: (1) detailed description of the materials used and their components, (2) experimental design, (3) procedures employed, and (4) statistical tests used to analyze the results. Most manuscripts should cite prior studies that used similar methods and succinctly describe the essential aspects used in the present study. A "methods figure" will be rejected unless the procedure is novel and requires an illustration for comprehension. If the method is novel, then you must carefully describe the method and include validation experiments. If the study used a commercial product, the manuscript must either state that you followed manufacturer's protocol or specify any changes made to the protocol. If the study used an *in vitro* model to simulate a clinical outcome, describe either experiments made to validate the model or previous literature that proved the clinical relevance of the model. The statistical analysis section must describe which tests were used to analyze which dependent measures; *P* values must be specified. Additional details may include randomization scheme, stratification (if any), power analysis as a basis for sample size computation, dropouts from clinical trials, the effects of important confounding variables, and bivariate versus multivariate analysis.

## *Results*

Only experimental results are appropriate in this section; do not include methods, discussion, or conclusions. Include only those data that are critical for the study, as defined by the aim(s). Do not include all available data without justification; any repetitive findings will be rejected from publication. All Figures, Charts, and Tables must be cited in the text in numerical order and include a brief description of the major findings. Consider using Supplemental Figures, Tables, or Video clips that will be published online. Supplemental material often is used to provide additional information or control experiments that support the results section (eg, microarray data).

## *Figures*

There are 2 general types of figures: type 1 includes photographs, radiographs, or micrographs; type 2 includes graphs. *Type 1:* Include only essential figures and use composite figures containing several panels of photographs, if possible. Each panel must be clearly identified with a letter (eg, A, B, C), and the parts must be defined in the figure legend. A figure that contains many panels counts as 1 figure. *Type 2:* Graphs (ie, line drawings including bar graphs) that plot a dependent measure (on the Y axis) as a function of an independent measure (usually plotted on the X axis). One example is a graph depicting pain scores over time. Use graphs when the overall trend of the results is more important than the exact numeric values of the results. A graph is a convenient way to report that an ibuprofen-treated group reported less pain than a placebo-treated group over the first 24 hours, but pain reported was the same for both groups over the next 96 hours. In this case, the trend of the results is the primary finding; the actual pain scores are not as critical as the relative differences between the NSAID and placebo groups.

## *Tables*

Tables are appropriate when it is critical to present exact numeric values; however, not all results need be placed in either a table or figure. Instead of a simple table, the results could state that there was no inhibition of growth from 0.001%-0.03% NaOCl, and a 100% inhibition of growth from 0.03%-3% NaOCl (N=5/group). If the results are not significant, then it is probably not necessary to include the results in either a table or as a figure.

## *Acknowledgments*

All authors must affirm that they have no financial affiliation (eg, employment, direct payment, stock holdings, retainers, consultantships, patent licensing arrangements, or honoraria), or involvement with any commercial organization with direct financial interest in the subject or materials discussed in this manuscript, nor have any such arrangements existed in the past 3 years. Disclose any potential conflict of interest. Append a paragraph to the manuscript that fully discloses any financial or other interest that poses a conflict.

Disclose all sources and attribute all grants, contracts, or donations that funded the study. Specific wording: "The authors deny any conflicts of interest related to this study."

### *References*

The reference style can be learned from reading past issues of *JOE*. References are numbered in order of citation. Place text citation of the reference Arabic number in parentheses at the end of a sentence or at the end of a clause that requires a literature citation. Do not use superscript for references. Original reports are limited to 35 references. There are no limits in the number of references for review articles.

### **Other Article Types and Guidelines**

Manuscripts submitted to *JOE* that are not Original Articles must fall into one of the following categories. Abstract limit: 250 words. Note that word limits, listed by type, do not include figure legends or References. If you are not sure whether your manuscript falls within one of the categories listed or if you would like to request pre-approval to submit additional figures, contact the Editor at [JEndodontics@uthscsa.edu](mailto:JEndodontics@uthscsa.edu).

### *Review Article*

Either narrative articles or systemic reviews/meta-analyses. Case Report/Clinical Techniques articles, even when they include an extensive review of the literature, are categorized as Case Report/Clinical Techniques. Word limit: 3500. Headings: Abstract, Introduction, Discussion, Acknowledgments. Maximum number of figures: 4. Maximum number of tables: 4.

### *Clinical Research*

Prospective or retrospective studies of patients or patient records, research on biopsies excluding the use of human teeth for technique studies. Word limit: 3500. Headings: Abstract, Introduction, Materials and Methods, Results, Discussion, Acknowledgments. Maximum number of figures: 4. Maximum number of tables: 4.

### *Formatting of funding sources*

List funding sources in this standard way to facilitate compliance to funder's requirements:

Funding: This work was supported by the National Institutes of Health [grant numbers xxxx, yyyy]; the Bill & Melinda Gates Foundation, Seattle, WA [grant number zzzz]; and the United States Institutes of Peace [grant number aaaa].

It is not necessary to include detailed descriptions on the program or type of grants and awards. When funding is from a block grant or other resources available to a university, college, or other research institution, submit the name of the institute or organization that provided the funding.

If no funding has been provided for the research, please include the following sentence:

This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

### *Units*

Follow internationally accepted rules and conventions: use the international system of units (SI). If other units are mentioned, please give their equivalent in SI.

### **Artwork**

#### *Electronic artwork*

#### *Figure captions*

Ensure that each illustration has a caption. Supply captions separately, not attached to the figure. A caption should comprise a brief title (**not** on the figure itself) and a description of the illustration. Keep text in the illustrations themselves to a minimum but explain all symbols and abbreviations used.

### **Tables**

Please submit tables as editable text and not as images. Tables can be placed either next to the relevant text in the article, or on separate page(s) at the end. Number tables consecutively in accordance with their appearance in the text and place any table notes below the table body. Be sparing in the use of tables and ensure that the data presented in them do not duplicate results described elsewhere in the article. Please avoid using vertical rules and shading in table cells.

### **References**

Please ensure that every reference cited in the text is also present in the reference list (and vice versa). Any references cited in the abstract must be given in full. Unpublished results and personal communications are not allowed in the reference list, but they may be mentioned in the text. Citation of a reference as "in press" implies that the item has been accepted for publication.

### *Reference links*

Increased discoverability of research and high quality peer review are ensured by online links to the sources cited. In order to allow us to create links to abstracting and indexing services, such as Scopus, CrossRef and PubMed, please ensure that data provided in the references are correct. Please note that incorrect surnames, journal/book titles, publication year and pagination may prevent link creation. When copying references, please be careful as they may already contain errors. Use of the DOI is encouraged.

A DOI can be used to cite and link to electronic articles where an article is in-press and full citation details are not yet known, but the article is available online. A DOI is guaranteed never to change, so you can use it as a permanent link to any electronic article. An example of a citation using DOI for an article not yet in an issue is: VanDecar J.C., Russo R.M., James D.E., Ambeh W.B., Franke M. (2003). Aseismic continuation of the Lesser Antilles slab beneath northeastern Venezuela. *Journal of Geophysical Research*, <https://doi.org/10.1029/2001JB000884>. Please note the format of such citations should be in the same style as all other references in the paper.

### *Web References*

As a minimum, the full URL should be given and the date when the reference was last accessed. Any further information, if known (DOI, author names, dates, reference to a source publication, etc.), should also be given. Web references are included in the reference list.

### *Data references*

This journal encourages you to cite underlying or relevant datasets in your manuscript by citing them in your text and including a data reference in your Reference List. Data references should include the following elements: author name(s), dataset title, data repository, version (where available), year, and global persistent identifier. Add [dataset] immediately before the reference so we can properly identify it as a data reference. The [dataset] identifier will not appear in your published article.

### *References in a special issue*

Please ensure that the words 'this issue' are added to any references in the list (and any citations in the text) to other articles in the same Special Issue.

### *Reference management software*

Most Elsevier journals have their reference template available in many of the most popular reference management software products. These include all products that support [Citation](#)

[Style Language styles](#), such as [Mendeley](#) and [Zotero](#), as well as [EndNote](#). Using the word processor plug-ins from these products, authors only need to select the appropriate journal template when preparing their article, after which citations and bibliographies will be automatically formatted in the journal's style. If no template is yet available for this journal, please follow the format of the sample references and citations as shown in this Guide.

Users of Mendeley Desktop can easily install the reference style for this journal by clicking the following link:

☞ <http://open.mendeley.com/use-citation-style/journal-of-endodontics>

When preparing your manuscript, you will then be able to select this style using the Mendeley plug-ins for Microsoft Word or LibreOffice.

### *Reference style*

*Text:* Indicate references by Arabic numerals in parentheses, numbered in the order in which they appear in the text. *List:* Number the references in the list in the order in which they appear in the text. List 3 authors then et al.

#### *Examples:*

Journal article:

1. Van der Geer J, Hanraads JAJ, Lupton RA. The art of writing a scientific article. *J Sci Commun*. 2010;163:51–59.

Book:

2. Strunk W Jr, White EB. *The Elements of Style*, 4th ed. New York: Longman; 2000.

Chapter in an edited book:

3. Mettam GR, Adams LB. How to prepare an electronic version of your article. In: Jones BS, Smith RZ, eds. *Introduction to the Electronic Age*. New York: E-Publishing; 2009:281–304.

### *Journal abbreviations source*

Journal names are abbreviated according to Index medicus.

## **Supplementary material**

Supplementary material such as applications, images and sound clips, can be published with your article to enhance it. Submitted supplementary items are published exactly as they are received (Excel or PowerPoint files will appear as such online). Please submit your material together with the article and supply a concise, descriptive caption for each supplementary file. If you wish to make changes to supplementary material during any stage of the process, please make sure to provide an updated file. Do not annotate any corrections on a previous version. Please switch off the 'Track Changes' option in Microsoft Office files as these will appear in the published version.

## **RESEARCH DATA**



This journal encourages and enables you to share data that supports your research publication where appropriate, and enables you to interlink the data with your published articles. Research data refers to the results of observations or experimentation that validate research findings. To facilitate reproducibility and data reuse, this journal also encourages you to share your software, code, models, algorithms, protocols, methods and other useful materials related to the project.

Below are a number of ways in which you can associate data with your article or make a statement about the availability of your data when submitting your manuscript. If you are sharing data in one of these ways, you are encouraged to cite the data in your manuscript and reference list. Please refer to the "References" section for more information about data citation. For more information on depositing, sharing and using research data and other relevant research materials, visit the [research data](#) page.

### *Data linking*

If you have made your research data available in a data repository, you can link your article directly to the dataset. Elsevier collaborates with a number of repositories to link articles on ScienceDirect with relevant repositories, giving readers access to underlying data that gives them a better understanding of the research described.

There are different ways to link your datasets to your article. When available, you can directly link your dataset to your article by providing the relevant information in the submission system. For more information, visit the [database linking page](#).

For [supported data repositories](#) a repository banner will automatically appear next to your published article on ScienceDirect.

In addition, you can link to relevant data or entities through identifiers within the text of your manuscript, using the following format: Database: xxxx (e.g., TAIR: AT1G01020; CCDC: 734053; PDB: 1XFN).

### *Mendeley Data*

This journal supports Mendeley Data, enabling you to deposit any research data (including raw and processed data, video, code, software, algorithms, protocols, and methods) associated with your manuscript in a free-to-use, open access repository. Before submitting your article, you can deposit the relevant datasets to *Mendeley Data*. Please include the DOI of the deposited dataset(s) in your main manuscript file. The datasets will be listed and directly accessible to readers next to your published article online.

For more information, visit the [Mendeley Data for journals page](#).

### *Data statement*

To foster transparency, we encourage you to state the availability of your data in your submission. This may be a requirement of your funding body or institution. If your data is unavailable to access or unsuitable to post, you will have the opportunity to indicate why during the submission process, for example by stating that the research data is confidential. The statement will appear with your published article on ScienceDirect. For more information, visit the [Data Statement page](#).

### **Proofs**

One set of page proofs (as PDF files) will be sent by e-mail to the corresponding author (if we do not have an e-mail address then paper proofs will be sent by post) or, a link will be provided in the e-mail so that authors can download the files themselves. Elsevier now provides authors with PDF proofs which can be annotated; for this you will need to download Adobe Reader version 7 (or higher) available free from <http://get.adobe.com/reader>. Instructions on how to annotate PDF files will accompany the proofs (also given online). The exact system requirements are given at the Adobe site: <http://www.adobe.com/products/reader/tech-specs.html>.

If you do not wish to use the PDF annotations function, you may list the corrections (including replies to the Query Form) and return them to the Journal Manager at Elsevier in an e-mail. Please list your corrections quoting line number. If, for any reason, this is not possible, then mark the corrections and any other comments (including replies to the Query Form) on a printout of your proof and return by fax. Please use this proof only for checking the typesetting, editing, completeness and correctness of the text, tables and figures. Significant changes to the article as accepted for publication will only be considered at this stage with permission from the Editor. We will do everything possible to get your article published quickly and accurately – please let us have all your corrections within 48 hours. It is important to ensure that all corrections are sent back to us in one communication: please check carefully before replying, as inclusion of any subsequent corrections cannot be guaranteed. Proofreading is solely your responsibility. Note that Elsevier may proceed with the publication of your article if no response is received.

### **Offprints**

The corresponding author will, at no cost, receive a customized [Share Link](#) providing 50 days free access to the final published version of the article on [ScienceDirect](#). The Share Link can be used for sharing the article via any communication channel, including email and social media. For an extra charge, paper offprints can be ordered via the offprint order form which is sent once the article is accepted for publication. Both corresponding and co-authors may order offprints at any time via Elsevier's [Webshop](#). Corresponding authors who have

published their article open access do not receive a Share Link as their final published version of the article is available open access on ScienceDirect and can be shared through the article DOI link.

## **ANEXO D - NORMAS DA REVISTA INTERNATIONAL ENDODONTICS JOURNAL**

### Author Guidelines

Content of Author Guidelines: 1. General, 2. Ethical Guidelines, 3. Manuscript Submission Procedure, 4. Manuscript Types Accepted, 5. Manuscript Format and Structure, 6. After Acceptance

Useful Websites: Submission Site, Articles published in International Endodontic Journal, Author Services, Wiley's Ethical Guidelines, Guidelines for Figures

The journal to which you are submitting your manuscript employs a plagiarism detection system. By submitting your manuscript to this journal you accept that your manuscript may be screened for plagiarism against previously published works.

### 1. GENERAL

International Endodontic Journal publishes original scientific articles, reviews, clinical articles and case reports in the field of Endodontology; the branch of dental sciences dealing with health, injuries to and diseases of the pulp and periradicular region, and their relationship with systemic well-being and health. Original scientific articles are published in the areas of biomedical science, applied materials science, bioengineering, epidemiology and social science relevant to endodontic disease and its management, and to the restoration of root-treated teeth. In addition, review articles, reports of clinical cases, book reviews, summaries and abstracts of scientific meetings and news items are accepted.

Please read the instructions below carefully for details on the submission of manuscripts, the journal's requirements and standards as well as information concerning the procedure after a manuscript has been accepted for publication in International Endodontic Journal. Authors are encouraged to visit Wiley Author Services for further information on the preparation and submission of articles and figures.

### 2. ETHICAL GUIDELINES

International Endodontic Journal adheres to the below ethical guidelines for publication and research.

#### 2.1. Authorship and Acknowledgements

Authors submitting a paper do so on the understanding that the manuscript has been read and approved by all authors and that all authors agree to the submission of the manuscript to the Journal.

International Endodontic Journal adheres to the definition of authorship set up by The International Committee of Medical Journal Editors (ICMJE). According to the ICMJE, authorship criteria should be based on 1) substantial contributions to conception and design of, or acquisition of data or analysis and interpretation of data, 2) drafting the article or revising it critically for important intellectual content and 3) final approval of the version to be published. Authors should meet conditions 1, 2 and 3.

**Acknowledgements:** Under acknowledgements please specify contributors to the article other than the authors accredited. Please also include specifications of the source of funding for the

study and any potential conflict of interests if appropriate. Please find more information on the conflict of interest form in section 2.6.

## 2.2. Ethical Approvals

Experimentation involving human subjects will only be published if such research has been conducted in full accordance with ethical principles, including the World Medical Association Declaration of Helsinki (version 2008) and the additional requirements, if any, of the country where the research has been carried out. Manuscripts must be accompanied by a statement that the experiments were undertaken with the understanding and written consent of each subject and according to the above mentioned principles. A statement regarding the fact that the study has been independently reviewed and approved by an ethical board should also be included. Editors reserve the right to reject papers if there are doubts as to whether appropriate procedures have been used.

When experimental animals are used the methods section must clearly indicate that adequate measures were taken to minimize pain or discomfort. Experiments should be carried out in accordance with the Guidelines laid down by the National Institute of Health (NIH) in the USA regarding the care and use of animals for experimental procedures or with the European Communities Council Directive of 24 November 1986 (86/609/EEC) and in accordance with local laws and regulations.

All studies using human or animal subjects should include an explicit statement in the Material and Methods section identifying the review and ethics committee approval for each study. The authors **MUST** upload a copy of the ethical approval letter when submitting their manuscript. Editors reserve the right to reject papers if there is doubt as to whether appropriate procedures have been used.

## 2.3 Clinical Trials

The International Endodontic Journal asks that authors submitting manuscripts reporting from a clinical trial to register the trials in any of the following public clinical trials registries: [www.clinicaltrials.gov](http://www.clinicaltrials.gov), <https://www.clinicaltrialsregister.eu/>, <http://isrctn.org/>. Other primary registries if named in the WHO network will also be considered acceptable. The clinical trial registration number and name of the trial register should be included in the Acknowledgements at the submission stage.

### 2.3.1 Randomised control clinical trials

Randomised control clinical trials should be reported using the guidelines available at [www.consort-statement.org](http://www.consort-statement.org). A CONSORT checklist and flow diagram (as a Figure) should also be included in the submission material.

### 2.3.2 Epidemiological observational trials

Submitting authors of epidemiological human observations studies are required to review and submit a 'strengthening the reporting of observational studies in Epidemiology' (STROBE) checklist and statement. Compliance with this should be detailed in the materials and methods section. ([www.strobe-statement.org](http://www.strobe-statement.org))

## 2.4 Systematic Reviews

Systematic reviews should be reported using the PRISMA guidelines available at <http://prisma-statement.org/>. A PRISMA checklist and flow diagram (as a Figure) should also be included in the submission material.

## 2.5 DNA Sequences and Crystallographic Structure Determinations

Papers reporting protein or DNA sequences and crystallographic structure determinations will not be accepted without a Genbank or Brookhaven accession number, respectively. Other supporting data sets must be made available on the publication date from the authors directly.

## 2.6 Conflict of Interest and Source of Funding

International Endodontic Journal requires that all authors (both the corresponding author and co-authors) disclose any potential sources of conflict of interest. Any interest or relationship, financial or otherwise that might be perceived as influencing an author's objectivity is considered a potential source of conflict of interest. These must be disclosed when directly relevant or indirectly related to the work that the authors describe in their manuscript. Potential sources of conflict of interest include but are not limited to patent or stock ownership, membership of a company board of directors, membership of an advisory board or committee for a company, and consultancy for or receipt of speaker's fees from a company. If authors are unsure whether a past or present affiliation or relationship should be disclosed in the manuscript, please contact the editorial office at [iejeditor@cardiff.ac.uk](mailto:iejeditor@cardiff.ac.uk). The existence of a conflict of interest does not preclude publication in this journal.

The above policies are in accordance with the Uniform Requirements for Manuscripts Submitted to Biomedical Journals produced by the International Committee of Medical Journal Editors (<http://www.icmje.org/>).

It is the responsibility of the corresponding author to have all authors of a manuscript fill out a conflict of interest disclosure form, and to upload all forms individually (do not combine the forms into one file) together with the manuscript on submission. The disclosure statement should be included under Acknowledgements. Please find the form below:

### Conflict of Interest Disclosure Form

## 2.7 Appeal of Decision

The decision on a paper is final and cannot be appealed.

## 2.8 Permissions

If all or parts of previously published illustrations are used, permission must be obtained from the copyright holder concerned. It is the author's responsibility to obtain these in writing and provide copies to the Publishers.

## 2.8 Copyright Assignment

If your paper is accepted, the author identified as the formal corresponding author for the paper will receive an email prompting them to login into Author Services; where via the Wiley Author Licensing Service (WALS) they will be able to complete the license agreement on behalf of all authors on the paper. Your article cannot be published until this has been done.

For authors choosing OnlineOpen

If the OnlineOpen option is selected the corresponding author will have a choice of the following Creative Commons License Open Access Agreements (OAA):

Creative Commons Attribution License OAA

Creative Commons Attribution Non-Commercial License OAA

Creative Commons Attribution Non-Commercial - No Derivs License OAA

To preview the terms and conditions of these open access agreements please visit the Copyright FAQs hosted on Wiley Author Services [http://exchanges.wiley.com/authors/faqs---copyright-\\_301.html](http://exchanges.wiley.com/authors/faqs---copyright-_301.html) and visit <http://www.wileyopenaccess.com/details/content/12f25db4c87/Copyright-License.html>.

If you select the OnlineOpen option and your research is funded by certain funders [e.g. The Wellcome Trust and members of the Research Councils UK (RCUK) or the Austrian Science Fund (FWF)] you will be given the opportunity to publish your article under a CC-BY license supporting you in complying with Wellcome Trust and Research Councils UK requirements. For more information on this policy and the Journal's compliant self-archiving policy please visit: <http://www.wiley.com/go/funderstatement>.

### 3. OnlineOpen

OnlineOpen is available to authors of primary research articles who wish to make their article available to non-subscribers on publication, or whose funding agency requires grantees to archive the final version of their article. With OnlineOpen, the author, the author's funding agency, or the author's institution pays a fee to ensure that the article is made available to non-subscribers upon publication via Wiley Online Library, as well as deposited in the funding agency's preferred archive. For the full list of terms and conditions, see

[http://wileyonlinelibrary.com/onlineopen#OnlineOpen\\_Terms](http://wileyonlinelibrary.com/onlineopen#OnlineOpen_Terms)

Any authors wishing to send their paper OnlineOpen will be required to complete the payment form available from our website at:

[https://authorservices.wiley.com/bauthor/onlineopen\\_order.asp](https://authorservices.wiley.com/bauthor/onlineopen_order.asp)

Prior to acceptance there is no requirement to inform an Editorial Office that you intend to publish your paper OnlineOpen if you do not wish to. All OnlineOpen articles are treated in the same way as any other article. They go through the journal's standard peer-review process and will be accepted or rejected based on their own merit.

## 5. MANUSCRIPT FORMAT AND STRUCTURE

### 5.1. Format

**Language:** The language of publication is English. It is preferred that manuscript is professionally edited. A list of independent suppliers of editing services can be found at [http://authorservices.wiley.com/bauthor/english\\_language.asp](http://authorservices.wiley.com/bauthor/english_language.asp). All services are paid for and arranged by the author, and use of one of these services does not guarantee acceptance or preference for publication

**Presentation:** Authors should pay special attention to the presentation of their research findings or clinical reports so that they may be communicated clearly. Technical jargon should be avoided as much as possible and clearly explained where its use is unavoidable. Abbreviations should also be kept to a minimum, particularly those that are not standard. The background and hypotheses underlying the study, as well as its main conclusions, should be clearly explained. Titles and abstracts especially should be written in language that will be readily intelligible to any scientist.

**Abbreviations:** International Endodontic Journal adheres to the conventions outlined in Units, Symbols and Abbreviations: A Guide for Medical and Scientific Editors and Authors. When non-standard terms appearing 3 or more times in the manuscript are to be abbreviated, they should be written out completely in the text when first used with the abbreviation in parenthesis.

### 5.2. Structure

All manuscripts submitted to International Endodontic Journal should include Title Page, Abstract, Main Text, References and Acknowledgements, Tables, Figures and Figure Legends as appropriate

Title Page: The title page should bear: (i) Title, which should be concise as well as descriptive; (ii) Initial(s) and last (family) name of each author; (iii) Name and address of department, hospital or institution to which work should be attributed; (iv) Running title (no more than 30 letters and spaces); (v) No more than six keywords (in alphabetical order); (vi) Name, full postal address, telephone, fax number and e-mail address of author responsible for correspondence.

Abstract for Original Scientific Articles should be no more than 250 words giving details of what was done using the following structure:

- Aim: Give a clear statement of the main aim of the study and the main hypothesis tested, if any.
- Methodology: Describe the methods adopted including, as appropriate, the design of the study, the setting, entry requirements for subjects, use of materials, outcome measures and statistical tests.
- Results: Give the main results of the study, including the outcome of any statistical analysis.
- Conclusions: State the primary conclusions of the study and their implications. Suggest areas for further research, if appropriate.

Abstract for Review Articles should be non-structured of no more than 250 words giving details of what was done including the literature search strategy.

Abstract for Mini Review Articles should be non-structured of no more than 250 words, including a clear research question, details of the literature search strategy and clear conclusions.

Abstract for Case Reports should be no more than 250 words using the following structure:

- Aim: Give a clear statement of the main aim of the report and the clinical problem which is addressed.
- Summary: Describe the methods adopted including, as appropriate, the design of the study, the setting, entry requirements for subjects, use of materials, outcome measures and analysis if any.
- Key learning points: Provide up to 5 short, bullet-pointed statements to highlight the key messages of the report. All points must be fully justified by material presented in the report.

Abstract for Clinical Articles should be no more than 250 words using the following structure:

- Aim: Give a clear statement of the main aim of the report and the clinical problem which is addressed.
- Methodology: Describe the methods adopted.
- Results: Give the main results of the study.
- Conclusions: State the primary conclusions of the study.

Main Text of Original Scientific Article should include Introduction, Materials and Methods, Results, Discussion and Conclusion

Introduction: should be focused, outlining the historical or logical origins of the study and gaps in knowledge. Exhaustive literature reviews are not appropriate. It should close with the explicit statement of the specific aims of the investigation, or hypothesis to be tested.

Material and Methods: must contain sufficient detail such that, in combination with the references cited, all clinical trials and experiments reported can be fully reproduced.

(i) Clinical Trials should be reported using the CONSORT guidelines available at [www.consort-statement.org](http://www.consort-statement.org). A CONSORT checklist and flow diagram (as a Figure) should also be included in the submission material.

(ii) Experimental Subjects: experimentation involving human subjects will only be published if such research has been conducted in full accordance with ethical principles, including the World



Medical Association Declaration of Helsinki (version 2008) and the additional requirements, if any, of the country where the research has been carried out. Manuscripts must be accompanied by a statement that the experiments were undertaken with the understanding and written consent of each subject and according to the above mentioned principles. A statement regarding the fact that the study has been independently reviewed and approved by an ethical board should also be included. Editors reserve the right to reject papers if there are doubts as to whether appropriate procedures have been used.

When experimental animals are used the methods section must clearly indicate that adequate measures were taken to minimize pain or discomfort. Experiments should be carried out in accordance with the Guidelines laid down by the National Institute of Health (NIH) in the USA regarding the care and use of animals for experimental procedures or with the European Communities Council Directive of 24 November 1986 (86/609/EEC) and in accordance with local laws and regulations.

All studies using human or animal subjects should include an explicit statement in the Material and Methods section identifying the review and ethics committee approval for each study, if applicable. Editors reserve the right to reject papers if there is doubt as to whether appropriate procedures have been used.

(iii) Suppliers: Suppliers of materials should be named and their location (Company, town/city, state, country) included.

Results: should present the observations with minimal reference to earlier literature or to possible interpretations. Data should not be duplicated in Tables and Figures.

Discussion: may usefully start with a brief summary of the major findings, but repetition of parts of the abstract or of the results section should be avoided. The Discussion section should progress with a review of the methodology before discussing the results in light of previous work in the field. The Discussion should end with a brief conclusion and a comment on the potential clinical relevance of the findings. Statements and interpretation of the data should be appropriately supported by original references.

Conclusion: should contain a summary of the findings.

Main Text of Review Articles should be divided into Introduction, Review and Conclusions. The Introduction section should be focused to place the subject matter in context and to justify the need for the review. The Review section should be divided into logical sub-sections in order to improve readability and enhance understanding. Search strategies must be described and the use of state-of-the-art evidence-based systematic approaches is expected. The use of tabulated and illustrative material is encouraged. The Conclusion section should reach clear conclusions and/or recommendations on the basis of the evidence presented.

Main Text of Mini Review Articles should be divided into Introduction, Review and Conclusions. The Introduction section should briefly introduce the subject matter and justify the need and timeliness of the literature review. The Review section should be divided into logical sub-sections to enhance readability and understanding and may be supported by up to 5 tables and figures. Search strategies must be described and the use of state-of-the-art evidence-based systematic approaches is expected. The Conclusions section should present clear statements/recommendations and suggestions for further work. The manuscript, including references and figure legends should not normally exceed 4000 words.

Main Text of Clinical Reports and Clinical Articles should be divided into Introduction, Report, Discussion and Conclusion,. They should be well illustrated with clinical images, radiographs,

diagrams and, where appropriate, supporting tables and graphs. However, all illustrations must be of the highest quality

**Acknowledgements:** International Endodontic Journal requires that all sources of institutional, private and corporate financial support for the work within the manuscript must be fully acknowledged, and any potential conflicts of interest noted. Grant or contribution numbers may be acknowledged, and principal grant holders should be listed. Acknowledgments should be brief and should not include thanks to anonymous referees and editors. See also above under Ethical Guidelines.

### 5.3. References

It is the policy of the Journal to encourage reference to the original papers rather than to literature reviews. Authors should therefore keep citations of reviews to the absolute minimum.

We recommend the use of a tool such as EndNote or Reference Manager for reference management and formatting. The EndNote reference style can be obtained upon request to the editorial office ([iejeditor@cardiff.ac.uk](mailto:iejeditor@cardiff.ac.uk)). Reference Manager reference styles can be searched for here: [www.refman.com/support/rmstyles.asp](http://www.refman.com/support/rmstyles.asp)

In the text: single or double authors should be acknowledged together with the year of publication, e.g. (Pitt Ford & Roberts 1990). If more than two authors the first author followed by et al. is sufficient, e.g. (Tobias et al. 1991). If more than 1 paper is cited the references should be in year order and separated by "," e.g. (Pitt Ford & Roberts 1990, Tobias et al. 1991).

Reference list: All references should be brought together at the end of the paper in alphabetical order and should be in the following form.

(i) Names and initials of up to six authors. When there are seven or more, list the first three and add et al.

(ii) Year of publication in parentheses

(iii) Full title of paper followed by a full stop (.)

(iv) Title of journal in full (in italics)

(v) Volume number (bold) followed by a comma (,)

(vi) First and last pages

Examples of correct forms of reference follow:

Standard journal article

Bergenholtz G, Nagaoka S, Jontell M (1991) Class II antigen-expressing cells in experimentally induced pulpitis. *International Endodontic Journal* 24, 8-14.

Corporate author

British Endodontic Society (1983) Guidelines for root canal treatment. *International Endodontic Journal* 16, 192-5.

Journal supplement

Frumin AM, Nussbaum J, Esposito M (1979) Functional asplenia: demonstration of splenic activity by bone marrow scan (Abstract). *Blood* 54 (Suppl. 1), 26a.

Books and other monographs

Personal author(s)

Gutmann J, Harrison JW (1991) *Surgical Endodontics*, 1st edn Boston, MA, USA: Blackwell Scientific Publications.

Chapter in a book

Wesselink P (1990) Conventional root-canal therapy III: root filling. In: Harty FJ, ed. *Endodontics in Clinical Practice*, 3rd edn; pp. 186-223. London, UK: Butterworth.

Published proceedings paper

DuPont B (1974) Bone marrow transplantation in severe combined immunodeficiency with an unrelated MLC compatible donor. In: White HJ, Smith R, eds. Proceedings of the Third Annual Meeting of the International Society for Experimental Rematology; pp. 44-46. Houston, TX, USA: International Society for Experimental Hematology.

Agency publication

Ranofsky AL (1978) Surgical Operations in Short-Stay Hospitals: United States-1975. DHEW publication no. (PHS) 78-1785 (Vital and Health Statistics; Series 13; no. 34.) Hyattsville, MD, USA: National Centre for Health Statistics.8

Dissertation or thesis

Saunders EM (1988) In vitro and in vivo investigations into root-canal obturation using thermally softened gutta-percha techniques (PhD Thesis). Dundee, UK: University of Dundee.

URLs

Full reference details must be given along with the URL, i.e. authorship, year, title of document/report and URL. If this information is not available, the reference should be removed and only the web address cited in the text.

Smith A (1999) Select committee report into social care in the community [WWW document]. URL <http://www.dhss.gov.uk/reports/report015285.html> [accessed on 7 November 2003]

#### 5.4. Tables, Figures and Figure Legends

Tables: Tables should be double-spaced with no vertical rulings, with a single bold ruling beneath the column titles. Units of measurements must be included in the column title.

Figures: All figures should be planned to fit within either 1 column width (8.0 cm), 1.5 column widths (13.0 cm) or 2 column widths (17.0 cm), and must be suitable for photocopy reproduction from the printed version of the manuscript. Lettering on figures should be in a clear, sans serif typeface (e.g. Helvetica); if possible, the same typeface should be used for all figures in a paper. After reduction for publication, upper-case text and numbers should be at least 1.5-2.0 mm high (10 point Helvetica). After reduction, symbols should be at least 2.0-3.0 mm high (10 point). All half-tone photographs should be submitted at final reproduction size. In general, multi-part figures should be arranged as they would appear in the final version. Reduction to the scale that will be used on the page is not necessary, but any special requirements (such as the separation distance of stereo pairs) should be clearly specified.

Unnecessary figures and parts (panels) of figures should be avoided: data presented in small tables or histograms, for instance, can generally be stated briefly in the text instead. Figures should not contain more than one panel unless the parts are logically connected; each panel of a multipart figure should be sized so that the whole figure can be reduced by the same amount and reproduced on the printed page at the smallest size at which essential details are visible.

Figures should be on a white background, and should avoid excessive boxing, unnecessary colour, shading and/or decorative effects (e.g. 3-dimensional skyscraper histograms) and highly pixelated computer drawings. The vertical axis of histograms should not be truncated to exaggerate small differences. The line spacing should be wide enough to remain clear on reduction to the minimum acceptable printed size.

Figures divided into parts should be labelled with a lower-case, boldface, roman letter, a, b, and so on, in the same typesize as used elsewhere in the figure. Lettering in figures should be in lower-case type, with the first letter capitalized. Units should have a single space between the

number and the unit, and follow SI nomenclature or the nomenclature common to a particular field. Thousands should be separated by a thin space (1 000). Unusual units or abbreviations should be spelled out in full or defined in the legend. Scale bars should be used rather than magnification factors, with the length of the bar defined in the legend rather than on the bar itself. In general, visual cues (on the figures themselves) are preferred to verbal explanations in the legend (e.g. broken line, open red triangles etc.)

Figure legends: Figure legends should begin with a brief title for the whole figure and continue with a short description of each panel and the symbols used; they should not contain any details of methods.

Permissions: If all or part of previously published illustrations are to be used, permission must be obtained from the copyright holder concerned. This is the responsibility of the authors before submission.

Preparation of Electronic Figures for Publication: Although low quality images are adequate for review purposes, print publication requires high quality images to prevent the final product being blurred or fuzzy. Submit EPS (lineart) or TIFF (halftone/photographs) files only. MS PowerPoint and Word Graphics are unsuitable for printed pictures. Do not use pixel-oriented programmes. Scans (TIFF only) should have a resolution of 300 dpi (halftone) or 600 to 1200 dpi (line drawings) in relation to the reproduction size (see below). EPS files should be saved with fonts embedded (and with a TIFF preview if possible). For scanned images, the scanning resolution (at final image size) should be as follows to ensure good reproduction: lineart: >600 dpi; half-tones (including gel photographs): >300 dpi; figures containing both halftone and line images: >600 dpi.

Further information can be obtained at Wiley Blackwell's guidelines for figures: <http://authorservices.wiley.com/bauthor/illustration.asp>.

Check your electronic artwork before submitting it: <http://authorservices.wiley.com/bauthor/eachecklist.asp>.

### 5.5. Supporting Information

Publication in electronic formats has created opportunities for adding details or whole sections in the electronic version only. Authors need to work closely with the editors in developing or using such new publication formats.

Supporting information, such as data sets or additional figures or tables, that will not be published in the print edition of the journal, but which will be viewable via the online edition, can be submitted. It should be clearly stated at the time of submission that the supporting information is intended to be made available through the online edition. If the size or format of the supporting information is such that it cannot be accommodated on the journal's website, the author agrees to make the supporting information available free of charge on a permanent Web site, to which links will be set up from the journal's website. The author must advise Wiley Blackwell if the URL of the website where the supporting information is located changes. The content of the supporting information must not be altered after the paper has been accepted for publication.

The availability of supporting information should be indicated in the main manuscript by a paragraph, to appear after the References, headed 'Supporting Information' and providing titles of figures, tables, etc. In order to protect reviewer anonymity, material posted on the authors

Web site cannot be reviewed. The supporting information is an integral part of the article and will be reviewed accordingly.

Preparation of Supporting Information: Although provision of content through the web in any format is straightforward, supporting information is best provided either in web-ready form or in a form that can be conveniently converted into one of the standard web publishing formats:

- Simple word-processing files (.doc or .rtf) for text.
- PDF for more complex, layout-dependent text or page-based material. Acrobat files can be distilled from Postscript by the Publisher, if necessary.
- GIF or JPEG for still graphics. Graphics supplied as EPS or TIFF are also acceptable.
- MPEG or AVI for moving graphics.

Subsequent requests for changes are generally unacceptable, as for printed papers. A charge may be levied for this service.

Video Imaging: For the on-line version of the Journal the submission of illustrative video is encouraged. Authors proposing the use such media should consult with the Editor during manuscript preparation.

## 6. AFTER ACCEPTANCE

Upon acceptance of a paper for publication, the manuscript will be forwarded to the Production Editor who is responsible for the production of the journal.

### 6.1. Figures

Hard copies of all figures and tables are required when the manuscript is ready for publication. These will be requested by the Editor when required. Each Figure copy should be marked on the reverse with the figure number and the corresponding author's name.

### 6.2 Proof Corrections

The corresponding author will receive an email alert containing a link to a web site. A working email address must therefore be provided for the corresponding author. The proof can be downloaded as a PDF (portable document format) file from this site. Acrobat Reader will be required in order to read this file. This software can be downloaded (free of charge) from the following Web site: [www.adobe.com/products/acrobat/readstep2.html](http://www.adobe.com/products/acrobat/readstep2.html). This will enable the file to be opened, read on screen, and printed out in order for any corrections to be added. Further instructions will be sent with the proof. Hard copy proofs will be posted if no e-mail address is available; in your absence, please arrange for a colleague to access your e-mail to retrieve the proofs. Proofs must be returned to the Production Editor within three days of receipt. As changes to proofs are costly, we ask that you only correct typesetting errors. Excessive changes made by the author in the proofs, excluding typesetting errors, will be charged separately. Other than in exceptional circumstances, all illustrations are retained by the publisher. Please note that the author is responsible for all statements made in his work, including changes made by the copy editor.

### 6.3 Early Online Publication Prior to Print

International Endodontic Journal is covered by Wiley Blackwell's Early View service. Early View articles are complete full-text articles published online in advance of their publication in a printed issue. Early View articles are complete and final. They have been fully reviewed, revised and edited for publication, and the authors' final corrections have been incorporated. Because they are in final form, no changes can be made after online publication. The nature of Early View articles means that they do not yet have volume, issue or page numbers, so Early View articles cannot be cited in the traditional way. They are therefore given a Digital Object

Identifier (DOI), which allows the article to be cited and tracked before it is allocated to an issue. After print publication, the DOI remains valid and can continue to be used to cite and access the article.

#### 6.4 Online Production Tracking

Online production tracking is available for your article through Blackwell's Author Services. Author Services enables authors to track their article - once it has been accepted - through the production process to publication online and in print. Authors can check the status of their articles online and choose to receive automated e-mails at key stages of production. The author will receive an e-mail with a unique link that enables them to register and have their article automatically added to the system. Please ensure that a complete e-mail address is provided when submitting the manuscript. Visit <http://authorservices.wiley.com/bauthor/> for more details on online production tracking and for a wealth of resources including FAQs and tips on article preparation, submission and more.

#### 6.5 Author Material Archive Policy

Please note that unless specifically requested, Wiley Blackwell will dispose of all hardcopy or electronic material submitted two months after publication. If you require the return of any material submitted, please inform the editorial office or production editor as soon as possible.

#### 6.6 Offprints

Free access to the final PDF offprint of your article will be available via Author Services only. Please therefore sign up for Author Services if you would like to access your article PDF offprint and enjoy the many other benefits the service offers.

Additional paper offprints may be ordered online. Please click on the following link, fill in the necessary details and ensure that you type information in all of the required fields: Offprint Cosprinters. If you have queries about offprints please email [offprint@cosprinters.com](mailto:offprint@cosprinters.com)

The corresponding author will be sent complimentary copies of the issue in which the paper is published (one copy per author).

#### 6.7 Author Services

For more substantial information on the services provided for authors, please see Wiley Blackwell Author Services

6.8 Note to NIH Grantees: Pursuant to NIH mandate, Wiley Blackwell will post the accepted version of contributions authored by NIH grant-holders to PubMed Central upon acceptance. This accepted version will be made publicly available 12 months after publication. For further information, see [www.wiley.com/go/nihmandate](http://www.wiley.com/go/nihmandate)

#### 7 Guidelines for reporting of DNA microarray data

The International Endodontic Journal gives authors notice that, with effect from 1st January 2011, submission to the International Endodontic Journal requires the reporting of microarray data to conform to the MIAME guidelines. After this date, submissions will be assessed according to MIAME standards. The complete current guidelines are available at [http://www.mged.org/Workgroups/MIAME/miame\\_2.0.html](http://www.mged.org/Workgroups/MIAME/miame_2.0.html). Also, manuscripts will be published only after the complete data has been submitted into the public repositories, such as GEO (<http://www.ncbi.nlm.nih.gov/geo/>) or ArrayExpress ([http://www.ebi.ac.uk/microarray/submissions\\_overview.html](http://www.ebi.ac.uk/microarray/submissions_overview.html)), in MIAME compliant format, with the data accession number (the identification number of the data set in the database) quoted in the manuscript. Both databases are committed to keeping the data private until the associated manuscript is published, if requested.

Prospective authors are also encouraged to search for previously published microarray data with relevance to their own data, and to report whether such data exists. Furthermore, they are encouraged to use the previously published data for qualitative and/or quantitative comparison with their own data, whenever suitable. To fully acknowledge the original work, an appropriate reference should be given not only to the database in question, but also to the original article in which the data was first published. This open approach will increase the availability and use of these large-scale data sets and improve the reporting and interpretation of the findings, and in increasing the comprehensive understanding of the physiology and pathology of endodontically related tissues and diseases, result eventually in better patient care.