UNIVERSIDADE FEDERAL DO RIO GRANDE DO SUL

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Decisão pela Extração Dentária e Incidência de Cáries e Perdas Dentárias em Idosos da Coorte de Carlos Barbosa, RS. Perspectivas Qualitativa e Quantitativa.

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Decisão pela Extração Dentária e Incidência de Cáries e Perdas Dentárias em Idosos da Coorte de Carlos Barbosa, RS. Perspectivas Qualitativa e Quantitativa.

Tese apresentada ao Programa de Pós-Graduação em Odontologia como requisito parcial para a obtenção do título de doutor na área de concentração em saúde bucal coletiva.

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RESUMO

Introdução: A perda dentária e o edentulismo podem afetar de maneira significativa a saúde bucal e a saúde geral, a qualidade de vida, e a nutrição de idosos. A cárie e a perda dentária têm sido descritas como o resultado de processos que envolvem elementos biológicos, nas superfícies dentárias, e de uma combinação de fatores comportamentais e sociais. Além disso, o contexto histórico no qual os indivíduos estão inseridos influencia seus comportamentos e percepções em relação à saúde bucal. Uma compreensão acerca de comportamentos de saúde demanda a utilização de métodos que permitam explorar a realidade subjetiva destes fatores. *Objetivo:* Os objetivos deste estudo de métodos quantitativo e qualitativo foram avaliar a associação entre fatores demográficos, socioeconômicos, comportamentais e de saúde e a incidência de Cárie Coronária, Cárie Radicular, e Perda Dentária na amostra estudada, e realizar entrevistas de grupo focal com membros desta amostra para explorar suas percepções acerca da perda dentária. *Métodos:* Um estudo de coorte foi conduzido com uma amostra aleatória simples de indivíduos com 60 anos ou mais em Carlos Barbosa, RS, entre 2004 e 2008. Entrevistas e exames bucais foram conduzidos com 388 indivíduos dentados na linha de base, e com 273 participantes no seguimento. A incidência de perdas dentárias, cáries coronárias e radiculares e suas associações com variáveis da linha de base foram modeladas com o uso de regressão binomial negativa. Em um segundo momento, informações de natureza qualitativa foram produzidas através de uma séria de oito entrevistas de grupo focal envolvendo 41 idosos, selecionados dos participantes do seguimento do estudo. As discussões de grupo foram moderadas pelo autor, foram gravadas, codificadas e analisadas através do uso da Teoria Fundamentada em Dados. *Resultados:* Foi observado no modelo multivariável que, ser mais velho; do sexo masculino; viver em área rural; ser casado; ter menor escolaridade; ser fumante; e estar insatisfeito com os serviços de saúde acessados, estiveram associados com a incidência perdas dentárias. Entre as variáveis clínicas, o uso de próteses parciais removíveis e o índice de sangramento gengival foram preditores, enquanto maior taxa de fluxo salivar foi um fator protetor para o desfecho. Com relação às cáries coronárias, no modelo multivariável final foi observado que, ser mais velho; do sexo masculino; viver em área rural; e ser fumante, estiveram associados à sua incidência. Entre as variáveis clínicas, o uso de próteses parciais removíveis foi um preditor, enquanto maior taxa de fluxo salivar foi um fator de proteção para este desfecho. No modelo multivariável final tendo como desfecho a densidade de incidência de cáries radiculares, ser mais velho; viver em área rural; e escovar os dentes com frequência menor do que diária, foram preditores; ao passo que a única variável clínica associada ao desfecho foi uma maior taxa de fluxo salivar, como fator de proteção. No segmento qualitativo, as respostas dos participantes permitiram concluir que as perdas dentárias estiveram relacionadas com a falta de programas de saúde bucal; normas sociais (incluindo valores relativos ao gênero); nível limitado de informações de saúde; e reduzidas acessibilidade e disponibilidade de serviços odontológicos. Contextos de vulnerabilidade social e programática tiveram um papel fundamental no desenvolvimento de normas e valores sociais e comportamentos individuais que resultaram em extrações dentárias. *Conclusão:* Estes achados são importantes, porque compreender as relações causais entre práticas individuais como higiene bucal, hábito de fumar, e procura por cuidados odontológicos preventivos, e perdas dentárias, não elucida as razões para as pessoas assumirem tais comportamentos.

Palavras-chave: Odontogeriatria; saúde bucal; cáries; perdas dentárias; incidência; estudo de coorte; pesquisa qualitativa; grupos focais; idoso.

ABSTRACT

Introduction: Tooth loss and edentulism may have a negative impact in the oral and general health, in the quality of life, and nutrition of the elderly. Dental caries and tooth loss have been described as results of processes involving biologic factors, on the surfaces of the teeth, and of a combination of behavioral and social factors. Furthermore, the historical context in which people are placed influences their behaviors and perceptions towards oral health. The understanding of health behaviors requires the use of methods which allow for the exploration of the subjective reality of those factors.

Objective: The objectives of this study using quantitative and qualitative methods were to evaluate the association between demographic, socioeconomic, behavioral and health factors and the incidence of tooth loss, coronal and root caries in the studied sample. Also, to carry on focus groups interviews with members from the sample to explore their perceptions about tooth loss.

Methods: A cohort study was conducted with a simple random sample of subjects 60 years old or older in Carlos Barbosa city, southern Brazil, between the years of 2004 and 2008. Interviews and oral examinations were conducted with 388 dentate subjects at baseline, and 273 participants at follow-up. The incidence of tooth loss, coronal and root caries and their association with baseline variables were modeled with the use of negative binomial regression. Following the quantitative part of the study, information of qualitative nature was obtained through a series of eight focus groups, involving 41 participants, purposefully selected from those participating in the follow-up. The focus groups discussions' were moderated by the author, were recorded, coded and analyzed through the use of Grounded Theory.

Results: In the multivariate model it was observed that, older age; male gender; living in a rural area; being married; less schooling; being a current smoker; and being dissatisfied with the health services accessed, were associated with the incidence of tooth loss. Among clinical variables, the use of removable partial dentures, and the gingival bleeding index were predictors, whereas higher stimulated saliva flow rate showed a protective effect for the outcome. With regards to the incidence of coronal caries, in the multivariate model it was found that, older age; male gender; living in a rural area; and being a current smoker, were associated with the outcome. Among clinical variables, the use of removable partial dentures was a predictor, whereas a higher stimulated saliva flow was a protective factor for the outcome. In the final model, for the outcome defined as the incidence density of new root caries, it was observed that, older age; living in a rural area; and brushing less than daily were predictors, whereas a higher stimulated saliva flow rate showed a protective effect for the outcome. With regards to the qualitative part of the study, the answers of the participants allowed for the conclusion that tooth extractions had been related, in the past, with the lack of oral health problems; social norms (including social values related to gender); low level of health information; and limited accessibility and availability of dental services. Contexts of social and programmatic vulnerability played a major role in the development of social norms and individual behaviors which resulted in tooth extractions.

Conclusion: These findings are important, because understanding the causal relations between individual behaviors such as oral hygiene, smoking, and the pursuing of preventive dental care, do not elucidate why people engage in such behaviors.

Key-words: Dental Geriatrics; oral health; dental caries; tooth loss; incidence; cohort study; qualitative research; focus groups; elderly.

INTRODUÇÃO E JUSTIFICATIVA

O Brasil, entre os anos 30 e 60 do século XX, apresentou sensível declínio da mortalidade, com a fecundidade mantendo-se em níveis elevados, o que acarretou um impacto significativo sobre o ritmo de crescimento demográfico, resultando no processo de envelhecimento populacional. O Brasil continuará com este processo a um ritmo maior do que aquele ocorrido nos países desenvolvidos (Carvalho e Garcia, 2003), e segundo as projeções da Organização Mundial da Saúde, no ano 2025, será o sexto país com o maior número de pessoas com 60 anos ou mais (Guedeaa *et al.*, 2006). Este processo populacional traz como consequências crescentes demandas sociais, incluindo as políticas públicas de atenção e saúde.

A inter-relação entre saúde bucal e saúde geral é mais pronunciada entre idosos, e assim uma condição bucal precária pode aumentar os riscos para a saúde geral, e o comprometimento das habilidades de comer e mastigar pode afetar o aspecto nutricional. Adicionalmente, doenças crônicas, infecções e pobre saúde bucal, mais notavelmente perda dentária e periodontite, são mais prevalentes em idosos. As consequências destas doenças e condições são relevantes, levando a inabilidades e reduzida qualidade de vida (Petersen, 2003).

No Brasil, os resultados de diversos estudos epidemiológicos sobre saúde bucal, conduzidos e sumarizados em uma revisão de literatura, confirmam as precárias condições em que se encontra a população idosa (Colussi e de Freitas, 2002). Mais recentemente, o SB Brasil (2003) identificou, em uma amostra representativa da população brasileira, um CPO-D de 27,8 (de um total de 32) na faixa etária de 65 a 74 anos. Neste estudo, mais de 80% dos sextantes examinados não apresentavam nenhum dente presente ou apresentavam apenas um dente funcional (Hugo *et al.*, 2007). São

dados alarmantes, retratando um problema atual, que tende a se agravar caso não sejam tomadas medidas de assistência a essa população (Colussi e de Freitas, 2002).

Cárie Dentária

De acordo com evidências em nível mundial, a cárie é o principal problema bucal dos indivíduos com sessenta anos ou mais. Alguns fatores como a redução do fluxo salivar pelo uso de medicamentos, a dificuldade de higienização por problemas psicomotores e a alteração da dieta, potencializam a ação da doença (Colussi e de Freitas, 2002). A cárie continua sendo motivo de grande preocupação na maioria dos países industrializados e em muitos países em desenvolvimento como os da América Latina, afetando entre 60 e 90% de todas as crianças e a vasta maioria dos adultos (Petersen, 2003). Embora uma melhora nas condições de saúde bucal tenha sido observada em países desenvolvidos, estudos têm demonstrado que a cárie pode ser um grande problema entre idosos (Fure, 2004). Pesquisas com seguimento longitudinal demonstraram que estes podem experimentar níveis similares ou até maiores de incidência de cáries do que crianças, os principais beneficiados com os programas para sua prevenção (Griffin *et al.*, 2004); e que, além disso, existe um grande contingente de idosos com cáries não-tratadas (Warren *et al.*, 2000).

A cárie é de causalidade complexa, e seu desenvolvimento depende da interação entre o hospedeiro e os micro-organismos cariogênicos, além de outros fatores causadores e modificadores de doença (Steele *et al.*, 2001). Observa-se na literatura recente que a noção de causalidade das cáries é restrita, principalmente, aos processos biológicos que ocorrem nas superfícies dos dentes (Paulander *et al.*, 2003). Discute-se, entretanto, se a causalidade biológica é suficiente para se entender a cárie e sua variabilidade nas populações, e também sua validade para definição de riscos, uma vez

que fatores biológicos não representam a integralidade dos fatores envolvidos nos processos desta doença (Kriger e Moysés, 1997). De acordo com Holst e colaboradores (2001), a cárie é o resultado de processos biológicos nas superfícies dentárias e de uma combinação de fatores comportamentais e sociais; para estes autores, é importante que se amplie o estudo dos determinantes de cárie para que este contemple variáveis não biológicas (sócio-demográficas, psicológicas).

Ainda de acordo com as evidências, as cáries de raiz representam um dos maiores problemas de saúde bucal para os idosos atualmente e no futuro próximo. Os argumentos para esta afirmação são: o aumento da expectativa de vida e as melhoras no padrão de saúde bucal observadas atualmente, ou seja: as pessoas estão vivendo mais, mantendo mais dentes por mais tempo, aumentado o número de superfícies radiculares expostas, e desta forma aumentando o risco de cáries de raiz (Nicolau *et al.*, 2000). Entretanto, em pesquisa realizada com idosos com 85 anos ou mais, Vilstrup e colaboradores (2007) reportaram que participantes com muitos dentes naturais tiveram baixa prevalência de cáries em comparação aos participantes com menos dentes. Curiosamente, superfícies com cáries secundárias não variaram de acordo com o número de dentes. Portanto, a teoria de que o aumento no número de dentes remanescentes entre idosos irá necessariamente resultar em um aumento concomitante de cáries carece de suporte, e demonstra a importância da produção de evidências mais conclusivas como em estudos da incidência da doença, a partir de seguimentos longitudinais.

Diferentemente das associações identificadas em estudos de prevalência, associações a partir de estudos de incidência são classificadas como fatores de risco (Beck, 1990). Existem poucas tentativas de construir modelos de cáries em populações (Holst *et al.*, 2001), e estudos de incidência de doenças bucais conduzidos com amostras

representativas de idosos são raros (Fure, 2004). A elaboração de um modelo de risco de cáries em populações necessita do reconhecimento de que idade, gênero, fatores comportamentais e psicológicos não podem ser separados das condições sociais nas quais as pessoas vivem, trabalham e repousam (Holst et al., 2001). A estrutura social manifesta através das políticas e serviços para a população, o seu nível de desenvolvimento e os comportamentos relativos à saúde resultantes de fatores sociais, culturais e psicológicos, assim como as crenças pessoais e as circunstâncias históricas de cada grupo social são determinantes que têm recebido relativamente pouca atenção no estudo das doenças bucais em idosos.

Mais conhecimento é necessário sobre os aspectos que influenciam diferentes desfechos de saúde bucal (Fure, 2004), juntamente com informações detalhadas acerca dos fatores de risco envolvidos e o modo como estes interagem com a expressão das cáries (Beck, 1990). Uma análise mais profunda destes aspectos pode proporcionar uma melhor compreensão da sua variabilidade nas populações, e consequentemente aumentar o entendimento acerca dos fatores essenciais para a promoção de saúde bucal em idades avançadas (Avlund *et al.*, 2003).

Perda Dentária

A perda dentária e o edentulismo podem afetar de maneira significativa a saúde bucal e a saúde geral, a qualidade de vida, incluindo o prazer em alimentar-se e a nutrição de idosos (Lee *et al.*, 2004). Perda dentária representa a causa mais frequente do comprometimento da mastigação (N'gom and Woda, 2002), estando relacionada com a redução da capacidade mastigatória e da percepção da habilidade mastigatória (Moyniham and Bradbury, 2001). Como consequência, se desenvolve uma tendência de os indivíduos com menos dentes remanescentes consumirem alimentos mais macios ou

processados, de baixo valor nutritivo, porém frequentemente com alto valor calórico (Hutton *et al*., 2002).

Existem evidências indicando que enquanto a cárie representa a principal causa para extrações dentárias, a doença periodontal assume uma maior relevância em adultos, enquanto idade, gênero e tipo de serviço de saúde também influenciam a distribuição das perdas dentárias (McCaul *et al*., 2001). De acordo com Warren *et al*. (2002), enquanto dentes saudáveis são ocasionalmente extraídos como parte de um plano de reabilitação bucal para repor outros dentes perdidos anteriormente, extrações dentárias ocorrem geralmente devido a condições clínicas, comumente cáries e doença periodontal.

Assim como vem sendo discutido na literatura, a perda dentária é o resultado de uma interação complexa de fatores, dos quais as condições clínicas do dente podem ser apenas mais um fator, ao invés de representarem a única razão para a perda de um dente específico (Warren *et al*., 2002). Aspectos sociais relacionados às extrações dentárias incluem diferenças sociais na preferência por algum tipo de tratamento, assim como na discussão entre o profissional e o paciente acerca das opções de tratamento (Gilbert *et al*., 2003).

Enquanto fatores de doença bucal têm sido os preditores mais consistentes destas perdas, outros fatores relacionados aos comportamentos e atitudes e suas interações podem ter contribuições significativas para explicar variações em sua prevalência (Haugejordenm *et al*., 2003). Fatores como o gênero, estado marital e auto-avaliação de saúde bucal estiveram relacionados com perdas dentárias em estudo conduzido por Locker *et al.* (1996), com idosos canadenses. Neste contexto, os resultados do SB Brasil revelaram que indivíduos com menor nível de instrução estiveram particularmente mais susceptíveis ao edentulismo. De acordo com os autores, o maior nível de escolaridade

observado neste estudo é um preditor significativo de atitudes positivas em relação à saúde bucal, o que poderia influenciar a procura por cuidados odontológicos (Hugo *et al.*, 2007).

É importante entender que fatores que entram em um modelo de estudo não necessariamente "causam" as perdas dentárias; ao invés disso, eles refletem aspectos de um processo complexo cujo desfecho é a perda de um ou mais dentes (Locker *et al.*, 1996). Apesar da pouca quantidade de evidências ligando fatores psicológicos e saúde bucal, reações psicológicas foram incluídas nos modelos mais recentes de cáries (Hugo *et al.*, 2006). Uma teoria sobre as cáries e perdas dentárias em populações deveria ter o potencial de englobar elementos sociais, individuais e biológicos; colocados juntos, uma rede de fatores sociais, contextuais, psicológicos e biológicos estariam relacionados com cáries (Holst *et al.*, 2001).

A promoção de saúde em idades avançadas representa um desafio, no sentido de obter e interpretar informações que permitam compreender a complexa teia de relações entre fatores tão distintos e relacionados: saúde bucal e sua relação com aspectos sistêmicos e emocionais podem representar, simultaneamente, causas e desfechos desta relação, e o construto de uma análise abrangente sobre os fatores de risco para cáries e perdas dentárias em idosos representa um ponto de partida para ampliar esta compreensão.

Embora certos modelos tenham considerado comportamentos de saúde como a chave para compreender desigualdades em saúde bucal (Pine *et al.*, 2004), outros têm favorecido os determinantes sociais com grande ênfase no papel das estruturas sociais e do ambiente na determinação dos desfechos de saúde (Holst *et al.*, 2001; Sheiham, 2000; Watt e Sheiham, 1999). Por exemplo, Watt e Sheiham (1999) notaram que indivíduos vivendo

ao norte apresentavam piores índices de saúde bucal do que aqueles vivendo no sul da Inglaterra, em razão de diferenças no acesso a serviços odontológicos.

Ettinger (1993) observou que o contexto histórico no qual os indivíduos estão inseridos influencia seus comportamentos e percepções em relação à saúde bucal, como consequência de níveis de disponibilidade, acessibilidade e qualidade do cuidado odontológico, associado ao nível de conhecimento acerca de saúde bucal, de indivíduos e populações. Kiyak e Reichmuth (2005) demonstraram que, em se comparando eventos sociodemográficos e odontológicos de cada década, é possível observar os impactos destes contextos nos comportamentos de saúde bucal de grupos populacionais, nos Estados Unidos. Este fenômeno é conhecido como 'efeito de coorte', e nele se reconhece que apenas recentemente os avanços em tecnologia e novas práticas preventivas e restauradoras ajudaram a modificar a conduta odontológica.

Estudos têm identificado e comparado as influências que fatores técnicos e de saúde bucal, e fatores individuais, têm sobre o processo de decisão clínica. Fatores técnicos têm sido considerados os principais elementos envolvidos na escolha do tratamento a ser realizado (Grembowski *et al.*, 1988; Grembowski *et al.*, 1989). Outros fatores como convicções acerca da prática clínica (Bader e Shugars, 1995) e a interação entre paciente e profissional (Maizels *et al.*, 1993) vêm sendo sugeridas como responsáveis por variações no processo de decisão pelo tratamento dentário.

Em relação ao papel de pacientes no processo de decisão pelo tratamento, vem sendo sugerido que a propensão pela terapêutica é influenciada pelos contextos físico, psicológico e social, além do desejo individual por um tipo de tratamento e da percepção do benefício a ser alcançado com este (Maizels *et al.*, 1993). Especialmente com relação aos comportamentos de saúde bucal em idosos, MacEntee e colaboradores (1993) sugerem que estes tendem a manter, por tanto tempo quanto possível,

comportamentos de saúde bucal estabelecidos em sua juventude. Em especial, vem sendo discutido na literatura que em algumas culturas o edentulismo é aceito como uma ocorrência natural da vida (Bouma e Poel, 1985).

Em relação aos aspectos individuais envolvidos nos comportamentos de saúde bucal, Bouma e Poel (1985) sugeriram que o medo do dentista pode resultar em comportamentos de procura por atendimento guiada somente por urgência, levando à deterioração da condição bucal, o que pode finalmente progredir para a extração de todos os dentes. Outro aspecto relacionado às extrações foi observado por Hiramatsu e colaboradores (2007), os quais entrevistaram idosos brasileiros que, por sua vez, culparam os dentistas por serem responsáveis pela decisão de extrair, ao invés de preservar seus dentes. Tal diversidade em percepções demonstra uma variedade de atitudes em relação ao tratamento odontológico e aos comportamentos de saúde bucal, a qual pode se explorada qualitativamente (Newton e Bower, 2005). Assim, a pesquisa qualitativa vem sendo sugerida como um método apropriado para explorar diferentes desfechos em saúde bucal (Stewart *et al.*, 2008; Bower e Scambler, 2007).

A Pesquisa Qualitativa

É evidente que uma compreensão acerca de comportamentos individuais de saúde, e da intervenção profissional no cuidado ao paciente, está incompleta a menos que seja observada a realidade subjetiva destes fatores, e da magnitude com que afetam o indivíduo (Sim, 1998; Dean, 1993). Neste sentido, se observa que o interesse nos métodos de pesquisa qualitativa se estende para a epidemiologia bucal (Brondani *et al.*, 2007), embora poucos estudos nesta área tenham utilizado esta abordagem.

Em entrevistas com dentistas, Kay e Blinkhorn (1996) notaram que as decisões clínicas acerca dos tratamentos dentários não surgiam somente com base em situações de

doença ou na disponibilidade de opções de tratamento, mas eram suportadas por discussões com pacientes acerca de valores sociais e individuais.

Com base em pesquisa etnográfica explorando as percepções de pacientes e dentistas acerca de modelos de saúde bucal, Nations e Nuto (2002) observaram que intervenções de saúde bucal baseadas no modelo biomédico odontológico falharam em atingir a amplitude de determinantes sociais de doença bucal, em uma população rural do nordeste do Brasil.

No contexto metodológico da pesquisa qualitativa, a Teoria Fundamentada em Dados visa estabelecer uma teoria integrada apoiada nos conceitos que surgem da pesquisa. Esta abordagem está baseada na categorização sistemática dos dados, e na teorização através de um processo indutivo no qual conceitos são definidos em onde categorias, suas propriedades, e suas relações, são exploradas (Glaser e Strauss, 1967). Na pesquisa qualitativa, a amostragem teórica é o processo de produção de informações através do qual o pesquisador interativamente coleta, codifica e analisa os dados e decide qual informação coletar e onde encontrar tal informação, a fim de desenvolver a teoria emergente (Strauss, 1987).

Além das entrevistas individuais, os grupos focais têm sido empregados de forma crescente na pesquisa qualitativa (Chesnutt e Robson, 2002). Brondani e colaboradores (2007) avaliaram qualitativamente um modelo de saúde bucal através de uma série de discussões de grupos focais entre idosos canadenses, e também o uso de vinhetas como um meio de conduzir discussões acerca de problemas bucais (Brondani *et al.*, 2008). Através de dinamismo e interação, grupos focais podem revelar informação sobre como as pessoas assumem determinados comportamentos de saúde (Kevern e Webb, 2001).

Grupos Focais

Grupos focais podem gerar grandes volumes de informações em um tempo relativamente pequeno (Rabiee, 2004). O guia de entrevista pode variar entre uma questão, a uma lista semi-estruturada de questões, até um guia muito específico (Morrison-Beedy *et al.*, 2001). A pesquisa com grupos focais permite uma abordagem para a avaliação de experiências, percepções e significados acerca da saúde (Kwan e Holmes, 1999) e qualidade de vida em idade avançada (Brondani *et al.*, 2008).

Krueger e Casey (2000) (20) acreditam que dados abrangentes podem ser gerados se os indivíduos do grupo focal são preparados para se engajar completamente na discussão, e propõe o uso de grupos homogêneos. Alguns pesquisadores recomendam que os participantes não se conheçam previamente, encorajando expressões mais honestas e espontâneas de suas visões e uma amplitude maior de respostas (Thomas *et al.*, 1995).

Dados resultantes de pesquisas qualitativas podem revelar informações de como indivíduos e comunidades adotam determinados comportamentos com relação à saúde bucal, e sugerir que estruturas subliminares, relacionamentos e processos estão envolvidos em saúde e doença bucal (Bartley *et al.*, 1998).

OBJETIVOS

O objetivo deste estudo de métodos quantitativo e qualitativo foi de obter resultados quantitativos estatísticos de uma amostra e depois fazer o acompanhamento com grupos focais com membros desta amostra para explorar diferentes aspectos de interesse. Na primeira fase, um seguimento longitudinal avaliou a associação entre fatores demográficos, socioeconômicos, comportamentais e de saúde e Cárie Coronária, Cárie Radicular, e Perda Dentária na População estudada.

Na segunda fase, entrevistas qualitativas de grupos foram utilizadas para explorar as percepções destes idosos acerca da perda dentária, de um ponto de vista histórico e contextual.

SUJEITOS E MÉTODOS

METODOLOGIA QUANTITATIVA

DELINEAMENTO

Estudo de Coorte de Base Populacional.

POPULAÇÃO E AMOSTRA

No ano de 2004 foi realizada uma pesquisa que teve como objetivo avaliar a condição de saúde bucal e sua relação com fatores demográficos, socioeconômicos, comportamentais e psicológicos de uma amostra de idosos independentes de Carlos Barbosa, RS. Nesta investigação, uma amostra representativa, aleatória simples, composta por 872 idosos independentes desta cidade foi avaliada. A amostra foi gerada a partir dos registros de idosos moradores da cidade, os quais passam por atualização anual e encontram-se no Departamento da Terceira Idade da Secretaria de Assistência Social e Habitação (SMASH) da Prefeitura Municipal desta cidade.

O estudo foi conduzido de março a dezembro de 2004 por dois pesquisadores, que realizaram previamente estudo piloto para treinamento e calibragem no uso de questionários e exames, sendo estes o WHOQOL-breve, um questionário desenvolvido pelo WHOQOL GROUP, para avaliação de Qualidade de Vida; Escala de Depressão Geriátrica (GDS), para aferição de depressão; Índice de dentes Cariados, Perdidos e Obturados (CPO-D), para avaliação de cáries e perdas dentais; Índice de Placa Visível

(IPV) e Índice de Sangramento Gengival (ISG) para avaliação de Higiene Bucal. Adicionalmente, foi conduzido um questionário compreendendo variáveis sócio-demográficas e comportamentais, bem como orientação de Higiene Bucal e encaminhamento de todos os voluntários que apresentavam problemas bucais ao respectivo serviço de Atenção Odontológica. Os instrumentos supracitados serão descritos em detalhes nesta seção.

Carlos Barbosa é um município a 104 Km de Porto Alegre, localizado na região nordeste do estado do Rio Grande do Sul. Sua população era de 20.519 habitantes, de acordo com os resultados do censo realizado pelo IBGE em 2000. Suas principais atividades econômicas estão nos setores Metalúrgico (80%) e Agrícola (9%). Destaca-se ainda que 95% das residências estão no perímetro urbano, sendo que 99,5% destas residências recebem abastecimento de água potável.

A Prefeitura Municipal de Carlos Barbosa desenvolve junto ao Departamento da Terceira Idade da Secretaria Municipal de Assistência Social e Habitação (SMASH), um programa de atenção ao Idoso, no qual são desenvolvidas atividades diárias com diferentes grupos de idosos em cada região do município. Foram avaliados no seguimento, em 2008, os indivíduos moradores da cidade de Carlos Barbosa, RS, elegíveis para o estudo. A amostra foi composta por aqueles indivíduos participantes do primeiro estudo sobre a saúde de idosos independentes de Carlos Barbosa de 2004, doravante denominado avaliação inicial.

Os voluntários foram contatados por telefone ou carta, e convidados a participar da pesquisa em ambientes equipados com cadeira odontológica, refletor e seringa de ar comprimido. Todos os participantes da avaliação inicial que se tornaram incapacitados para participar da pesquisa por razão de falecimento, doença, mudança para outra

cidade, ou que passaram a residir em instituição ou que estavam hospitalizados, foram excluídos do seguimento.

Participaram da coleta de dados dois cirurgiões-dentistas previamente treinados e com experiência em pesquisa epidemiológica com idosos. Foi realizada primeiramente na fase de treinamento e estudo piloto a aferição da concordância entre os examinadores através do Índice Kappa, e o estudo somente foi iniciado quando alcançado um nível de concordância adequado.

MEDIDAS

Avaliação Inicial

Depressão

A Escala de Depressão em Geriatria ("Geriatric Depression Scale" GDS) (ANEXO 4) é um dos instrumentos mais frequentemente utilizados para detecção da depressão no idoso. Esta escala foi utilizada na investigação conduzida em 2004 (Hugo *et al.*, 2006). A GDS é uma escala auto-aplicável desenvolvida para ser facilmente respondida, sem a necessidade de treinamento específico de entrevistadores (Burns *et al.*, 2002). O uso desta escala tem validação em populações adultas e tem sido recomendado para avaliação de depressão em idosos da comunidade (Evans e Mottram, 2000). Cada questão apresenta resposta do tipo sim/não que depende da resposta atribuída. A versão reduzida (15 questões) foi derivada por Shiekh e Yesavage (1986) da versão completa da escala (Yesavage *et al.*, 1983). A versão reduzida tem um ponto de corte de 6/7 e se correlaciona de modo significativo com a escala completa (Burns *et al.*, 2002).

Qualidade de Vida

O WHOQOL-breve (ANEXO 5) é um instrumento para avaliação da qualidade de vida que foi desenvolvido pelo WHOQOL GROUP a partir do WHOQOL-100. Estes instrumentos foram desenvolvidos a partir da constatação de que não havia nenhum instrumento que avaliasse qualidade de vida a partir de uma perspectiva transcultural, e apresentam características psicométricas satisfatórias, inclusive entre populações brasileiras (Fleck 1999; Fleck, 2000). O WHOQOL-breve, especificamente, consta de 26 questões, sendo duas gerais de qualidade de vida e as demais 24 representam cada uma das 24 facetas que compõe o instrumento original (Fleck, 2000). Os domínios avaliados pelo teste compreendem: domínio físico, domínio psicológico, relações sociais e meio-ambiente.

Higiene bucal

A higiene bucal foi avaliada por meio do Indíce de placa visível. O Índice de placa visível (IPV) (ANEXO 3) é um índice dicotômico de placa (a partir do Indíce de placa Silness e Löe), em que se aplica escore 0 para ausência e escore 1 para presença de placa visível, em cada uma das faces do dente avaliadas. Os dados do IPV são expressos como uma porcentagem do número de margens gengivais examinadas (Ainamo e Bay, 1976).

Cáries coronárias, cáries radiculares e perdas dentárias

O Índice CPOD, preconizado pela OMS (1999) (ANEXO 3), foi utilizado para avaliação das cáries coronárias e radiculares na população estudada. Brevemente, os critérios atribuídos pelo uso deste Índice são: Coroa/raiz hígida (0); Coroa/raiz cariada (1); Coroa/raiz restaurada com cárie (2); Coroa/raiz restaurada sem cárie (3); Dente ausente como resultado de cárie (4); Dente ausente por qualquer outra razão (5); Selante

de fissura (6); Dente suporte de prótese, coroa protética ou faceta (7); Coroa não erupcionada (8); Traumatismo (T); Não registrado (9).

Outras variáveis

Questionário abordando questões relativas à idade, sexo, nível de escolaridade, renda mensal, estado marital, doenças atuais e pregressas, uso de medicamentos, hábitos de higiene, história odontológica, uso de tabaco, motivo para extração dentária, entre outras (ANEXO 2).

SEGUIMENTO

A avaliação da Higiene Bucal através do IPV e ISG, bem como da incidência de cáries e perda dentária através do índice CPOD, foram repetidas durante o seguimento. O questionário constante de variáveis sociodemográficas foi aplicado novamente com o intuito de avaliar alterações nos comportamentos com relação à saúde, assim como o surgimento de novas condições médicas, uso de medicamentos, mudanças sócio-econômicas, entre outros fatores.

Com o projeto tendo sido aprovado pelo Comitê de Ética em Pesquisa, e tendo sido selecionados os voluntários, seguiram-se as seguintes etapas:

1) Estudo piloto para treinamento e calibragem intra e inter-examinador pré-experimental. Realizaram a coleta de dados por meio de questionários e exames clínicos, dois cirurgiões-dentistas previamente treinados em pesquisa populacional em Odontogeriatria, e foram realizados procedimentos de calibragem para os exames clínicos (CPOD, IPV, ISG), com o objetivo de atingir concordância adequada (Kappa $\geq$ 0,6) para dar-se início ao seguimento.

2) Convite aos voluntários, esclarecendo aos mesmos os objetivos do estudo, bem como os aspectos pertinentes à sua realização. Aqueles que cumpriram os critérios e aceitaram participar como voluntários foram convidados a ler e assinar o termo de consentimento informado, responderam aos questionários e foram examinados clinicamente para avaliar higiene bucal, cárie coronária, cárie radicular e perda dentária. Os exames foram realizados em um único dia, na seguinte ordem: índice de placa visível e exames para avaliar doença cárie e número de dentes. Os exames para avaliar doença cárie foram realizados logo após os exames para avaliação da higiene bucal nesta ordem: Indíce CPOD, Índice de Cárie Radicular.

Para avaliação dos parâmetros acima citados, foi usada sonda periodontal milimetrada de ponta romba Willians, espelho bucal plano número 5 e pinça para algodão.

Dados referentes ao número de participantes e perdas durante o seguimento, bem como acerca da participação na linha de base podem ser encontrados na figura 1.

Figura 1. Fluxograma dos participantes do estudo.
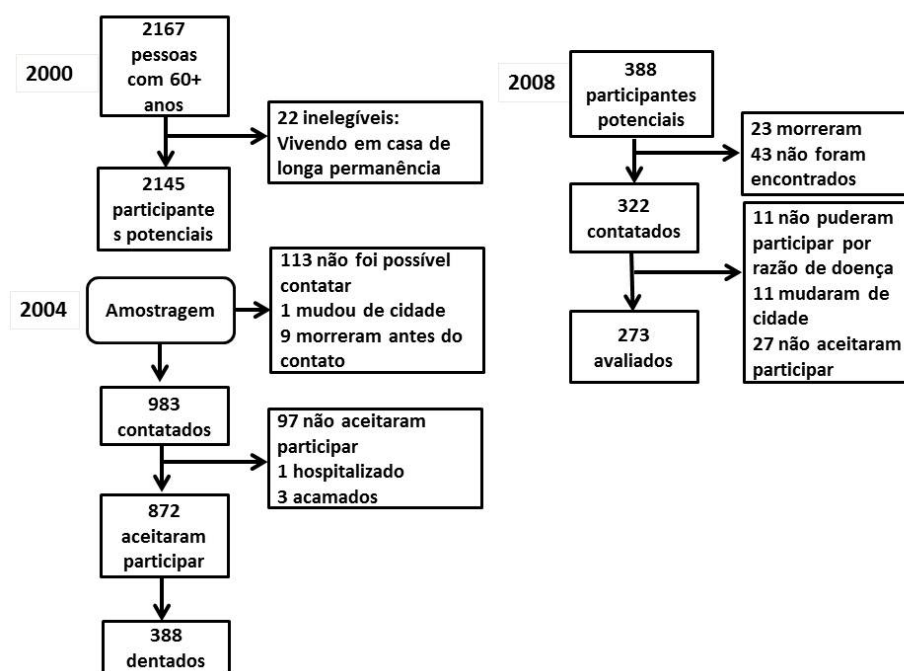
QUESTÕES ÉTICAS

Este projeto foi aprovado pela Comissão de Ética da Faculdade de Odontologia da UFRGS e pela Prefeitura Municipal de Carlos Barbosa. Todos os participantes assinaram o Termo de Consentimento Informado em duas vias (ANEXO 1). Todos os indivíduos que necessitaram atendimento odontológico, emergencial ou não, foram encaminhados ao Posto de Saúde do Município.

ANÁLISE DOS DADOS

INCIDÊNCIA DE PERDA DENTÁRIA

Para os participantes examinados na linha de base e no seguimento, a incidência de perda dentária foi definida para um dente ou uma raiz presente na linha de base e que fosse anotado/a como perdido/a no seguimento. Reversões, definidas com dentes anotados como perdidos na linha de base e presentes no seguimento ocorreram muito raramente e foram tratadas como viés de examinador na linha de base. Os dados foram então modificados no banco de dados da linha de base e o dente considerado como presente, para fins de análise, em ambos os exames. Este desfecho foi definido como a taxa de incidência de perdas dentárias em quatro anos, identificada como a razão entre o número de dentes perdidos durante o período envolvendo os dois exames, e o número de dentes presentes na linha de base, por indivíduo.

Os testes do qui-quadrado e ANOVA foram utilizados para avaliar associações entre variáveis independentes e a taxa de incidência de perda dentária, com a finalidade de identificar as variáveis a serem incluídas em modelos de regressão multivariável. Modelos multivariados foram desenvolvidos com a aplicação de regressão binomial negativa.

INCIDÊNCIA DE CÁRIES CORONÁRIAS

A avaliação de incidência de cáries coronárias foi realizada com base na comparação, dente a dente, das cáries e restaurações presentes nos exames de 2004 e 2008. A incidência de cáries coronárias foi determinada para novas lesões de cáries, restaurações em dentes previamente hígidos, e lesões de cárie recorrentes em dentes previamente restaurados. Dentes perdidos entre 2004 e 2008 não foram considerados na análise. Este desfecho foi definido como a taxa de incidência de cáries, em quatro anos, determinada pela razão entre o número de dentes com novas cáries ou restaurações durante o período, e o número de dentes em risco, por indivíduo. Todos os dentes presentes em ambos os exames, sem cáries coronárias na linha de base, e sem coroas protéticas, foram considerados em risco para a incidência de cáries. A incidência de cáries foi calculada após a exclusão de dentes que apresentavam cobertura protética total na linha de base, bem como a dos dentes que a receberam durante o período de seguimento.

Os testes de Mann-Whitney e Kruskall-Wallis foram utilizados para avaliar associações entre a taxa de incidência de cáries e variáveis independentes na análise bivariada. Diferenças entre participantes perdidos e mantidos durante o seguimento foram verificadas. As reprodutibilidades inter- e intra-examinador foram verificadas antes e durante o estudo utilizando coeficientes Cohen Kappa. Modelos multivariados foram desenvolvidos com a aplicação de regressão binomial negativa.

INCIDÊNCIA DE CÁRIES RADICULARES

A incidência de cáries radiculares foi determinada para novas lesões de cáries, restaurações em raízes previamente hígidas, e lesões de cáries recorrentes em raízes previamente restauradas. Dentes perdidos entre os exames da linha de base e do

seguimento não foram considerados na análise. Reversões, definidas como raízes observadas como cariadas ou restauradas na linha de base e hígidas no seguimento, aconteceram raramente, e foram tratadas como viés de examinador na linha de base. Seu estado foi então modificado no banco de dados da linha de base, e consideradas hígidas durante a análise. Este desfecho foi definido em termos de Densidade de Incidência (DI) de cáries radiculares, a qual é definida como a razão entre o número de novas lesões de cáries ou restaurações radiculares, e o número de raízes-tempo em risco, por indivíduo.

Definição de raízes-tempo em risco

DI é uma medida padronizada da taxa de ocorrência de um evento em um tempo determinado. O numerador normalmente contém o número de eventos que ocorreram neste tempo, enquanto o denominador usualmente contém o total de observações-tempo em risco para o evento de interesse. Neste estudo, foi adotada uma convenção para o cálculo do tempo em risco, na qual todo novo evento (recessão gengival, ou o aparecimento de uma lesão de cárie ou restauração) foi considerado como havendo ocorrido na metade do tempo entre os dois exames. Assim, uma raiz exposta que desenvolveu lesão de cárie ou foi restaurada foi considerada em risco somente até o ponto do desenvolvimento desta lesão (ou restauração), ou seja, dois anos. Raízes que sofreram exposição durante o período de seguimento, porém não desenvolveram lesão de cárie ou não receberam restauração, também foram consideradas em risco por dois anos. Raízes em que não foi verificada exposição em ambos os exames (raízes sem recessão gengival) foram definidas como tempo em risco inexistente. Raízes que não estavam expostas na linha de base e desenvolveram cáries durante os quatro anos de seguimento foram classificadas como estando em risco durante a metade do tempo entre

as observações, ou seja, dois anos, e permanecido em risco até o surgimento da lesão, o que foi assumido haver ocorrido em três anos.

Os testes de Mann-Whitney e Kruskall-Wallis foram utilizados para avaliar associações entre a DI de cáries radiculares e variáveis independentes na análise bivariada. Diferenças entre pessoas perdidas e mantidas durante o seguimento foram verificadas. As reprodutibilidades inter- e intra-examinador foram verificadas antes e durante o estudo utilizando coeficientes Cohen Kappa. Modelos multivariados foram desenvolvidos com a aplicação de regressão binomial negativa.

METODOLOGIA QUALITATIVA

O segmento qualitativo tem como base a produção de informação de natureza qualitativa através de uma série de oito grupos focais entre 41 idosos propositadamente selecionados do grupo de participantes reavaliados durante o seguimento.

Os diferentes grupos contemplam diversidade em termos de localização geográfica da residência, estado de saúde bucal, gênero e cultura étnica da seguinte maneira: três grupos ocorreram na área central da cidade (mulheres e homens participaram juntos); três em áreas rurais com predominância de imigração italiana (um composto somente por homens; um composto somente por mulheres, e um terceiro incluindo homens e mulheres); e dois em áreas rurais com predominância de imigração alemã. A diferença em localização geográfica permitiu a exploração de aspectos relacionados à disponibilidade e acesso a serviços de saúde bucal. A composição de grupos formados exclusivamente por homens ou mulheres permitiu a elucidação de assuntos relacionados a comportamentos de saúde com base no gênero. Entre os cinco grupos conduzidos em áreas rurais, dois ocorreram em áreas muito isoladas no interior do município para explorar percepções acerca da acessibilidade e utilização de serviços de saúde bucal.

A coleta e análise dos dados ocorreram iterativamente, permitindo selecionar participantes que seriam representativos do tipo de informação requerida, nos temas de interesse relacionados aos objetivos do estudo (Strauss e Corbin, 1998). As discussões dos grupos foram moderadas pelo pesquisador (Renato De Marchi), tiveram duração média de 90 minutos, foram gravadas em áudio e transcritas para análise temática. Para assegurar que temas fundamentais fossem discutidos em cada grupo focal, um roteiro de entrevista foi utilizado. Os temas fundamentais dentro das questões colocadas aos participantes incluíam as experiências com saúde bucal e extrações dentárias, experiências prévias e atuais com serviços dentários, comportamentos e sensações relacionadas à saúde bucal, bem como suas percepções sobre tratamento dentário e os profissionais de odontologia.

Notas de campo foram escritas pelo moderador depois de cada discussão, registrando impressões iniciais e comentários, informando discussões subsequentes, e sumarizando as categorias analíticas iniciais. Memorandos foram escritos durante as transcrições e análises para organizar percepções gerais sobre as entrevistas e para registrar reflexões e decisões feitas durante a análise.

As transcrições e as notas de campo (resumos e memorandos) forneceram um vasto conjunto de dados para a análise temática. A coleta e a análise de dados foram conduzidas com base em Teoria Fundamentada em Dados (Strauss e Corbin, 1998). Os transcritos foram codificados pelo pesquisador utilizando o programa QSR NVivo 8.0, e este processo foi auditado por colaboradores. A análise dos dados consistiu em três etapas principais: 1) conclusão de uma página sumária; 2) codificação; 3) redução e interpretação dos dados.

Como sugerido na Teoria Fundamentada, a codificação aberta foi utilizada para diferenciar os transcritos em segmentos significativos, e códigos foram designados para estes segmentos. Na próxima etapa, a codificação axial possibilitou a integração destes códigos com significados similares e o desenvolvimento de categorias explanatórias. As

relações entre as categorias foram verificadas recursivamente nos dados. Uma vez identificadas, estas relações foram descritas em um texto e ilustradas com segmentos das falas dos participantes. Rigor metodológico também foi assegurado através da concordância entre o pesquisador e colaboradores no processo de codificação e desenvolvimento conceitual.

Financiamento do Estudo

Manuscrito 1

TITLE: Four-year incidence and predictors of tooth loss among older adults in a southern Brazilian city

ABSTRACT

Tooth loss is still prevalent among older adults, and may negatively affect their health and well-being. Previous evidence from longitudinal studies has shown that oral disease-related factors are the more consistent predictors of tooth loss. Although certain models have considered oral health behavior as a key construct in explaining oral health inequalities, others have favored the role of social structure and the social environment in determining oral health outcomes. *Objective*: to determine tooth loss incidence and its predictors among community-dwelling older adults in a southern Brazilian city. *Methods:* A cohort study was conducted using a simple random sample of persons aged 60 years or older at baseline in Carlos Barbosa city, southern Brazil, between 2004 and 2008. Interviews and oral examinations were conducted among 388 dentate individuals at baseline, and among 273 at four years follow up. The incidence of tooth loss was modeled through a conceptual framework with the use of Negative Binomial Regression. *Results:* Some 67.8% of people lost one or more teeth, whereas 12.5% became edentulous during the follow-up period. In the multivariate model that controlled for baseline predictors, older age; male gender; living in a rural area; being married; less schooling; current smoking; and dissatisfaction with the access to health services were associated with tooth loss. Among the clinical variables, the use of partial dentures and gingival bleeding index were predictors, whereas higher saliva flow rate was a protective factor for the outcome. *Discussion*: As proposed in the conceptual

framework, demographic factors; primary determinants of health; behavioral; and clinical variables were predictors of tooth loss. These results are important, because understanding the causal association between lifestyle practices such as oral hygiene or smoking with tooth loss does not elucidate why individuals and communities engage in such practices. *Conclusion*: Interventions aiming to reduce tooth loss and edentulism in the elderly should account for social and environmental factors, in combination with clinical and behavioral components.

INTRODUCTION

The increase in the number of older persons represents a major challenge to public health systems. At this time, the elderly represent the fastest-growing age group in Brazil (1). Results from the only representative study on the oral health status of the Brazilian elderly population showed that among participants 65–74 years of age, 54.8% were edentulous, 35.6% had 1–19 teeth, and 9.6% had 20 or more teeth (2).

Tooth loss can have a profound impact on health and well-being (3), leading to embarrassment, social constraints and low self-esteem and self-image (4), and a poorer quality of life for older people (5). In addition, tooth loss and edentulism result in compromised masticatory function, reducing the quality of diet (6), and increasing the risk of various health problems like cardiovascular diseases (7), obesity (8), malnutrition (9), physical disabilities and even death (10).

In 1979, the WHO adopted a resolution calling for the attainment of 'health for all by year 2000'. Consistent with this, the Federation Dentaire Internationale/World Dental Federation (FDI) recommended a 25% or more reduction in edentulousness for those 65 years and above, and that at least 50% of them should have retained 20 or more functional teeth (11). Since then, the incidence of tooth loss has been reported for a

variety of population groups in industrialized countries (12-20). Some studies have shown that oral health has improved considerably among older adults in recent decades with fewer teeth being now extracted, and rates of edentulousness decreasing as well (12,13,17). Nonetheless, several studies have suggested that with increasing age, there is an increasing tooth mortality risk (15,16,18) and that tooth mortality rates among the elderly can be unusually high (15,21).

In multivariate analyses, it has been observed that caries and periodontal disease-related factors tend to be the most consistent and important predictors of tooth loss (13-20). Even so, in studies that have followed subjects longitudinally to quantify risk factors for tooth loss, disease presence or clinical factors alone have not accounted for the majority of the variation in tooth loss (14, 15, 20).

Although certain models have considered oral health behavior as a key construct in explaining oral health inequalities, others have favored the role of social structure and the social environment in determining oral health outcomes (22). Particularly within the Brazilian population, there is evidence of the associations between social factors and oral health/disease in older adults (2,5).

By identifying those factors, it may be possible to delineate interventions aiming to limit future extractions in elderly populations (21). Thus, the objective of this study was to determine the 4-year incidence of tooth loss among community-dwelling southern Brazilian people aged 64 or older, and to assess the association between tooth loss and predictor variables.

METHODS

This paper results from a cohort study of a simple random sample of community dwelling people aged 60+ years living in Carlos Barbosa, a southern Brazilian city. The

cohort considered in this study consisted of the dentate elderly people who were

interviewed and examined at baseline in 2004 (5) and followed up 4 years later (23).

Population and Sample

Baseline

The city had 20,519 inhabitants in 2000, of whom 2,167 were aged 60 and older. In

2000, participants were randomly selected from the municipality register of persons

aged 60 years or more. Twenty-two older persons living in a long-term residence were

considered ineligible. Of the potential participants identified in the city register, 983

older persons were contacted, 13 persons were restricted to bed at home, one person was

hospitalized and 97 persons refused to participate. In the end, 872 individuals

participated in the study, from whom 388 were dentate, ranging from 60 to 88 years old.

The Committee of Ethics in Research of the Federal University of Rio Grande do Sul

approved the study protocol. Before starting data collection, participants were informed

about the study objectives and procedures. All participants provided written informed

consent. The study was performed according to the Brazilian resolution for standards of

ethics in research involving human participants (24).

Baseline data collection

Data collection consisted of interviews and oral examinations. The researchers

conducted individual interviews in the participants' homes or in community clubhouses.

Oral examinations were performed in dental clinics provided by the Health Department

of Carlos Barbosa. Mirrors and probes were used under standardized illumination to

assess the status of teeth and periodontal tissues. The dental state, using the DMFT

index, the Gingival Bleeding Index (GBI), Visible Plaque Index (VPI) and the use of

dental prostheses were assessed according to criteria of the World Health Organization

(25). Stimulated saliva (five minutes) was collected by chewing on a piece of Parafilm

(0.3 g of Parafilm M laboratory film, American National Can, Greenwich, CT, USA).

At 30-s intervals, saliva was expectorated into graded containers, and after 5 min the

amount of stimulated saliva was determined volumetrically. All baseline oral

examinations were performed by two previously trained and experienced dentists.

Duplicate dental inspections were conducted on 10% of the participants for reliability.

The inter- and intra-examiner reproducibility of oral examination results before and

during the study were calculated using the Cohen kappa coefficient and have been

described previously for the baseline (5).

Evaluation of Self-Reported Sociodemographic, Behavioral, and Health Information

A standard questionnaire was used to collect sociodemographic, behavioral, and health

information. Some variables were categorized for analysis purposes. Marital status was

categorized as married or single/divorced/widowed. Schooling was categorized as 3 or

fewer versus 4+ years of formal education. Participants were dichotomized as those

currently living in urban or rural areas, according with the classification of the

municipality of Carlos Barbosa. Urban areas in this city are defined as those with

infrastructure that includes services of water supply, sanitary systems, primary school

and Public Health Unit. For smoking status, each participant was categorized as a never

or former smoker versus a current smoker. The following question from the World

Health Organization Quality of Life (WHOQOL) questionnaire, with answers on a 5-

point Likert scale ranging from very dissatisfied [1] to very satisfied [5], was used as a

to evaluate satisfaction with access to health services: "How satisfied are you with your

access to health services?"

Four-year follow-up data collection

People who participated at baseline were re-contacted four years later, in 2008. From the 388 dentate individuals who participated in the baseline, 23 died and 43 were not found. Thus, 322 participants were contacted, of which 11 have been unable to participate for reasons of illness, 11 had moved away from Carlos Barbosa and 27 refused to participate. In the end, 273 older persons were evaluated. Follow-up examinations were conducted by two dentists, previously trained by the examiners who conducted the baseline dental assessments, and the examination protocol was identical to the protocol used at baseline.

Incidence of Tooth Loss

For participants who were examined at both baseline and follow-up, individual teeth were defined as lost if there was either an intact tooth or a retained root present at baseline which was recorded as missing at follow-up. Reversals, defined as tooth recorded as missing at baseline examination and present at follow-up, occurred very seldom and were treated as baseline examiner bias. Their status was then amended on the baseline data and considered as existent, for analysis purposes, at both examinations. The outcome of this study was defined as the ratio between the number of the teeth lost during the period concerning the two examinations, and the number of teeth present at baseline, per person (26). Baseline variables were considered as potential predictors in the analysis. The results were modeled through the use of a hierarchical approach based on the conceptual framework proposed by Andersen and Davidson (1997) (27).

In the first block of this model we included age and sex as exogenous variables. The second block, of primary determinants, included environmental (geographic location of the residence), and personal characteristics (marital status, schooling, and satisfaction

with health services). The third block, health behaviors, included personal practices (frequency of tooth brushing, smoking status) and visits to the dentist. The fourth block comprised oral health variables, i.e. the presence of caries at baseline, the use of removable dentures (RPD), stimulated saliva flow rate (five minutes), Gingival Bleeding Index (GBI) and Visible Plaque Index (VPI).

Analysis

Chi-square tests and ANOVA models were used to evaluate associations with the incidence rate of tooth loss (defined as the ratio between the teeth lost during the follow-up period and the teeth at risk), for the identification of independent variables to be included in the regression models. The same tests were used to estimate the distributions of the categorical and continuous independent variables, respectively, in relation to the loss of none, one, 2+, or all teeth. Differences in characteristics between the people retained and those lost to follow-up were verified. The inter- and intra-examiner reproducibilities of oral examination results before and during the study were calculated using the Cohen kappa coefficient. Multivariate models were constructed using Negative Binomial Regression.

Initially, the hierarchical approach consisted of Negative Binomial regressions that were performed in order to check the measures of effect of each studied variable in respect to the studied outcome. Following, multivariate Negative Binomial regressions were carried out inside each block. Variables were selected to be kept in the subsequent hierarchical blocks if their P-values remained <0.10 after adjustment inside their own blocks, and after adjustment for the hierarchically superior variables that remained associated with the outcomes inside their own blocks. Finally, only the variables that had a p<0.10 with the outcome in the previous models were added in a final model. In

the final model only variables with a p<0.05 were considered significant associated with the outcome. The associations are presented as Incidence Odds Ratios and their respective 95% Confidence Intervals. All the analyses were performed using the Stata SE 11.1 software for statistical analysis (Statacorp, Texas, USA).

RESULTS

At the 4-year follow-up, data were available for 273 of the 388 people who were dentate and who had an examination at baseline. Baseline characteristics of people who were lost to follow-up and the group retained in the cohort are presented in Table 1. Compared with the latter, people lost to follow-up were more likely to be older and have less years of schooling. As a result of missing data for some participants in the follow up, the number of subjects is less than 273 for the variables RPD use, visits to the dentist, tooth brushing and self-perception of oral health (Table 1).

In the follow-up, the mean age of the study participants was 66.2 ± 5.4, and 71 (26%) were 70+ years old. Some 142 (52%) participants were male; 86 (31.7%) had more than four years of schooling, and 219 (80.2%) were married. Some 16.6% of teeth present at baseline were lost, and the mean number of teeth lost in the study sample was 1.7 ± 2.3. The median of the number of teeth lost in the study sample was 1 (0 – 2). Some 67.8% of people lost one or more teeth, whereas 34 (12.5%) persons became edentulous during the four-year follow-up period. The Kappa coefficients for intra- and inter-examiner reproducibility of DMFT assessments at baseline, before and during the study respectively, were 0.93 and 0.98, while the kappa coefficients for inter- and intra-examiner reproducibility before and during the study ranged from 0.97 to 0.98, at follow-up.

The frequencies of the independent variables in relation to the loss of none, one, or 2+ teeth (according to the quartiles of the sample), and the loss of all teeth, are shown in Table 2. Worth mentioning, participants who have lost all their teeth are not included in the categories of those losing one, or 2+ teeth, presented in Table 2. The location of the participant's residence; gender; use of RPD; VPI; GBI and caries were significantly associated ($P \leq 05$) with the outcome in the bivariate analysis.

The hierarchical approach used in the multivariate analysis is presented in Table 3. In the first block, male gender and persons aged ≥ 70 y (according to the percentile 75) showed associations with the outcome ($P < 0.01$). In the second block, positive and statistically significant associations ($P < 0.01$) were found between living in rural area; being married; having three or less years of schooling; being dissatisfied with the health services; and tooth loss. In the third block, being a current smoker was significantly associated with tooth loss. In the fourth block, the P-values for the presence of caries at baseline were increased after adjusting for variables in the hierarchically anterior blocks. Nevertheless, it was maintained in the final fully adjusted model, because of its relevance as regards to tooth loss (12-17). Using one or two PRDs and the variable GBI showed a positive association, while increased stimulated saliva flow rate (five-minutes) was protective for the outcome. Tests for collinearity showed no significant associations between predictor variables.

In the final fully adjusted model (Table 4), there was a higher incidence odds ratio of tooth loss for men; people aged 70+; married persons; people living in a rural area; current smokers; and those dissatisfied with the quality of health services. People who had at least 4 years of schooling presented a lower incidence odds ratio for tooth loss. Among clinical variables, the use of RPD, and GBI were positively associated with the outcome, whereas higher saliva flow rate was a protective factor.

DISCUSSION

This is the first study, at least to our knowledge, showing that social determinants are important predictors for incidence of tooth loss, even after adjustment for behavioral and clinical factors, in older Brazilians. These results are relevant because of the known detrimental effects of tooth loss on the health and well-being of older adults (3-10), and the need for developing effective strategies for its prevention (11,21).

The incidence of tooth loss during a 4-year period in this sample of south Brazilians aged 64+ at follow-up was 67.8%, which is much higher than the rate reported for other elderly populations, albeit with different periods of follow-up and different age groups in those studies. For example, Slade and colleagues (1997) found a two-year incidence of 19.5% in Australians aged 60+ (19), whereas for Canadians aged 65 + the 3-year incidence was 23% (14). When annualizing these proportions, this sample of Brazilians aged 64+ showed a tooth loss rate of 16.9%, whereas 9.7% was reported for Australians aged 60+, and a lower rate of 7.7% was observed among Canadians aged 65+, per year. The mean of the four-year incidence rate, as defined by the ratio between teeth lost during follow up period and the teeth at risk, was 0.26 ± 0.34. Furthermore, 12.5% of participants became edentulous in the 4-year period. This is much more than the 0.7% observed in older Australians (19); 1.2% in Canadians (19); 1% in Swedish (18); and 4% for Iowans (15).

Previous evidence has shown that the incidence of tooth loss is higher for women than for men (5,13). Yet, men were more prone to lose teeth in this study, which may be attributed to the fact that they had significantly more teeth at baseline (5). It can be hypothesized that, in this study, sex was not a factor per se in its association with tooth

loss. It may, conversely, be a marker of cohort differences in oral health between sexes (28), leaving men more prone to lose teeth at older ages.

Also, participants aged 70+ were more likely to experience tooth loss within the follow-up period, which is in accordance with findings from a 15-year longitudinal study of older Iowans, for who tooth loss increased after the age of 70 (15). Such can be a result of a number of factors, including reduction in dexterity to perform oral hygiene procedures (13), barriers to access dental services (29), and the effect of accumulation of dental diseases in the elderly (28).

The higher odds of losing teeth for rural seniors can be explained by the fact that the few dental services available in those rural areas (when they exist) are provided by the municipality, and characterized by offering only dental restorations and tooth extractions (30). Such interpretation is supported by the notion that the greater availability, accessibility and quality of dental care create better opportunities for prevention and treatment of dental caries (22). In addition, rural communities in this city are not provided with water fluoridation. In fact, the water fluoridation in Carlos Barbosa city began in 2001, according with the State regulations which determine a fluoride concentration of 0.8 ppm, while variations between 0.6 to 0.9 ppm are considered normal.

Married participants were more likely to experience loss of one or more teeth, which is contrary to what has been found by Locker and coworkers (1996), who credited the effect of not being married and losing more teeth to the lack of social support (14). In fact, McGrath and Bedi (2002) found that older people living alone in Britain were more likely to visit the dentist only while in pain, and also to be edentulous (31). We hypothesize that married persons utilize dental services more often, once counseled by their partners, experiencing more tooth loss from intervention and services. This notion

is supported in part by a study in which elderly living alone were more likely to present non-treated decayed teeth, in comparison to those living with others (32).

Less educated subjects were also more susceptible to the outcome, which corroborates previous evidence that higher educational level is associated with lower risk for tooth mortality (5,16,21). The effects of higher education on lessening the risk of tooth loss might be interpreted in terms of better health behaviors among the more literate people, who may have been more responsive to the health information they received.

Current smokers were also at greater odds of losing teeth, which is in agreement with results from previous investigations (13,14,19). As discussed by Slade and colleagues, smoking has been identified as a major risk factor for periodontal disease but may contribute to tooth loss in other ways (19). Smoking may be serving partly as a proxy variable for other health behavior and attitudes that culminate in a decision by the dentist to extract a tooth or the patient to demand it (33).

The association between the use of RPD and tooth loss in this study may be linked to the effect of low socioeconomic status (SES) on choices of treatment, which had guided them towards tooth extraction instead of more conservative care. Most likely, people with this kind of oral rehabilitation may not be able to afford the higher costs of fixed prosthesis, thus being more prone to lose teeth that could otherwise be maintained (21). This interpretation is in line with the observations of Morse and coworkers (2002), who noted a high prevalence of crowned teeth among Swedish elderly, who had access to comprehensive dental care at reduced costs at the Swedish Public Dental Health Service. The authors suggested that teeth were more likely to be restored using crowns in Sweden, and extracted or restored using less expensive restorative modalities in other regions of the world (34), which is likely the case for this sample of older Brazilians.

The presence of caries at baseline showed no significant association with the outcome in multivariate analysis. This finding is in dissonance with a number of studies, where caries was the main risk indicator (14,17-19). Yet, as already mentioned, the majority of cohort studies evaluating tooth loss in the elderly have been carried out in industrialized countries (14-20). Brazil, a newly industrializing economy, still presents main social inequalities (1,2) that may be essentially accountable for oral health inequalities (22), of which tooth loss is a substantial indicator (30). Such notion is supported at least in part by evidence from a representative study of the oral health of older Brazilians, which showed that those with lower income, less schooling, and those who attended public dental care services, showed a higher prevalence of tooth loss than their counterparts (30). Also, based on a 24 months follow up study with 45+ years old persons in the US, Gilbert and coworkers (2003) observed that lower-SES persons were less likely to receive treatments that could serve as alternatives to tooth removal, given the same disease extent and severity, than their higher-SES counterparts (35).

Some potential limitations of this study should be acknowledged. One limitation is the lack of information on disease status at the time of extraction. Also, there was no data to account for the role that the dentist played on tooth loss (33). Bias because of nonresponse may also be of concern. However, dropouts are inevitable in cohort studies, and differences of characteristics between people retained and those lost to follow-up were significant only for a few variables. Further, we maintained follow-up with 79.6% of the eligible participants.

This study shows that demographic aspects, primary determinants of health, along with behavioral and clinical factors make significant contributions to variation in the incidence of tooth loss, in this sample of southern Brazilian older adults. These results are important, because understanding the causal association between lifestyle practices

such as oral hygiene or smoking with caries and periodontal disease does not elucidate why individuals and communities choose to engage in such practices (14). Therefore, interventions aiming to reduce tooth loss and edentulism in the elderly should account for behavioral, social and environmental factors, consistently with the notion that although clinical variables are important indicators of tooth loss, they may also reveal the effects of social disparities in the oral health/disease process.

While tooth loss in the elderly has been studied in a number of different settings, further research into older people and dentists' interactions in the process of decision-making on tooth extractions is also needed, to furnish a far-reaching understanding of why teeth are lost. Achievement of the goal of reduction of tooth loss and edentulism will demand research on dental professionals' philosophies and practices, and older people's beliefs and behaviors, their interactions with each other, and with their environment and communities.

ACKNOWLEDGMENTS

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Table 1. Baseline characteristics of participants and non-participants in the follow-up

VARIABLES	Participants N= 273	Non-participants N= 115	P-value
Age			
≤ 69	202 (74)	65 (56)	0.001
≥ 70	71 (26)	50 (34)	
Geographical location of residence			
Urban	136 (50)	70 (61)	0.11
Rural	137 (50)	45 (39)	
Sex			
Male	142 (52)	59 (51)	0.79
Female	131 (48)	56 (49)	
Marital Status			
Married	220 (80)	92 (80)	0.93
Widowed	42 (15)	18 (16)	
Single/divorced	11 (05)	05 (04)	
Schooling			
≤ 3 years	185 (68)	91 (79)	0.05
≥ 4 years	88 (32)	24 (21)	
Partial Removable Denture use			
Yes	147 (54)	53 (46)	0.16
No	125 (46)	62 (54)	
Income (minimum wage)			
≤ 1	137 (50)	64 (56)	0.31
>1	136 (50)	51 (44)	
Frequency of visits to the dentist			
Regularly	37 (14)	11 (09)	0.27
Occasionally or problem-oriented	221 (86)	104 (81)	
Frequency of tooth brushing			
Daily	222 (86)	100 (87)	0.99
Less than daily	36 (14)	15 (13)	
Self-perception on oral health			
Positive	182 (67)	72 (63)	0.49
Negative	90 (33)	43 (37)	

Percentages are provided in parenthesis

Table 2. Characteristics of studied sample according to the number of teeth lost in the 4-year follow-up period. (N=273)

Characteristic		N (%)				P
		Number of teeth lost				
		0	1	≥ 2	All	
Gender	Male	28 (20)	39 (27)	57 (40)	18 (13)	<0.01[*]
	Female	60 (46)	34 (26)	21 (16)	16 (12)	
Age	< 70 years old	71 (35)	56 (28)	53 (26)	22 (11)	0.15[*]
	70+ years old	17 (24)	17 (24)	25 (35)	12 (17)	
Geographic Location	Urban	54 (40)	36 (26)	33 (24)	13 (10)	0.04[*]
	Rural	34 (25)	37 (27)	45 (33)	21 (15)	
Marital Status	Married	64 (29)	57 (26)	68 (31)	30 (14)	0.09[*]
	Other	23 (43)	16 (30)	10 (20)	04 (07)	
Income (minimum wages)	< 2	45 (33)	41 (30)	33 (24)	18 (13)	0.37[*]
	≥ 2	43 (32)	32 (23)	45 (33)	16 (12)	
Schooling, years	≤ 3	23 (25)	27 (29)	27 (29)	16 (17)	0.15[*]
	≥ 4	65 (36)	46 (26)	51 (28)	18 (10)	
Satisfaction with health services	Dissatisfied and very dissatisfied	05 (32)	07 (44)	02 (12)	02 (12)	0.12[†]
	Neither satisfied nor dissatisfied	11 (42)	10 (38)	03 (12)	02 (08)	
	Satisfied and very satisfied	71 (31)	55 (24)	73 (32)	30 (13)	
Smoking status	Current smoker	04 (08)	15 (28)	19 (36)	15 (28)	0.19[*]
	Former/never smoker	84 (38)	58 (26)	59 (27)	19 (09)	
Frequency of tooth brushing	At least once a day	85 (34)	66 (26)	69 (27)	32 (13)	0.22[*]
	Less than once a day	03 (14)	07 (33)	09 (43)	02 (10)	
Flossing	Yes	68 (31)	57 (26)	62 (28)	32 (15)	0.20[*]
	No	19 (16)	16 (30)	16 (30)	02 (04)	
Visits to the dentist	Regularly	10 (31)	09 (28)	12 (38)	01 (03)	0.31[*]
	Other	78 (32)	64 (27)	66 (27)	33 (14)	
Removable dentures	Use	39 (26)	36 (25)	48 (36)	24 (16)	0.02[*]
	Non-use	49 (39)	37 (30)	29 (23)	10 (08)	
Caries	Prevalent	63 (28)	64 (29)	66 (30)	28 (13)	0.05[*]
	Non-prevalent	25 (48)	09 (17)	12 (23)	06 (12)	

*Chi-square test

Table 3. Association between Variables and Four-year Incident Rate of Tooth Loss in Community-dwelling Older Adults from Carlos Barbosa, South Brazil. (N=273)

Four-year Incidence Rate of Tooth Loss		Incidence Odds Ratio (95% Confidence Interval)		
		Crude	Adjusted[*]	Adjusted[£]
First block (exogenous variables)				
Gender	Male	1.51 (1.22 – 1.86)	1.39 (1.13 – 1.72)	
Age	≥ 70 y old	2.01 (1.63 – 2.47)	1.92 (1.56 – 2.37)	
Second block (primary determinants)				
Location of residence	Rural	1.74 (1.42 – 2.13)	1.67 (1.35 – 2.06)	1.32 (1.03 - 1.68)[†]
Marital status	Married	1.40 (1.02 – 1.77)	1.53 (1.16 – 2.03)	1.62 (1.20 – 2.19)[†]
Schooling	≥ 4 years	0.64 (0.53 – 0.79)	0.69 (0.56 – 0.85)	0.68 (0.54 – 0.85)[†]
Income	> 1 mimimum wage	0.90 (0.73 – 1.10)	1.05 (0.85 – 1.31)	0.98 (0.76 – 1.27)
Satisfaction with the access to health services	Neither satisfied nor dissatisfied	0.73 (0.39 – 1.35)	0.66 (0.35 – 1.21)	2.02 (0.93 – 4.38)
	Dissatisfied and very dissatisfied	1.50 (0.95 – 2.37)	1.48 (0.93 – 2.35)	3.57 (1.90 – 6.74)[†]
Third block (oral health behaviors)				
Smoking status	Current smoker	1.72 (1.24 – 2.40)	1.72 (1.24 – 2.40)	1.68 (1.13 – 2.50)[†]
Frequency of tooth brushing	< 1/day	0.76 (0.54 – 1.06)	0.77 (0.55 – 1.07)	0.70 (0.45– 1.07)
Visits to the dentist	Occasionally or problem-oriented	1.24 (0.91 – 1.70)	1.23 (0.90 – 1.68)	1.18 (0.85 – 1.64)
Fourth block (clinical variables)				
Five-minutes stimulated saliva flow		0.91 (0.87 – 0.95)	0.95 (0.91 – 0.99)	0.94 (0.91 – 0.99)[†]
Gingival Bleeding Index		1.01 (1.01 – 1.02)	1.01 (1.01 – 1.02)	1.01 (1.01 – 1.02)[†]
Removable dentures	Wear one or two	2.48 (2.01 – 3.05)	2.82 (2.27 – 3.50)	2.68 (2.12 – 3.39)[†]
Caries at baseline	prevalent	1.58 (1.18 – 2.11)	1.20 (0.87 – 1.66)	0.92 (0.65 – 1.29)

Analysis in four blocks according to the conceptual framework proposed by Andersen and Davidson (27)
[*] Adjusted for variables in the level.
[£] Adjusted for precedent levels.
[†] $P < 0.10$.

Table 4. Final Fully Adjusted Model of the Association between Variables and Four-year Incidence Rate of Tooth Loss in Community-dwelling Older Adults from Carlos Barbosa, South Brazil

Four-year Incident Rate of Tooth Loss	Incidence Odds Ratio (95% Conf. Interval)							
	Crude			P-value	Adjusted			P-value
Male gender (reference female)	1.51	1.22	1.86	<0.001	1.43	1.12	1.83	0.004
Age ≥70 (reference <70)	2.01	1.63	2.47	<0.001	1.40	1.10	1.79	0.007
Rural (reference urban)	1.74	1.42	2.13	<0.001	1.34	1.07	1.69	0.011
Married (reference single/widowed/divorced)	1.40	1.02	1.77	0.031	1.64	1.21	2.20	0.001
Schooling , ≥ 4 years (reference ≤ 3)	0.64	0.53	0.79	<0.001	0.68	0.54	0.85	0.001
Satisfaction with health services (reference satisfied and very satisfied)								
Neither satisfied nor dissatisfied	0.73	0.39	1.35	0.31	2.35	1.11	4.98	0.026
Dissatisfied and very dissatisfied	1.50	0.95	2.37	0.08	4.11	2.23	7.57	<0.001
Current smoker (reference never/former smoker)	1.72	1.24	2.40	0.001	1.77	1.19	2.62	0.004
Caries at baseline yes (reference no)	1.58	1.18	2.11	0.002	0.92	0.66	1.29	0.64
Five-minutes stimulated saliva flow	0.91	0.87	0.95	<0.001	0.94	0.91	0.99	0.01
Gingival bleeding Index	1.01	1.01	1.02	<0.001	1.01	1.01	1.02	<0.001
Partial Removable Denture ≥ 1 (reference none)	2.48	2.01	3.05	0.001	2.73	2.17	3.44	<0.001

Totally adjusted model according to the conceptual framework (27)

Manuscrito 2.

TITLE: Four-year incidence and predictors of coronal caries among community-living older adults in a southern Brazilian city

ABSTRACT

Although an improvement in oral health has been observed in most populations in Western countries, coronal caries in older adults is still an issue. Caries has been described as a combined result of behavioral, contextual and societal factors. *Objective*: to determine the incidence and predictors of coronal caries among community-living older adults in a southern Brazilian city. *Methods:* A cohort study was conducted using a simple random sample of persons aged 60 years or older in Carlos Barbosa city, southern Brazil. Interviews and oral examinations were conducted among 388 dentate individuals at baseline, and among 273 at four years follow-up. The incidence of new coronal caries lesions and restorations was modeled by means of Negative Binomial Regression. *Results:* Some 184 (76.7%) participants presented new caries lesions or restorations, whose mean number was 2.2 ± 2.1, whereas the four-year mean caries incidence rate was 0.28 ± 0.29. In the multivariate model that controlled for baseline predictors, older age; male gender; living in a rural area; current smoking; and negative self-perception of oral health were associated with caries incidence. Among clinical variables, the use of partial dentures was a predictor, whereas higher saliva flow rate was a protective factor for the outcome. *Discussion*: Demographic factors, primary determinants of health, behavioral and clinical variables were predictors of new caries lesions and restorations. *Conclusion*: There was a high incidence rate of coronal caries among these older Brazilians. Interventions aiming to prevent dental caries in the elderly should account for social and environmental factors.

INTRODUCTION

The fast growth of the older adult population is a worldwide phenomenon. It poses

challenges to health and social policy-makers because of the changing burden of chronic

diseases and the marked inequalities in oral health status and access to dental care of

this population [Petersen and Yamamoto, 2005]. Demographic indicators predict a

dramatic shift in the distribution of the Brazilian population, with substantial growth in

the number of persons in the over 60-years age group [Carvalho and Rodríguez-Wong,

2008].

New dental techniques, use of fluoride, greater utilization of dental services, and

increased awareness of personal hygiene have resulted in greater retention of natural

teeth through to older ages for certain populations [Hamasha *et al.*., 2005]. Yet, older

people usually have restricted access to oral health care in Brazil [Martins *et al.*., 2008;

Hugo *et al.*., 2007] and in the world [Petersen and Yamamoto, 2005]. Results from a

representative study of the Brazilian population showed that in 2003, only 10% of the

older people had 20 or more natural teeth [Hugo *et al.*., 2007]. In addition, elderly

people are more frequently at risk of changes in their social and medical situation,

which also increases the risk of dental caries [Petersen and Yamamoto, 2005]. If dental

caries is not dealt with sufficiently well, it may lead in many cases to a circle of

restorations and secondary caries, which may eventually end in tooth extraction [Fure

and Zickert, 1997]. Although an improvement in oral health has been observed in most

populations in Western countries, recent studies have revealed that dental caries may be

a problem among older people [Fure, 2004; Gilbert *et al.*., 2001; Hamasha *et al.*., 2005;

Luan *et al.*., 2000; Warren *et al.*., 2000]. Some studies have also revealed a high

prevalence of remaining teeth in the elderly, as well as an increase in the incidence of

caries, fixed prostheses and restorations with age [Hamasha *et al..*, 2005; Luan *et al..*, 2000; Gilbert *et al..*, 2001; Fure, 2004; Drake *et al..*, 1997; Steele *et al..*, 1998]. Compared to younger adults, more attention has been placed on root caries in the elderly, due to heightened risk of increasing attachment loss with age. Nonetheless, the incidence of coronal caries in older adults has been shown to be comparable to that in schoolchildren [Hamasha *et al..*, 2005]. In fact, studies have consistently confirmed that coronal caries, once presumed to be relatively minimal in middle-aged and older adults, is a common occurrence in these age groups [Powell, 1998]. Certain clinical variables, including previous caries experience, levels of certain oral bacteria, salivary conditions, and sociodemographic circumstance, have been identified as important predictors of coronal caries in adults [Fure and Zickert, 1997; Powell, 1998].

Holst and coworkers [2001] proposed that caries is a result of biological processes on tooth surfaces and of processes in the environment. These authors suggest that the environmental process is a combined result of behavioral, contextual and societal factors, which in a series of steps ultimately influence the way caries develops in individuals and in populations.

In this perspective, studies have reported an increase in the caries increment with age [Fure and Zickert, 1997; Warren *et al..*, 2000] while Fure [2004] observed that attack rates for coronal caries was significantly higher for the females in a study with Swedish elders. Smoking habits were also correlated to coronal and root decay, which was attributed to some factors related to smoking, such as behavioral quality, and a decrease in salivary flow rate [Fure, 2004; Drake *et al..*, 1997]. As regards clinical variables, Steele and coworkers [1998] noted that among older people in England, wearing removable partial dentures (RPD) approximately doubled the likelihood of root caries lesions. Locker and Jokovic [1997] in a longitudinal study with older Canadians,

observed that those who had worsened their self-perceived oral health had more caries and periodontal disease.

It is apparent that the need for dental care in the elderly is likely to increase as the incidence of caries continues by age and the number of remaining teeth increases [Hamasha *et al.*., 2005]. Without an understanding of what causes caries in a population, appropriate methods to prevent the disease and promote oral health cannot be developed [Holst *et al.*., 2001]. Most epidemiological studies of caries in adults have been conducted in Europe and North America, where a variety of preventive measures are used, and access to dental treatment is more frequent.

The Carlos Barbosa Cohort Study (CBCS) is a prospective, longitudinal observational cohort study of oral health of south-Brazilian older people [Hugo *et al.*., 2009; Martins *et al.*., 2011]. The CBCS was designed to improve understanding of the incidence and dynamics of a broad range of dental health outcomes. Within that range, we hypothesized that certain clinical, behavioral, and demographic and socioeconomic factors would be predictive of caries incidence in a sample of dentate adults. Thus, the objective of this study was to determine the 4-year incidence of new coronal caries lesions and restorations among community-living southern Brazilian people aged 64 or older, and to assess the association between tooth loss and predictor variables.

METHODS

The cohort considered in this study consisted of the dentate elderly people who were interviewed and examined at baseline in 2004 [Hugo *et al.*., 2009] and followed up four years later [Martins *et al.*., 2011].

Population and Sample

The city had 20,519 inhabitants in 2000, of whom 2,167 were aged 60 and older. In 2004, participants were randomly selected from the municipality register of persons aged 60 years or more. Twenty-two older persons living in a long-term residence were considered ineligible. Of the potential participants identified in the city register, 983 older persons were contacted, 13 persons were restricted to bed at home, one person was hospitalized and 97 persons refused to participate. In the end, 872 individuals participated in the study, from whom 388 were dentate. The Committee of Ethics in Research of the Federal University of Rio Grande do Sul approved the study protocol. Before starting data collection, participants were informed about the study objectives and procedures. All participants provided written informed consent. The study was performed according to the Brazilian resolution for standards of ethics in research involving human participants [Brazil. National Health Council, 1999].

Baseline data collection

Data collection consisted of interviews and oral examinations. The researchers conducted individual interviews in the participants' homes or in community clubhouses. Oral examinations were performed in dental clinics provided by the Health Department of Carlos Barbosa. Mirrors and probes were used under standardized illumination to assess the status of teeth and periodontal tissues. The dental state, using the DMFT index, and the use of dental prostheses were assessed according to criteria of the World Health Organization [WHO, 1997]. The Gingival Bleeding Index (GBI) and Visible Plaque Index (VPI) were measured [Ainamo and Bay,1975]. Stimulated saliva (five minutes) was collected by chewing on a piece of Parafilm (0.3 g of Parafilm M

laboratory film, American National Can, Greenwich, CT, USA). At 30-s intervals, saliva was expectorated into graded containers, and after 5 min the amount of stimulated saliva was determined volumetrically. Baseline data collection was conducted by two dentists. Inter-examiner reliability for the coronal caries portion of the baseline has been described previously [Hugo *et al.*., 2009].

Evaluation of Self-Reported Demographic, Socioeconomic, Behavioral, and Health Information

A standard questionnaire was used to collect demographic, socioeconomic, behavioral, and health information, which were classified for analytical reasons, within conceptual blocks of analysis. Some variables were categorized for analysis purposes. Age was categorized as ≤ 69 year old, or ≥70 years old (above percentile 75), and was classified along with the gender of the participant, as an exogenous variable. Within the analytical block of demographic, socioeconomic variables and self-rated oral health, participants were categorized as follows: Those currently living in urban or rural areas, according with the classification of the municipality of Carlos Barbosa. Urban areas in this city are defined as those with infrastructure that includes services of water supply, sanitary systems, primary school and Public Health Unit. Schooling was categorized as less than four, or 4+ years of education. Income was dichotomized into receiving up to two, or more than two minimum monthly wages (the minimum monthly wage during baseline data collection was equivalent to 118.00 US dollars). Participants were categorized as married or single/divorced/widowed for the variable marital status. In the block of behavioral variables, participants were classified as follows: For smoking status, each participant was categorized as a never or former smoker versus a current smoker. For self-rated oral health, participants were dichotomized as those who rated their oral

health as poor or very poor, and those who considered it good or very good. Frequency

of tooth brushing was defined into two categories, one of those brushing at least once a

day and the other those brushing less than daily; whereas for frequency of visits to the

dentist, participants were categorized as those who visited the dentist regularly, or those

who sought for dental care only occasionally or in a problem-oriented manner.

Four-year follow-up data collection

People who participated at baseline were re-contacted four years later, in 2008. From

the 388 dentate individuals who participated at baseline, 23 died and 43 were not

found. Thus, 322 participants were contacted, of which 11 have been unable to

participate for reasons of illness, 11 had moved away from Carlos Barbosa and 27

refused to participate. In the end, 273 older persons were evaluated. To evaluate the

potential for bias as a result of subject attrition, we compared characteristics of those

who participated for a clinical examination at four years with those who did not.

Follow-up examinations were conducted by two dentists, and the examination protocol

was identical to the protocol used at baseline. For the four-year examination, duplicate

dental inspections were conducted on 10% of the participants during the study for

reliability. Examiners were blinded to the previous examiner's findings, but because

replicate examinations were conducted on the same day, examiners were not blinded to

whether the examination was to be used for inter-examiner reliability estimates.

Caries Determination

The clinical examination done at four years was identical to the baseline examination.

Briefly, however, all teeth were noted, including third molars. Diagnosis of caries was

based on clinical presentation without radiographs. Root fragments were considered as

missing teeth. Fixed prosthetic crowns were also identified; three-fourth crowns and partial-coverage onlays were not identified as prosthetic crowns; rather, they were recorded as restorations during the caries assessment. Caries were evaluated according to the WHO criteria [1997]: "Caries is recorded as being present when a lesion in a pit or fissure, or on a smooth tooth surface, has a detectably softened floor, undermined enamel or softened wall. A tooth with a temporary filling should also be included in this category. On proximal surfaces, the examiner must be certain that the explorer has entered a lesion. Where any doubt exists, caries should not be recorded as being present." The criteria for coronal caries were interpreted, however, as the explorer entering the lesion with no pressure.

The assessment of caries incidence was based on a tooth-by-tooth comparison of the untreated caries and filled status at the 2004 and 2008 examinations. Caries incidence was determined for new caries lesions, fillings on previously sound teeth, and new recurrent caries on previously filled teeth [Beck *et al..*, 1997]. Teeth that were lost between the 2004 and 2008 examinations were not considered in the analysis. The caries incidence rate was defined as the ratio between the number of the teeth with new caries lesions or restorations during the period concerning the two examinations, and the number of teeth at risk, per person. All teeth present at both examinations, without coronal caries lesions at baseline, and without crowns, were considered at risk for caries incidence.

Reversals, defined as tooth recorded as decayed or filled at baseline examination and sound at follow-up, occurred very seldom and were treated as baseline examiner bias. Their status was then amended on the baseline data and considered as sound, for analysis purposes, at both examinations. Concurring with the overall recommendations of Beck and colleagues [1997], analysis of coronal caries incidence was done in the

following manner: Caries incidence was calculated after excluding teeth that had full prosthetic crown coverage at baseline; this was done because these teeth, assuming no incident loss of the crown, could not possibly develop a coronal carious increment. Teeth that received full prosthetic crowns between the baseline and four-year examination were also excluded; this was done to avoid a bias presumably introduced when incident crowns were placed on teeth for reasons other than incident caries.

Analysis

Mann-Whithney and Kruskall-Wallis tests were used to evaluate the associations of incidence rate of caries with independent variables in the bivariate analysis. Differences in characteristics between the people retained and those lost to follow-up were verified. The inter- and intra-examiner reproducibilities of oral examination results before and during the study were calculated using the Cohen kappa coefficient. Multivariate models were constructed using Negative Binomial Regression.

We used a stepwise analytic technique, in which variables that showed a significance of $p<0.10$ were maintained for the next step of the regression [Hosmer and Lemeshow, 2000]. Variables were analyzed within their blocks of clinical, behavioral, demographic and socioeconomic, and exogenous variables, and later on those variables that showed a significance of $p<0.10$ from previous analytical blocks were added to the next step of the analysis. The first step in multiple regression modeling tested the significance of four clinical factors (Visible Plaque Index; Gingival Bleeding Index; 5-minutes stimulated saliva flow rate; and use of RPD). The second block included three baseline behavioral factors (frequency of tooth brushing; frequency of visits to the dentist; and smoking status), subsequently including the variables retained from the first block of analysis. The third block comprised demographic and socioeconomic variables

(geographical localization of the residence; income; schooling; and marital status), comorbidity, and self-rated oral health, successively including the variables retained from the previous step. The variables that met the p<0.10 criterion were 'geographical location of the residence' and 'monthly income'. The fourth step included the variables retained from the previous steps and exogenous variables, as considered the age (categorized as ≤69 and ≥70 years old) and sex of the participant.

Finally, only the variables that had a p<0.10 with the outcome in the previous models were added in a final model. In the final, fully adjusted model, only variables with a p<0.05 were considered significantly associated with the outcome. The associations are presented as Incidence Odds Ratios and their respective 95% Confidence Intervals. All the analyses were performed using the Stata SE 11.1 software for statistical analysis (Statacorp, Texas, USA).

RESULTS

At the 4-year follow-up, data were available for 273 of the 388 people who were dentate and who had an examination at baseline. Some 67.8% of participants lost one or more teeth, whereas 33 (12.1%) persons became edentulous during the four-year follow-up period. Thus, the results presented here refer to the 240 participants who were dentate at both baseline and follow-up examinations. The mean age of the study participants was 65.9 ± 4.9, and 59 (24.6%) were 70+ years old. Some 125 (52.1%) participants were male; 77 (32.1%) had more than four years of schooling, and 189 (78.8%) were married. The mean age for males was 66.8 ± 5.0 and for females was 64.9 ± 4.7. The mean number of remaining teeth among these subjects was 9.4 ± 5.7 teeth, with a range of one to 29 teeth, and only 20 (8.3%) of the participants had 20 or more remaining teeth in 2008. Some 184 (76.7%) participants presented new caries lesions or restorations, and

the mean number of new caries lesions or restorations in the study sample was 2.2 ± 2.1, whereas the median was 2 (1 – 3). The mean annualized caries incidence rate for the study sample was 0.28 ± 0.29. Male participants presented significantly more teeth at risk (12.92 ± 6.9) than the females (9.48 ± 5.6) at baseline (P<0.001).

The Kappa coefficients for intra- and inter-examiner reproducibilities of DMFT assessments at baseline, before and during the study respectively, were 0.93 and 0.98, while the kappa coefficients for inter- and intra-examiner reproducibility before and during the study ranged from 0.97 to 0.98, at follow-up. Baseline characteristics of people who were lost to follow-up and the group retained in the cohort are presented in Table 1. Compared with the latter, people lost to follow-up were more likely to be older and have less years of schooling.

Bivariate statistics were computed to describe caries incidence rates in relation to the predictor variables (Table 2). Being 70+ years old; reporting one's own oral health as poor or very poor; and wearing one or two RPD were significantly associated (P≤05) with the outcome in the bivariate analysis.

The stepwise approach used in the multivariate analysis is presented in Table 3. In the first block, wearing one or two RPD showed a positive association (P<0.001), while increased stimulated saliva flow rate (five-minutes) was protective for the outcome. In the second block, positive and significant associations (P<0.10) were found between being a current smoker; and visiting the dentist irregularly, and the incidence of caries. In the third block, living in a rural area; being paid more than two minimum wages per month; and self-rating one's oral health as poor or very poor were positively associated (P<0.10) with the outcome. In the fourth block, being a male, and 70 years old or older were positively associated with the incidence of new caries lesions or restorations.

In the final fully adjusted model (Table 4), there was a higher incidence odds ratio of new caries lesions or restorations for men; people aged 70+; people living in a rural area; current smokers; and those who rated their own oral health as poor or very poor. Among clinical variables, the use of RPD was positively associated with the outcome, whereas higher saliva flow rate showed a protective effect.

DISCUSSION

This is the first study, at least to our knowledge, assessing the incidence of caries and its relation to demographic, socioeconomic, behavioral and clinical predictors of the disease, in older Brazilians. These results are relevant because caries tend to be the most consistent predictor of tooth loss [Fure and Zickert, 1997; Gilbert *et al.*., 1999], and because of the need for developing effective strategies for its prevention [Holst *et al.*., 2001]. The use of RPD, saliva flow rate, smoking status, geographic location of the residence, sex, and age, were the variables which emerged as the best explanatory variables of the variation in caries incidence.

The incidence of new caries lesions and restorations during the four-year period in this sample of south Brazilians aged 60+ at baseline was 76.7%, which is lower, similar, or higher than that reported in comparable studies, although with different periods of follow-up and different age groups in those studies. CBCS incidence figures are somewhat lower than those from the Iowa 65+ Oral Health Study, where approximately 93% of the subjects developed some new coronal caries increment during a 9- to 11-year follow up [Hamasha *et al.*., 2005]. In another study of Swedish elderly, Fure [2004] observed that 95% of the participants developed one or more carious lesions during a 10-year period, whereas Luan and coworkers [2000] in a 10-year follow up study of adult and older Chinese, noted that 66–96% of 20-80 years-old subjects'

experienced new caries lesions or restorations, with the prevalence increasing with age. Our results are, on the other hand, higher than those observed in a five-year longitudinal study with Swedish elders, where Fure and Zickert [1997] found that 51% of participants developed new caries lesions. They are also higher than observed by Gilbert and collaborators [2009] in the Florida Dental Care Study, where among the 45+ years old participants, 36% developed new caries lesions in a 24-month period.

One of the main findings from this study is that there was an increase in the caries incidence with age, which is in accordance with findings from other investigations [Fure and Zickert, 1997; Drake *et al.*, 1997]. Luan and coworkers [2000] suggested that because most elderly have much easier access to a variety of foods during the day than adults who are at work, the higher incidence of caries might reflect changing dietary habits. In addition, enhanced drug consumption, followed by a reduced salivary flow rate and elevated acidogenic bacterial counts, is an important explanation of the increase in caries incidence with age [Fure, 2004]. Kiyak and Reichmuth [2005] suggested that a reduction in dexterity to perform oral hygiene procedures, along with barriers to access dental services may as well be accountable for the increase in oral diseases with age. Our results showed that men were more prone to have incident caries lesions or restorations, which may indicate that because women pursue dental treatment more regularly than men [Martins *et al.*, 2008] they may be more likely to receive preventive care as a result of better patterns of access to dental services [Holst *et al.*, 2001].

One more important result of this study was that participants living in rural areas of the municipality presented higher incidence of new caries and restorations. This result could be explained in terms of at least two main features: exposition to fluoridated water; and availability and accessibility of dental care. Rural areas of Carlos Barbosa are not provided with water fluoridation, while evidence shows that in communities

with fluoridated drinking water, the caries prevalence decrease significantly [Wiktorsson *et al.*, 1992]. Moreover, access to dental care is limited in rural regions of this municipality, as observed in other Brazilian settings [Barbato *et al.*., 2007], which may partially explain these results. Such interpretation is supported by the notion that the greater availability and accessibility of dental care create better opportunities for prevention and treatment of dental caries [Holst *et al.*., 2001]. These results are relevant as they indicate that older persons living in rural areas might need special consideration in the event of public policies' development, as well as in the perspective of dental private practice.

Participants who rated their own oral health negatively were more prone to caries incidence in this study. These results are important in view of the findings from a three-year longitudinal study with older Canadians, where Locker and Jokovic [1997] observed that subjects' reports of their oral health status were a valid and reliable measure. They are also in agreement with findings from a recent cross-sectional investigation with Brazilian elderly, in which Patussi and collaborators [2010] suggested that a single question of self-perception of oral health may be a good predictor of clinical conditions. We hypothesize that the association between negative self-perception of oral health and caries incidence may be a result of the pain caused by tooth decay, thus reflecting the distress and the negative subjective experiences related to the development of the disease.

Smoking was a variable that contributed significantly to the explanation of caries incidence, as already observed in other settings [Fure, 2004; Drake *et al.*., 1997]. As discussed by Slade *et al.*. [1997], smoking has been identified as a major risk factor for periodontal disease and tooth loss, but may contribute to dental diseases in other ways. The association between tobacco consumption and tooth decay has been suggested as a

result of other factors related to smoking, such as behavioral quality [Warren *et al.*., 2000], a decrease in salivary flow rate and, particularly in the case of root caries, an increase in the number and areas of exposed root surfaces [Drake *et al.*., 1997].

In this study, wearing one or two RPD increased the chance of new caries lesions or restorations, which substantiates evidence from a cross-sectional study conducted with people 60+ years old of three areas of England, where Steele *et al.*. [1998] reported a similar and independent association of RPD's use and the prevalence of caries lesions, albeit in root surfaces. As it has been proposed, the mechanism by which the use of RPD increases the risk of root caries is the accumulation of oral bacteria on the RPD's surfaces, thus affecting the exposed root surfaces [Steele *et al.*. 1998]. In fact, several studies have shown that many elderly people present poor oral hygiene and an increased level of acidogenic micro-organisms in plaque and saliva, with these factors been related to higher prevalence and incidence of caries [Powell, 1998]. Thus, the findings of this study indicate that the use of RPD may be a significant factor in the development of coronal caries as well, possibly through the retention of dental plaque in the areas of contact between the natural teeth and the RPDs.

In addition, a higher rate of stimulated saliva flow was protective for caries incidence in this investigation. As it has been discussed in the literature, the elderly are more frequently subject to functional disorders, diseases and medical treatments that result in hyposalivation [Petersen and Yamamoto, 2005]. In fact, the reduction on saliva flow rate with age was reported for a sample of Swedish elderly in a ten-year cross-sectional and incidence study of caries [Fure, 2004]. Even so, this is one of the first studies showing a lower incidence of caries among older people with higher saliva flow rate. These results are likely a consequence of a shift towards a more cariogenic oral flora, following the reduction in the salivary flow rate.

Some methodological issues of this work warrant further discussion. While most reports in the literature provide incidence estimates as annualized rate of caries per 100 surfaces, this study was carried out on a tooth-by-tooth examination basis. Therefore, it is not feasible to compare our results with those from other investigations in terms of incidence density [Beck *et al..*, 1997]. However, we used a measure of incidence rate, which is a useful yardstick for comparing two rates of disease [Slade and Caplan, 2001] especially in this case, where the exact time of disease onset is not known [Hujoel *et al..*, 1991]. Moreover, most of the literature of caries incidence in adults considered new crowns as five new surfaces of caries experience, assuming that those crowns replaced carious coronal surfaces [Hamasha, 2005; Beck *et al..*, 1997]. Thus, while the scoring of crowns in such manner could result in overestimation of coronal caries increment, the reported incidence rate estimate in our study is slightly lower than it should be, once it was calculated after teeth that received full prosthetic crown coverage during the follow up were excluded. Nevertheless, this is in agreement with the recommendations of Slade and Caplan [2000], who suggested the adoption of approaches that are consistent with the method used to handle missing teeth when computing events for crowned teeth in studies of caries incidence. Hence, as proposed by Beck and colleagues [1997], teeth lost during the follow-up were not considered to be missing due to caries (the traditional method) [Hujoel *et al..*, 1991]. Rather, since data on actual date of extraction, reason for extraction, and tooth status at time of extraction were unknown, no assumptions were made as to why the teeth were lost, and they were excluded from the analysis.

Some limitations of this study have to be acknowledged. The attrition bias may have influenced the results, since people lost to follow-up were more likely to be older and have less years of schooling, as already mentioned. These individuals might therefore have displayed divergent dental health from those who participated. As suggested by

Payne *et al*. [1995] the characteristics of those lost and retained should be compared in order to give some indication of the likely degree and direction of bias. Of particular interest were differences in variables found to be predictors of coronal caries in multivariate analyses. However, it showed that only one of these variables, being 70 years or older, was an independent predictor of caries incidence. Consequently, the differences observed appear unlikely to be of sufficient magnitude and strength to have a major effect on estimates of disease incidence. Furthermore, many factors that may have contributed to the incidence of caries were not included in the model. These may include a wide range of subtle factors, for example the position of the teeth, treatment patterns, and exposure to fluoride. Unfortunately the data set does not include this information.

However, observational cohort studies such as the CBCS offer the important advantages of using a sample that is representative of a defined population, as they include persons regardless of whether they actually seek dental care, and they monitor change due to dental care that is provided in 'real-world' public or private practice settings where the majority of dental care is delivered [Gilbert *et al.*, 2001].

We conclude that dental caries comprises a significant problem in this sample of older Brazilians. In order to cope with this dental health problem, there is a strong need for rapid changes in attitudes and behaviors towards oral health, combined with appropriate use of fluorides. As people enter old age, even stronger emphasis should be put on preventive strategies. Although improved availability and accessibility of dental care is supposed to create better opportunities for prevention and treatment of dental caries, older people's perception of the need to make use of clinical dental services, regardless of how accessible these services are to them, do warrant further discussion.

ACKNOWLEDGMENTS

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Table 1. Baseline Characteristics of Participants and Non-participants in the Follow-up

VARIABLES	Participants N= 273	Non-participants N= 115	P-value
Age			
≤ 69	202 (74)	65 (56)	0.001
≥ 70	71 (26)	50 (34)	
Geographical location of residence			
Urban	136 (50)	70 (61)	0.11
Rural	137 (50)	45 (39)	
Sex			
Male	142 (52)	59 (51)	0.79
Female	131 (48)	56 (49)	
Marital Status			
Married	220 (80)	92 (80)	0.93
Widowed	42 (15)	18 (16)	
Single/divorced	11 (05)	05 (04)	
Schooling			
≤ 3 years	185 (68)	91 (79)	0.05
≥ 4 years	88 (32)	24 (21)	
Partial Removable Denture use			
Yes	147 (54)	53 (46)	0.16
No	125 (46)	62 (54)	
Income (minimum wage)			
≤ 1	137 (50)	64 (56)	0.31
>1	136 (50)	51 (44)	
Frequency of visits to the dentist			
Regularly	37 (14)	11 (09)	0.27
Occasionally or problem-oriented	221 (86)	104 (81)	
Frequency of tooth brushing			
Daily	222 (86)	100 (87)	0.99
Less than daily	36 (14)	15 (13)	
Self-perception on oral health			
Positive	182 (67)	72 (63)	0.49
Negative	90 (33)	43 (37)	

Percentages are provided in parenthesis

Table 2. Association between Variables and Four-year Incidence Rates of caries in Community-living Older Adults from Carlos Barbosa, South Brazil (N=240)

Variable	Categories	N	Incidence rate (median ± sd)	P-value
Sex	Male	125	0.31 ± 0.27	0.07[*]
	Female	115	0.25 ± 0.29	
Age (years-old)	≤ 69	181	0.26 ± 0.27	0.02[*]
	≥ 70	59	0.35 ± 0.30	
Geographical location of the residence	Urban	124	0.24 ± 0.26	0.11[*]
	Rural	116	0.33 ± 0.29	
Marital status	Married	189	0.30 ± 0.28	0.07[*]
	Single/divorced/widowed	50	0.22 ± 0.25	
Schooling (years)	< 4	78	0.31 ± 0.29	0.20[*]
	≥ 4	160	0.26 ± 0.26	
Income (minimum wages)	≤ 2	144	0.26 ± 0.28	0.33[*]
	> 2	96	0.30 ± 0.27	
Comorbidities	Yes	180	0.27 ± 0.28	0.27[*]
		60	0.32 ± 0.27	
Satisfaction with the health services accessed	Very satisfied and satisfied	200	0.29	0.45[£]
	Neither satisfied nor dissatisfied	24	0.22	
	Dissatisfied and very dissatisfied	14	0.26	
Visits to the dentist (frequency)	Regularly	35	0.27 ± 0.27	0.82[*]
	Occasionally/Problem-oriented	191	0.28 ± 0.27	
Tooth brushing (daily frequency)	≤ 1	82	0.27 ± 0.30	
	≥ 2	143	0.30 ± 0.27	
Flossing	Yes	52	0.20 ± 0.27	0.45[*]
	No	186	0.26 ± 0.28	
Smoking status	Current smoker	42	0.30 ± 0.27	0.56[*]
	Former/Never smoker	197	0.28 ± 0.28	
Self-rated oral health	Good or very good	153	0.26 ± 0.27	0.21[*]
	Poor or very poor	86	0.31 ± 0.28	
Use of Partial Removable Denture (one or two)	Yes	125	0.35 ± 0.30	<0.01[*]
	No	114	0.20 ± 0.22	
Number of teeth at risk	Males	125	12.92 ± 6.9	<0.001[*]
	Females	115	9.48 ± 5.6	
Number of teeth lost in the 4-year follow-up period	None	88	0.26	0.17[£]
	One	73	0.26	
	Two or more	78	0.33	

[*] Mann Whithney
[£] Kruskall Wallis

Table 3. Association between Variables and four-year incidence rate of new caries lesions and restorations in Community-living older adults from Carlos Barbosa, South Brazil (N=240)

Caries Incidence Rate		Incidence Odds Ratio (95% Confidence Interval)		
		Crude	Adjusted[*]	Adjusted [£]
First block (clinical variables)				
Five-minutes stimulated saliva flow		0.95 (0.92 – 0.99)	0.97 (0.93 – 1.01)	
Gingival Bleeding Index		1.00 (0.99 – 1.00)	1.00 (0.99 – 1.00)	
Visible Plaque Index		1.00 (0.99 – 1.00)	1.00 (0.99 – 1.00)	
Removable dentures	Wear one or two	2.26 (1.85 – 2.76)	2.35 (1.91 – 2.99)	
Second block (behavioral variables)				
Smoking status	Current smoker	1.42 (1.11 – 1.81)	1.67 (1.30 – 2.15)	1.57 (1.20 – 2.05)[†]
Frequency of toothbrushing	≤ 1/day	1.02 (0.83 – 1.25)	1.03 (0.83 – 1.28)	1.05 (0.84– 1.31)
Visits to the dentist	Occasionally or problem-oriented	0.82 (0.64 – 1.06)	0.76 (0.59 – 0.99)	0.77 (0.59 – 1.01)[†]
Third block (sociodemographic variables and self-rated oral health)				
Location of residence	Rural	1.57 (1.30 – 1.92)	1.71 (1.39 – 2.09)	1.58 (1.27 - 1.96)[†]
Marital status	Married	1.81 (0.92 – 1.52)	1.15 (0.89 – 1.49)	1.14 (0.87 – 1.50)
Schooling	≥ 4 years	0.97 (0.79 – 1.19)	1.02 (0.83 – 1.27)	1.07 (0.86 – 1.35)
Income	> 2 minimum wage	0.90 (0.73 – 1.10)	1.26 (1.03 – 1.54)	1.34 (1.07 – 1.66)[†]
Self-rated oral health	Poor or very poor	1.42 (1.16 – 1.74)	1.48 (1.20 – 1.82)	1.20 (0.96 – 1.50)[†]
Fourth block (exogenous variables)				
Sex	Female	0.77 (0.63 – 0.93)	0.80 (0.65 – 0.98)	0.85 (0.67 – 1.07)
Age	70+ years-old	1.62 (1.31 – 2.01)	1.60 (1.28 – 1.97)	1.18 (0.93 – 1.51)

[*]Adjusted for variables in the block.
[£]Adjusted for precedent blocks.
[†]$P< 0.10$.

Table 4. Final fully adjusted model of the variables and four-year incidence rate of new caries lesions and restorations in community-living older adults from Carlos Barbosa, South Brazil (N=240)

Caries Incidence Rate	Incidence Odds Ratio (95% Conf. Interval)				
	Crude	P-value	Adjusted		P-value
Male gender *(reference female)*	1.30 (1.06 - 1.59)	0.01	1.35 (1.09 - 1.67)		0.006
Age ≥70 *(reference <70)*	1.62 (1.31 – 2.01)	<0.001	1.27 (1.01 - 1.60)		0.043
Rural *(reference urban)*	1.57 (1.30 – 1.92)	<0.001	1.33 (1.08 - 1.63)		0.006
Poor self-reported oral health *(reference good)*	1.42 (1.16 – 1.74)	0.001	1.28 (1.03 - 1.59)		0.023
Current smoker *(reference never/former smoker)*	1.42 (1.11 – 1.81)	0.005	1.32 (1.02 - 1.72)		0.035
Five-minutes stimulated saliva flow	0.95 (0.92 – 0.99)	0.014	0.96 (0.92 - 0.99)		0.026
Partial Removable Denture ≥ 1 *(reference none)*	2.26 (1.85 – 2.76)	<0.001	2.04 (1.65 - 2.52)		<0.001

Manuscrito 3.

TITLE: Four-year incidence and predictors of root caries among community-living older adults in a southern Brazilian city

ABSTRACT

The prevalence of root caries in the general population is increasing as the population ages, and people are retaining their teeth longer, with more root surfaces becoming exposed. *Objective:* To determine the incidence density of new root caries lesions and restorations among community-living southern Brazilian older adults, and to assess its association with predictor variables. *Methods:* A cohort study was conducted with a simple random sample of persons aged 60 years or older in Carlos Barbosa city, southern Brazil. Interviews and oral examinations were conducted among 388 dentate individuals at baseline, and 273 at four-year follow-up. The outcome of this study is the root caries incidence density, defined as the ratio between the number of roots with new caries lesions or restorations during the follow-up period, and the sum of root-time at risk, per subject. The results were modeled with Negative Binomial Regression. *Results:* The mean number of roots at risk among participants was 7.0 ± 4.9. Some 116 (49.4%) subjects presented incidence of the disease, whose mean number was 0.8 ± 1.0, whereas the mean incidence density was 0.16 ± 0.31. In the multivariate model that controlled for baseline predictors, older age; living in a rural area; and brushing less than daily were predictors, whereas higher saliva flow rate presented a protective effect. *Discussion*: There was a high incidence of root caries among these older Brazilians. Preventive strategies including the use of fluorides and instruction to improve the attitude and behavior towards oral hygiene are needed.

INTRODUCTION

Current demographic indicators predict a dramatic shift in the distribution of the
Brazilian population. A continued increase in the number of elderly people is expected
such that by the year 2025, approximately 15% of the Brazilian people, that is to say 30
million people, will be 60 or older (1).Such increase, along with improvements in oral
health, is expected to result in a reduction in edentulism and missing teeth among these
elders (2).

Root caries is a prevalent and debilitating dental disease among older adults (3). If
effective preventive measures are not taken, this disease may lead in many cases to a
circle of restorations and secondary caries, which eventually end in tooth extraction (4).
Evidence suggests that, in fact, root caries is one of the main causes of tooth loss (4,5).
The prevalence of root caries in the general population is increasing as the population
ages, since root caries increases with age (3). This increased prevalence is associated
with people retaining their teeth longer (2), and with root surfaces becoming
physiologically (aging) or pathologically (periodontal disease) exposed (6,7). As the
cemental surface becomes exposed to the oral cavity, it becomes vulnerable to the
accumulation of dental plaque, a condition that may lead to caries (8). Cumulative
gingival recession also increases the risk of root caries because these areas are more
difficult to clean (9). Furthermore, the elderly are more frequently subject to functional
disorders, diseases and medical treatments that result in hyposalivation (8). This
reduced salivary output may induce a shift towards a more cariogenic oral flora, hence
increasing the risk of caries (10).

Based on a systematic review of the literature, Ritter and coworkers (2010) estimated
that about a third of the older adult population bears most of the root caries burden (3).

A variety of risk indicators have been associated with root caries in cross-sectional and longitudinal studies (2,4,6-17). Fure's longitudinal study on Swedish elderly showed that the incidence of root caries increased with age, with highest increase in the oldest age group (6). Narhi *et al.* (1999) noted that low salivary flow rate and high numbers of salivary microorganisms were associated with root caries among elders in Helsinki (10). In a study conducted with elder from three areas of England, Steele *et al.* (2001) observed that root caries were associated with poor oral hygiene and the use of partial dentures (12). Among Swedish people 80 years or older, Avlund *et al.* (2004) found a positive association between a decrease in functional ability and cognitive function and root caries (13). Nicolau and coworkers (2000) observed in a sample of older people living in Thailand, that being male and having a higher number of teeth at baseline increased the chance of root caries (14), while Powell *et al.* (1998) reported that baseline coronal caries was the best predictor of root caries incidence among older people in Seattle (15).

For some authors, root caries risk indicators are, by definition, expected to be related to caries etiological factors such as susceptible tooth surfaces, biofilm, availability of fermentable carbohydrate, quality and quantity of saliva, and other putative immune factors (10,15). Conversely, Holst and coworkers (2001) suggested that, in fact, a combination of behavioral, contextual and societal factors, influence the way caries develops in individuals and in populations (19).

Katz (1980) proposed that studies of root caries should take account of the number of roots actually at risk of developing caries. He suggested the use of the Root Caries Index (RCI), which is the ratio between the number of caries lesions and the number of roots exposed to the oral environment. Such measure prevents the underestimation of the attack rate of root caries, as teeth with gingival recession represent the true intraoral

unit at risk (20). In this context, Beck *et al.* (1997) recommended that findings from incidence studies of caries should include measures of the attack rate, such as the RCI, along with detailed information on the risk factors involved in the expression of caries (21).

The Carlos Barbosa Cohort Study (CBCS) is a prospective, longitudinal observational cohort study of oral health of south-Brazilian older people (22,23). The CBCS was designed to improve understanding of the incidence and dynamics of a broad range of dental health outcomes. The objective of this study was to determine the four-year incidence density of new root caries lesions and restorations among community-living southern Brazilian people aged 60 or older at baseline, and to assess its association with predictor variables.

METHODS

The cohort considered in this study consisted of the dentate elderly people who were interviewed and examined at baseline in 2004 (22) and followed up four years later (23).

Population and Sample

The city had 20,519 inhabitants in 2000, of whom 2,167 were aged 60 and older. In 2004, participants were randomly selected from the municipality register of persons aged 60 years or more. Twenty-two older persons living in a long-term residence were considered ineligible. Of the potential participants identified in the city register, 983 older persons were contacted, 13 persons were restricted to bed at home, one person was hospitalized and 97 persons refused to participate. In the end, 872 individuals participated in the study, from whom 388 were dentate. The Committee of Ethics in

Research of the Federal University of Rio Grande do Sul approved the study protocol. Before starting data collection, participants were informed about the study objectives and procedures. All participants provided written informed consent. The study was performed according to the Brazilian resolution for standards of ethics in research involving human participants (24).

Baseline data collection

Data collection consisted of interviews and oral examinations. The researchers conducted individual interviews in the participants' homes or in community clubhouses. Oral examinations were performed in dental clinics provided by the Health Department of Carlos Barbosa. Mirrors and probes were used under standardized illumination to assess the status of teeth and periodontal tissues. The dental state, using the DMFT index, and the use of dental prostheses were assessed according to criteria of the World Health Organization (25). The Gingival Bleeding Index (GBI) and Visible Plaque Index (VPI) were measured (26). Stimulated saliva (five minutes) was collected by chewing on a piece of Parafilm (0.3 g of Parafilm M laboratory film, American National Can, Greenwich, CT, USA). At 30-s intervals, saliva was expectorated into graded containers, and after 5 min the amount of stimulated saliva was determined volumetrically. Baseline data collection was conducted by two dentists. Inter-examiner reliability for the coronal caries portion of the baseline has been described previously (22).

Evaluation of Self-Reported Demographic, Socioeconomic, Behavioral, and Health

Information

A standard questionnaire was used to collect demographic, socioeconomic, behavioral, and health information, which were classified for analytical reasons, within conceptual blocks of analysis. Age and sex of the participants were considered as exogenous variables. Within the analytical block of demographic and socioeconomic variables, participants were categorized as follows: Those currently living in urban or rural areas, according with the classification of the municipality of Carlos Barbosa. Urban areas in this city are defined as those with infrastructure that includes services of water supply, sanitary systems, primary school and Public Health Unit. Schooling was categorized as less than four, or 4+ years of education. Income was dichotomized into receiving up to two, or more than two minimum monthly wages (the minimum monthly wage during baseline data collection was equivalent to 118.00 US dollars). Participants were categorized as married or single/divorced/widowed for the variable marital status. In the block of behavioral variables, participants were classified as follows: For smoking status, each participant was categorized as a never or former smoker versus a current smoker. Frequency of tooth brushing was defined into two categories, one of those brushing at least once a day and the other those brushing less than daily; whereas for frequency of visits to the dentist, participants were categorized as those who visited the dentist regularly, or those who sought for dental care only occasionally or in a problem-oriented manner.

Four-year follow-up data collection

People who participated at baseline were re-contacted four years later, in 2008. From the 388 dentate individuals who participated in the baseline, 23 died and 43 were not

found. Thus, 322 participants were contacted, of which 11 have been unable to participate for reasons of illness, 11 had moved away from Carlos Barbosa and 27 refused to participate. In the end, 273 older persons were evaluated. To evaluate the potential for bias as a result of subject attrition, we compared characteristics of those who participated in the clinical examination at four years with those who did not. Follow-up examinations were conducted by two dentists, and the examination protocol was identical to the protocol used at baseline. For the four-year examination, duplicate dental inspections were conducted on 10% of the participants during the study for reliability. Examiners were blinded to the previous examiner's findings, but because replicate examinations were conducted on the same day, examiners were not blinded to whether the examination was to be used for inter-examiner reliability estimates.

Caries determination

The examinations were carried out with the use of a mouth mirror, a dental explorer and a periodontal probe. The number of remaining teeth and presence of coronal and root caries were recorded. The condition of each root was analyzed according to the following criteria: a) a root surface was considered to have gingival recession when the apical surface of the cemento-enamel junction was visible; b) a root surface was considered carious when it presented an area with a darkened appearance, discolored, well-defined, allowing easy penetration of the exploratory probe; c) a root surface was registered as filled when it had a restoration, without being judged whether it was an abrasion, erosion or caries result (27). This diagnosis was also made if a carious lesion or a restoration covered the cemento-enamel junction or was situated on the root surface, as recorded clinically, irrespective of visible gingival recession. Root defects

were not recorded. For full prosthetic crowns, the portion of the tooth that was apical to the crown margin was scored as the root.

The incidence of root caries was determined for new caries lesions, fillings on previously sound roots, and new recurrent caries on previously filled roots (27). Teeth that were lost between the 2004 and 2008 examinations were not considered in the analysis. Reversals, defined as roots recorded as decayed or filled at baseline examination and sound at follow-up, occurred very seldom and were treated as baseline examiner bias (28). Their status was then amended on the baseline data and considered as sound, for analysis purposes, at both examinations. The outcome of this study is the root caries incidence density (ID), which is defined as the ratio between the number of roots with new caries lesions or restorations during the follow up period, and the number of root-time at risk, per subject (21).

Enumeration of root-time at risk

ID is the average rate of occurrence for a fixed follow-up period. The numerator usually contains the number of events that occur over a specified period, while the denominator usually contains the total amount of observation-time at risk for the event of interest (21). In this study, a standard convention used in calculating time at risk was adopted, in which any observed change in status (gingival recession or caries lesion onset) was assumed to have occurred at the mid-point between the two examinations (29). Hence, an exposed surface that changed from sound to decayed was deemed to have experienced that event at the midpoint, and hence be regarded as at-risk only up until that point, i.e. two years. Newly exposed roots, which had become exposed during the last four-year period but were not decayed or filled, were also regarded as two years at-risk in the calculations. Teeth that were unexposed at both examinations (roots with no

gingival recession) were assigned no time-at-risk. Teeth that were unexposed at baseline and developed caries during the 4-years follow-up were assumed to have become at risk half-way between the baseline and 4-year examination, i.e. two years, and remained at risk until caries onset, which was assumed to have occurred half-way between two and four years, i.e. three years.

Analysis

Mann-Whithney and Kruskall-Wallis tests were used to evaluate the associations of root caries ID with independent variables in the bivariate analysis. Differences in characteristics between the people retained and those lost to follow up were verified. The inter- and intra-examiner reproducibilities of oral examination results before and during the study were calculated using the Cohen kappa coefficient. Multivariate models were constructed using Negative Binomial Regression.

We used a stepwise analytic technique, in which variables that showed a significance of $p<0.10$ were maintained for the next step of the regression (30). Variables were analyzed within their blocks of clinical, behavioral, demographic and socioeconomic, and exogenous variables, and later on those variables that showed a significance of $p<0.10$ from previous analytical blocks were added to the next step of the analysis. The first step in multiple regression modeling tested the significance of five clinical factors (Visible Plaque Index; Gingival Bleeding Index; 5-minutes stimulated saliva flow rate; use of removable partial dentures (RPD); and baseline RCI). The second block included three baseline behavioral factors (frequency of tooth brushing; frequency of visits to the dentist; and smoking status), subsequently including the variables retained from the first block of analysis. The third block comprised demographic and socioeconomic variables (geographical localization of the residence; income; schooling; and marital status),

successively including the variables retained from the previous steps. The variable that met the p<0.10 criterion were 'geographical location of the residence'. The fourth step included the variables retained from the previous steps and exogenous variables, as considered the age and sex of the participant.

Finally, only the variables that had a p<0.10 with the outcome in the previous models were added in a final model. In the final, fully adjusted model, only variables with a p<0.05 were considered significantly associated with the outcome. The associations are presented as Incidence Odds Ratios and their respective 95% Confidence Intervals. All the analyses were performed using the Stata SE 11.1 software for statistical analysis (Statacorp, Texas, USA).

RESULTS

At the 4-year follow-up, data were available for 273 of the 388 people who were dentate and who had an examination at baseline. Some 67.8% of participants lost one or more teeth, whereas 33 (12.1%) persons became edentulous during the four-year period. Five participants were assigned no root at risk and had no root caries lesion or restoration during the follow up. Thus, the results presented here refer to the 235 participants who were dentate at both baseline and follow-up examinations, and presented at least one root at risk during the 4-year follow up interval. The mean age of the study participants in 2008 was 73.3 ± 7.2, and 80 (34%) were aged 64 to 70 years old. From the subjects evaluated in 2008, some 119 (50.6%) were male; 76 (32.3%) had less than four years of schooling, and 185 (78.7%) were married, whereas the mean age for males was 73.7 ± 8.4 and for females was 72.7 ± 5.6. The mean number of roots at risk among these subjects was 7.0 ± 4.9, with a range of one to 28 roots at risk. Some 116 (49.4%) participants presented new root caries lesions or restorations, whose mean number in the

study sample was 0.8 ± 1.0. The mean root caries ID in the study sample was 0.16 ±

0.31. Male participants presented significantly more teeth (13.3 ± 6.8) than the females

(9.47 ± 5.5) at baseline (P<0.001). They also had significantly more roots at risk at

baseline (8.04 ± 5.3) than the females (5.8 ± 4.2) (P=0.003).

The Kappa coefficients for intra- and inter-examiner reproducibility of the root DF

assessments at baseline, before and during the study respectively, were 0.91 and 0.93,

while the kappa coefficients for inter- and intra-examiner reproducibility before and

during the study ranged from 0.86 to 0.90, at follow-up. Baseline characteristics of

people who were lost to follow-up and the group retained in the cohort are presented in

Table 1. Compared with the latter, people lost to follow-up were more likely to be older

and have less years of schooling.

Bivariate statistics were computed to describe root caries ID in relation to the predictor

variables (Table 2). Living in a rural area and brushing less than daily were significantly

associated (P≤05) with the outcome in the bivariate analysis.

The stepwise approach used in the multivariate analysis is presented in Table 3. In the

first block, wearing one or two RPD showed a positive association (P=0.04), while

higher stimulated saliva flow rate (five-minutes) was protective for the outcome

(P=0.001). In the second block, positive and significant associations (P<0.10) were

found between being a current smoker; visiting the dentist irregularly; brushing less

than daily; and the ID or new root caries and restorations. In the third block, living in a

rural area was positively associated (0.002) with the outcome. In the fourth block, being

a male, and being older were positively associated (P<0.10) with the ID of new root

caries lesions or restorations.

In the final fully adjusted model (Table 4), there was a higher incidence odds ratio of

root caries ID for people living in a rural area, and those who brushed their teeth less

than daily. Age was a risk factor for the root caries ID, whereas among clinical variables, saliva flow rate was the only variable associated to the outcome, as a protective effect.

DISCUSSION

This is the first study, at least to our knowledge, assessing the incidence of root caries lesions and restorations and its relation to demographic, socioeconomic, behavioral and clinical predictors of the disease, in older Brazilians. These results are relevant because of the need to identify predictors of the disease and the subjects more vulnerable to its occurrence, hence providing the basis to develop effective measures for its prevention (3). The main factors related to the incidence of root caries in this study were the geographic location of the residence, age, frequency of tooth brushing, and saliva flow rate.

The incidence of root caries lesions during a 4-year interval in this sample of south Brazilians aged 60+ at baseline was 49.4%, which is lower than the 61% observed by Fure and Zickert (1997) among Swedish elderly, yet in a 5-year incidence study (4); it is also lower than that observed by Chalmers and coworkers (2005) in older Australians, where new root caries occurred in 62.1% of dementia and 44.2% of non-dementia participants, however in a 1-year follow up period (7). These results are also lower than that reported by Powell and collaborators (1998) in a 3-year longitudinal study of older adults in Seattle, where 67% of participants developed the disease (15). Even so, they are higher than that reported by Hamasha *et al.* (2005), in an 11-year study with older Iowans, where 43% developed some new root caries (9), and from a longitudinal study of older Canadians where Locker (1996) observed an incidence of 27.4% during a 3-year period (18).

A significant finding of this study was the increase in caries incidence with age, which is in accordance with results from other investigations (2,4,14,18). Evidence shows that older subjects, in fact, present a heightened risk of attachment loss (6,7), which results in exposure of the root surfaces to the oral environment, creating more surfaces at risk (10). Hence, it is likely that older adults be at greater risk of oral diseases because of a likely concomitant decline in physical ability and in cognitive function (13), which may affect their skill to maintain good oral hygiene, as well as restraining their access to necessary dental care. Notably, Fure (2003) in a longitudinal study of Swedish elders noted that the incidence of coronal caries decreased, while incidence of root caries increased with age (6). It could be hypothesized that, because exposed root surfaces are areas more difficult to clean than the more accessible coronal areas of the tooth (9), older age might be related to root caries development as a consequence of a more complicated demand on oral hygiene, combined with a possible reduction in the ability for its performance.

Another important result was that subjects living in a rural area of the municipality presented higher ID of root caries. This result could be explained mainly by two features: exposition to fluoridated water; and availability and accessibility of dental care. Rural areas of Carlos Barbosa are not provided with water fluoridation. Results from the Iowa study (11) indicated that living in a fluoridated community for more than 30 years was associated with a lower risk of root caries. Thus, these evidence leads to speculation that water fluoridation may benefit older adults, even if they did not consume fluoridated water as children.

In addition, access to dental care is restricted in rural regions of this municipality, which is likely to reduce the frequency of the visits to the dentist for preventive care, especially for the elderly. This may contribute to the higher incidence of root caries

observed in this study, as improved availability and accessibility of dental care provide better opportunities for prevention and treatment of dental caries (19). These results indicate that older persons living in rural areas are more vulnerable, and should therefore be targeted with intensive prevention measures, particularly water fluoridation (11).

In this study, subjects who acknowledged brushing their teeth less than daily presented a higher chance to develop new root caries lesions, which is to be expected, since poor oral hygiene result in accumulation of biofilm, which is one of the core etiological factors involved in the development of root caries (8).

In addition, the incidence of new root caries lesions and restorations was inversely associated with the rate of stimulated saliva flow in this study. Although Narhi *et al.* (1999) noted that in a sample of older adults in Helsinki the stimulated salivary flow rate decreased slightly with increasing age during a 5-year follow-up study, none of the studied salivary factors predicted the increment in root caries in their analysis. They suggested that salivary microbial counts are higher in the elderly than in adults in general, which may be related to the concentrating effect of a decreasing flow rate (10), while Fure (2004) suggested that a reduced salivary output may induce a shift towards a more cariogenic oral flora (2).

Some limitations of this study have to be acknowledged. First, the attrition bias may have influenced the results, since people lost to follow-up were significantly more likely to be older and have less years of schooling. These individuals might therefore have displayed divergent dental health from those who participated. Second, it was not possible to detect roots filled at baseline which were subject to secondary decay and re-filled prior to the four-year follow up examination. Third, 67.8% of participants lost one or more teeth between the baseline and follow up examinations so that the root caries

experience of these teeth over the observation period is not known. Fourth, we made no attempt to distinguish between restorations placed for caries and those placed for cervical abrasion, erosion or other reasons. Moreover, there are many factors, such as an individual's physical health, cognitive function, and attitudes toward oral health, which could contribute to root caries but unfortunately are unavailable in the data set.

The strength of this study was the use of incidence density, a more consistent measurement of caries incidence in populations (29). Most longitudinal studies of dental caries report caries increment (3,16). The description of the methods for computing increment is commonly limited to the outcome measure, which usually is DMF (number of decayed, missing and filled) increment or DF (number of decayed and filled) increment, with the surface or the tooth as the unit of examination. Hence the dental caries increment is usually expressed as the mean number of DF or DMF surfaces or teeth per person (28).

As discussed by Hujoel (1991) misleading interpretations of dental disease occurrence can result if, in the calculation of disease incidence, the numerator and the denominator use different units of analysis. For instance, a change in DMF score is an incidence measure with a site-specific count in the numerator and a patient-time at risk as denominator (29). More specifically, site-specific estimators of prevalence or incidence should have in the denominator respectively the number of sites at risk or the total number of site-time at risk, per subject (28). Beck pointed out that the use of DMF scores may indicate low caries susceptibility, especially in an older group, because DMF scores are unrelated to the number of teeth at risk (21).

Katz (1980) noted that DMF indices assume that the entire dentition of an individual is at risk, whereas the significant variation in tooth survivorship and extent of gingival recession undermines the validity of this assumption, particularly for older adults (20).

Thus, in this study these principles were applied through the calculation of the incidence density of the disease, which takes account of the sites-time at risk for the disease. This study shows that the incidence of root caries occurred in nearly half of the subjects, leading to the conclusion that dental caries is a substantial problem for these elders. Given the increasing tendency for older adults to retain their teeth (2), and the association among age, gingival recession, and root caries (3), it is predicted that decay on root surfaces will become a major dental problem among the elderly (18). The consequences of this for planning of oral health care in Brazil and other newly industrializing economies are evident with present-day changes in the demographic profiles of the population (1). Particularly in the context of the older population, for whom access to care, compliance issues, and cost preclude the use of many of the existing intensive prevention measures (3).

Although no single, over-arching risk factor for root caries among older people has been identified, it seems appropriate to develop preventive strategies including the use of fluorides in both population- and individual-level prevention, and the implementation of public health policies aiming to improve attitudes and behaviors towards oral hygiene among older people.

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Table 1. Baseline characteristics of participants and non-participants in the follow-up

VARIABLES	Participants N= 273	Non-participants N= 115	P-value
Age			
≤ 69	202 (74)	65 (56)	0.001
≥ 70	71 (26)	50 (34)	
Geographical location of residence			
Urban	136 (50)	70 (61)	0.11
Rural	137 (50)	45 (39)	
Sex			
Male	142 (52)	59 (51)	0.79
Female	131 (48)	56 (49)	
Marital Status			
Married	220 (80)	92 (80)	0.93
Widowed	42 (15)	18 (16)	
Single/divorced	11 (05)	05 (04)	
Schooling			
≤ 3 years	185 (68)	91 (79)	0.05
≥ 4 years	88 (32)	24 (21)	
Partial Removable Denture use			
Yes	147 (54)	53 (46)	0.16
No	125 (46)	62 (54)	
Income (minimum wage)			
≤ 1	137 (50)	64 (56)	0.31
>1	136 (50)	51 (44)	
Frequency of visits to the dentist			
Regularly	37 (14)	11 (09)	0.27
Occasionally or problem-oriented	221 (86)	104 (81)	
Frequency of tooth brushing			
Daily	222 (86)	100 (87)	0.99
Less than daily	36 (14)	15 (13)	
Self-perception on oral health			
Positive	182 (67)	72 (63)	0.49
Negative	90 (33)	43 (37)	

Percentages are provided in parenthesis

Table 2. Bivariate Association Between Variables and Four-year Incidence Density of New Root Caries Lesions and Restorations in Community-living Older Adults from Carlos Barbosa, South Brazil (N=235)

Variable	Categories	N	Incidence Density (mean ± sd)	P-value
Sex	Male	119	0.14 ± 0.20	0.88[*]
	Female	116	0.18 ± 0.40	
Age (years-old)	≤ 69	175	0.15 ± 0.28	0.46[*]
	≥ 70	80	0.18 ± 0.41	
Geographical location of the residence	Urban	120	0.15 ± 0.37	0.03[*]
	Rural	115	0.17 ± 0,25	
Marital status	Married	185	0.16 ± 0.34	0.56[*]
	Single/divorced/widowed	49	0.15 ± 0.19	
Schooling (years)	< 4	76	0.14 ± 0.21	0.61[*]
	≥ 4	159	0.17 ± 0.35	
Income (minimum wages)	≤ 2	115	0.16 ± 0.34	0.27[*]
	> 2	120	0.16 ± 0.29	
Comorbidities	Yes	178	0.17 ± 0.34	0.67[*]
		57	0.15 ± 0.21	
Visits to the dentist (frequency)	Regularly	30	0.23 ± 0.55	0.55[*]
	Occasionally/Problem-oriented	205	0.15 ± 0.27	
Tooth brushing (daily frequency)	< 1	18	0.28 ± 0.45	0.01[*]
	≥ 1	217	0.15 ± 0.32	
Smoking status	Current smoker	14	0.17 ± 0.19	0.43[*]
	Former/Never smoker	221	0.16 ± 0.32	
Use of Removable Partial Denture (one or two)	Yes	121	0.16 ± 0.26	0.70[*]
	No	113	0.16 ± 0.36	

[*]Mann Whitney test

Table 3. Association between Variables and Four-year Incidence Density of New Caries Lesions and Restorations in Community-living Older Adults from Carlos Barbosa, South Brazil (N=325)

Root Caries Incidence Density		Incidence Odds Ratio (95% Confidence Interval)		
		Crude	Adjusted[*]	Adjusted [£]
First block (clinical variables)				
Five-minutes stimulated saliva flow		0.89 (0.84 – 0.95)	0.89 (0.84 – 0.95)[†]	
Gingival Bleeding Index		1.00 (0.99 – 1.00)	0.99 (0.98 – 1.00)	
Visible Plaque Index		1.00 (0.99 – 1.00)	1.00 (0.99 – 1.00)	
Removable dentures	Wear one or two	1.47 (1.08 – 1.99)	1.40 (1.01 – 1.95)	
Baseline RCI		1.74 (0.79 – 3.80)	1.25 (0.51 – 3.12)	
Second block (behavioral variables)				
Smoking status	Current smoker	0.74 (0.41 – 1.37)	0.65 (0.35 – 1.19)	0.54 (0.29 – 1.00)
Frequency of tooth brushing	$\leq$ 1/day	2.00 (1.31 – 3.04)	1.98 (1.29 – 3.03)	2.68 (1.69 – 4.24)[†]
Visits to the dentist	Occasionally or problem-oriented	0.70 (0.47 – 1.05)	0.73 (0.48 – 1.10)	0.65 (0.41 – 1.04)[†]
Third block (Demographic and socioeconomic variables)				
Location of residence	Rural	1.96 (1.44 – 2.67)	1.94 (1.41 – 2.66)	1.70 (1.21 - 2.39)[†]
Marital status	Married	0.82 (0.56 – 1.18)	0.77 (0.53 – 1.12)	0.76 (0.52 – 1.11)
Schooling	$\geq$ 4 years	0.91 (0.66 – 1.25)	0.97 (0.70 – 1.35)	0.94 (0.67 – 1.31)
Income	> 2 minimum wages	0.89 (0.66 – 1.22)	1.05 (0.76 – 1.44)	0.98 (0.70 – 1.37)
Fourth block (exogenous variables)				
Sex	Male	1.12 (0.83 – 1.52)	1.19 (0.87 – 1.62)	1.34 (0.96 – 1.88)
Age		1.03 (1.00 – 1.06)	1.03 (1.01 – 1.06)	1.03 (1.00 – 1.05)[†]

[*] Adjusted for variables in the block.
[£] Adjusted for precedent blocks.
[†] $P < 0.10$.

Table 4. Final Fully Adjusted Model of the Association between Variables and Four-year Incidence Density of New Caries Lesions and Restorations in Community-living Older Adults from Carlos Barbosa, South Brazil (N=325)

Root Caries Incidence Density	Incidence Odds Ratio (95% Conf. Interval)			
	Crude	P-value	Adjusted	P-value
Male gender *(reference female)*	1.12 (0.83 – 1.52)	0.44	1.30 (0.93 - 1.81)	0.12
Age	1.03 (1.00 – 1.06)	0.01	1.27 (1.01 - 1.60)	0.019
Rural *(reference urban)*	1.96 (1.44 – 2.67)	<0.001	1.88 (1.37 – 2.57)	<0.001
Five-minutes stimulated saliva flow	0.89 (0.84 – 0.95)	<0.001	1.88 (1.19 – 2.96)	0.001
Brushing less than daily *(reference at least daily)*	2.00 (1.31 – 3.04)	0.001	2.04 (1.65 – 2.52)	0.006

Manuscrito 4.

TITLE: Vulnerability and the psychosocial aspects of tooth loss in old age: a southern Brazilian study.

ABSTRACT

Extensive tooth loss and edentulism can have a negative impact on the general health and quality of life of older adults. The extent to which psychological and social factors affect an individual's decision to undergo tooth extraction and mouth clearance (extraction of all teeth), and the theoretical relationships between social structure, social life and oral health can be unraveled through qualitative research. This study aimed to explore the social and psychological factors involved in tooth extraction and mouth clearance within a historical perspective among rural Southern Brazilian older adults. It is based on qualitative data gathered via a series of eight focus groups among 41 older adults. Underlying the focus group discussions of different levels of health risks and resources for prevention of disease was the concept of vulnerability. Participants' responses illustrated that tooth loss and mouth clearance were related to a lack of public dental health policies and programs, were influenced by social norms (including values pertaining to gender), and were associated with a low level of oral health knowledge. The social and program-dependent contexts of vulnerability were shown to have played a major role in the development of norms and values towards tooth extraction and mouth clearance. Vulnerability must be reduced in order to prevent disease particularly among rural populations. The influence of fatalistic beliefs about the inevitable loss of teeth with age may negatively influence the acceptance of dental treatment and predilection for oral health self-care.

INTRODUCTION

Since the 1950's Brazil has experienced a substantial decline in mortality and fertility, which has had a positive impact on longevity. It is estimated that by 2025, Brazil will have the sixth largest elderly population in the world, with 30 million people older than 60 years (15% of the population) (Carvalho & Garcia, 2003). A substantial number of these older adults will probably keep their natural dentition (WHO, 2006) and thus will eventually be in need of preventive and/or restorative oral care (Petersen & Yamamoto, 2005). At present, however, this is not the situation of most Brazilian older adults. Furthermore, it is generally accepted that there is a substantial lack of information about the health of the elderly in Latin America (Maupomé *et al.*, 1999). According to the only representative study of the oral health status of the elderly population in Brazil, the number of decayed, missing and filled teeth (DMFT) was 27.8 (out of 32). Missing teeth alone accounted for more than 90% of the total DMFT (Hugo *et al.*, 2007).

Oral health, as an important component of general health and quality of life, is the sum of an individual's life experiences with dental disease and dental care, and an accumulation of health behaviors, attitudes and expectations (Ettinger, 1990). Although oral health behavior has been considered a key construct in explaining oral health inequalities (Pine *et al.*, 2004), the role of social structure and the social environment in determining oral health outcomes has also been raised (Holst *et al.*, 2001; Watt & Sheiham, 1999). For example, Watt & Sheiham (1999) reported that there was generally poorer oral health in the northern regions of England as compared to the southern; this was due mostly to geographical differences in access to dental services.

A lack of oral health particularly in terms of tooth loss has become almost synonymous with poverty and personal neglect (MacEntee, 2005). Although caries and

periodontal diseases are the most common causes associated with tooth loss (Holst *et al.*, 2001), a combination of pathological processes and value judgments has been suggested as factoring into decisions for tooth extraction (Maupomé *et al.*, 1999). A more psychosocial perspective, however, associates tooth loss with age, gender, and personal experiences with health services (Mccaul *et al.*, 2001) as well as socio-economic status, treatment preferences, and education levels (Gilbert *et al.*, 2006).

For some older adults, tooth loss can impact their general health (Petersen and Yamamoto, 2005), which might result in discomfort and lead to problems in eating, communication, and appearance (Benyaminia *et al.*, 2004). Embarrassment, social constraints and low self-esteem may occur due to tooth loss (Chen & Hunter, 1996; Locker, 1988), which may add to the mainly negative age stereotypes attributed to the older people in some societies (Macia *et al.*, 2009). Previous evidence has shown that having fewer teeth and being dissatisfied with the inability to chew food are associated with a poorer general quality of life in this age group (Hugo *et al.*, 2009). However, relatively few studies have examined tooth loss in the context of individual choice of tooth extraction arising from psychological and social factors.

In the Netherlands, Bouma & Poel (1985) found that the primary reasons for full mouth extraction were anxiety, bad experiences with previous dental treatmentand fatalistic feelings about the inability to keep one's natural teeth for a lifetime. Bouma *et al.* (1987) and others (MacEntee, 1993; Thorne & Kazanjian, 1999) also concluded that positive attitudes towards full dentures and a higher prevalence of denture wearers within an individual's socio-cultural environment tended to favor full mouth extraction. These perceptions indicate that older persons may believe that poor oral health is concomitant with aging and that nothing can be done to improve this situation (Maupomé, 1999).

The extent to which psychological and social factors affect one's decision whether or not to choose full mouth extraction and the theoretical relationships between social structure, social life and oral health and disease status can be unraveled by qualitative research (Bower & Scambler, 2007). Grounded theory, a qualitative research method, aims to establish an integrated theory built upon the concepts arising from inquiry through a process of constant comparison and reduction, but has been seldom used in dental research (de Mello & Erdmann, 2007; Hallberg & Klingberg, 2007). This approach relies on the systematic categorization of data, and theorizing through an inductive process in which concepts are labeled as categories, themes, and properties, and their interrelationships are explored (Glaser & Strauss, 1967).

The information can be gathered via individual interviews or focus groups (FGs). Brondani *et al.* (2007, 2008) evaluated a model of oral health qualitatively via a series of group discussions among elders who shared their ideas concerning issues of the mouth. In the UK, Kwan & Holmes (1999) studied oral health beliefs with FGs of Chinese residents, and observed that tooth loss was seen as a natural process of ageing. Through interaction and dynamism, FGs may reveal information about how and why individuals engage in particular health behaviors, while allowing for the exploration of concepts such as self-efficacy, for example (Kevern & Webb, 2001). This approach may help explore the underlying structures, relationships and processes that determine oral health and disease (Bower & Scambler, 2007), which can then be examined through the lens of vulnerability (Ayres *et al.*, 2006).

According to Mann & Tarantola (1996), vulnerability refers to an individual's chance of contracting diseases as a result of personal, collective and contextual factors that represent higher or lower susceptibility to diseases and also, inextricably, to a higher or lower availability of resources to prevent them. This study aims to explore the various

perceptions regarding single and multiple tooth extraction and full mouth extraction through a series of focus group discussions among older adults in the city of Carlos Barbosa, southern Brazil, through the concept of vulnerability, and drawing on some aspects of grounded theory methodology. Our inquiry was guided by the following research question: *How do community-dwelling elderly perceive tooth extraction in general, and full mouth extraction in particular?*

SUBJECTS AND METHODS

This study is part of the Carlos Barbosa Cohort Study (CBCS), an ongoing quantitative and qualitative longitudinal research program assessing oral health status and quality of life (Hugo *et al.*, 2009), body composition (Hilgert *et al.*, 2009), nutrition (De Marchi *et al.*, 2008), and the medical, socio-demographic and psychological status of adults 60 years of age and older. The CBCS started in 2004 with an initial enrolment of 872 senior residents representing 40% of the local older adult population at that time. In 2008, 587 community-dwelling elderly from the initial enrolment were re-evaluated.

Ethical approval was granted by the Ethics Committee of the Faculty of Dentistry at the Federal University of Rio Grande do Sul (UFRGS) and by the Municipal Government of the City of Carlos Barbosa. Informed consent forms were signed by all participants. This manuscript centers on the qualitative data collected via a series of eight focus groups among 41 older adults purposefully selected from the 587 participants who were re-evaluated in 2008. Focus groups were chosen because the concept of oral health and tooth extraction is better addressed through the interaction of participants who build on each other's comments when compared to individual in-depth interviews (Casey & Kreuger, 2000).

Purposeful sampling was employed to reach elders from different geographical residential locations (urban, rural or isolated), oral health status (dentate or edentate with and without the use of dentures), and gender (male or female). Most of the group members knew each other as per the small town characteristics of Carlos Barbosa and from local elderly group activities and community gatherings. In our study, group members were invited with the help of community leaders who may have contacted their close friends. There is some evidence suggesting that pre-existing groups in which members know each other can overcome issues related to the exploration of potentially stigmatizing and sensitive topics when compared to groups in which participants are unfamiliar with each other (Casey & Kreuger, 2000). On the other hand, known group members can bias the discussions towards fewer disagreements and less spontaneity. However, we made special effort to avoid behaviors related to leadership patterns in the groups by having the moderator seek equal participation, encourage fair discussions, and emphasize the importance of all participants' opinions to the study (Brondani *et al.*, 2008).

The different groups were diverse in their composition as follows: three groups were gathered at the downtown area (men and women together) and five in the rural region. From these five groups, one was composed of men only, another of women only, and the other three had men and women together. Three of these five groups were held in rural yet more accessible regions, whereas the other two were conducted in very remote rural areas. The different geographic locations allowed us to explore issues related to the quality and availability of, and access to, dental services. The gender composition enabled us to discuss issues specially related to women's vulnerability, such as pregnancy and oral health. We believe that this variety of characteristics enabled us to explore

various perceptions about single or multiple tooth extraction in general, and full mouth extraction in particular.

DATA COLLECTION AND ANALYSIS

Data collection and analysis were carried out by drawing on some aspects of the grounded theory research method (Strauss & Corbin, 1998) including induction, iteration, constant comparison, thematic analysis with codes, categories and themes and cross-group pattern-analysis as described ahead (Brondani *et al.*, 2007; 2008). A theoretical sampling process was used to select participants who would be "information-rich" (Strauss & Corbin, 1998) on themes of interest related to our objectives. Group discussions were moderated by the first author (RDM), lasted for an average of 90 minutes, occurred in Portuguese, and were tape recorded, transcribed and translated to English by the first author for thematic analysis. An interview guide was used to ensure that key themes were covered in each focus group discussion, including each participant's experience of oral health and tooth extractions, early and current experiences with dental services, behaviors and feelings towards oral health, and his or her perceptions about the need for dental treatment. Field notes written by the moderator after each discussion captured initial impressions and comments, informed subsequent group discussions, and summarized initial analytical categories and codes.

The transcripts and field notes provided data for the thematic analysis, and were coded by the first author (RDM) using QSR NVivo 8.0 software; this process was then audited by the second author (AFL) to increase rigor in the coding process and conceptual development (Strauss & Corbin, 1998). The analytic process was recursive and interactive, relying on systematic coding of the data, and theorizing through the categorization process (Glaser & Strauss, 1967). We used open coding to break down the

transcripts into meaningful segments and assigned codes to these segments. In the next step, the axial coding process enabled us to cluster codes with similar meanings into categories, and to examine the connections among them. Some of the categories were collapsed and subsumed with others as we sought evidence for a core category (Strauss & Corbin, 1998), namely *tooth extraction*.

The focus was on specifying the categories based on the concept of vulnerability (Ayres *et al.*, 2006) and on systematically integrating the relationships between the categories with the core category. A unified analysis was developed around the core category (Glaser & Strauss, 1967) via the three dimensions of vulnerability: [1] individual vulnerability, e.g., behavioral and personal characteristics; [2] societal vulnerability, e.g., gender, education and information, the supportive environment and livelihoods; and [3] program-dependent vulnerability, e.g., public health policies, provision and quality of health services (Mann & Tarantola, 1996; Ayres *et al*., 2006). We illustrate this manuscript with some *verbatim* translated quotes from the participants who are not identified to ensure confidentiality.

RESULTS AND DISCUSSION

Our main objective was to explore the various perceptions surrounding tooth extraction and full mouth extraction through the theoretical framework of vulnerability as we asked ourselves: *How do community-dwelling elderly perceive the factors that made them vulnerable to have tooth extraction in general, and full mouth extraction in particular?*

1) Individual Vulnerability

The individual component of vulnerability was the first level of analysis in this study and accounted for personal characteristics in terms of level of information and behaviors toward oral health. It is well known that determinants such as exposure to fluoride, oral hygiene and sugar consumption affect the occurrence and development of tooth decay (Thylstrup & Ferjerskov, 1986). In the context of our study, participants' responses to our inquiries illustrated that the development of oral diseases might have been also associated with a scarcity of information about oral health, oral hygiene behaviors influenced by their parents, and fear of dental treatment.

Oral Health information and parental education

Historically, the concept of prevention became widely accepted and advocated by dental professionals in developed countries such as the U.S.A. (Gift, 1988) only after the mid-1960s. Although there is no information as to whether or not the same timeframe can be applied to Brazil, the concept of oral health education and promotion was not fostered when our participants were younger to the extent that they *"had no information about taking care of the teeth… not even the parents were aware or made any comment about it"* (69 years old, female, from downtown group discussion). The lack of health education has been associated with a high prevalence of caries (Holst *et al.*, 2001), which is the major factor associated with tooth extraction (McCaul *et al.*, 2001) and likely experienced by our participants.

As expressed by the quotation above, parents' beliefs and attitudes toward their own dental health influence their children's values and behaviors, both positively and negatively (Wong *et al.*, 2005). Our participants' parents were first-generation descendants from poor European immigrants who had no formal education, no contact

with dentists and no information about oral health. A 73-year-old female participant from the downtown area told us "*(our) parents had no study, they had never been to school ... my mother-in-law was 82 yrs old and had never been to a dentist*" . As a result, most participants agreed that they were unaware of oral health issues such as hygiene until much later in life. In the meantime, they had experienced many episodes of tooth decay and tooth loss.

Dental Fear

Some participants told us that their views about dentistry were based on the fear of dental treatment. Such fear was mostly due to the pain and discomfort caused by the restorative treatment itself and the somewhat rudimentary equipment available including *"that drill moved by pedal"* (67 year old, female, from rural area group). For this participant, and for many others, tooth extraction was the treatment chosen because it usually involved only one visit to the dentist with no need for follow-up visits. Echoed in our participants' stories, Buoma & Poel (1985) suggested that fear of dental treatment might result in further avoidance behavior leading to deterioration of the dentition, which might ultimately lead to full mouth extraction.

2) Societal Vulnerability

This next level of analysis referred to the societal component of vulnerability in terms of educational level, gender, employment, resources and social norms, and might overlap with the previous and the proceeding levels. Similarly to oral hygiene, micro-organisms and diet, contextual and societal factors may influence the way periodontal disease (Sbaraglia *et al.*, 2002) and caries develop in individuals and populations (Holst *et al.*, 2001). There is evidence that individuals from low social class or income levels

and with little or no education are more likely to be edentulous (Davis *et al.*, 2000). In this context, responses to our inquiries showed that development of oral diseases and consequent tooth extraction were associated with low levels of literacy; low income; lack of transportation systems; limited availability of resources; gender vulnerability, and social norms.

Low literacy

According to our participants, at the time they went to school, there were only four years of formal education available and only some participants had attended school fully. There was no transportation to school, and the main teaching focus seemed to be educating children *"to read and to write, [and do] some basic calculations"* (71 year old female from rural area group). This level of education may have been associated with the type and amount of information on oral health given and received in the context of this community, as we have illustrated above when discussing the educational role of the parents. There is evidence that a low level of education influences health behaviors negatively and subsequently enhances caries risk and its prevalence (Holst *et al.*, 2001), which seemed to be experienced by our participants in one way or another. In fact, Gilbert & Duncan (2006) reported that a low level of education tends to be associated with significantly higher probabilities for tooth loss, which was yet again a reality for our participants.

Low income

As in many areas of Brazil, in Carlos Barbosa there was a lack of urbanization, industries and workplaces until the mid-1960's. Most of our participants worked in subsistence farming during their childhood and youth (Abramovay, 1997). They had to

contribute to their family's income; participants usually had a large number of siblings and upon reaching a certain age, would have a large number of their own children as per the high birth rate at the time (Carvalho & Garcia, 2003). It is important to mention that the contraceptive pill became available in Brazil during the 1960's, but its use substantially increased only during the seventies and the eighties (Pedro, 2003), which was after the reproductive age of most of our participants. This context was exemplified by a 69 year-old male participant from a group that met at the downtown area:

"[i]n that period there was no industry, nothing around. Everything depended upon the small agriculture production. But families had to eat and keep going. Some had 7 children, others 12, and they all had to be fed, dressed. It was not easy. Even when you got something to sell, you would not find anyone who would buy it. Money was also little."

Oral health may be less of a priority for low income families, and restorative dental treatment might be avoided altogether due to financial deprivation. With the progression of dental decay, however, pain was likely to drive patients to undergo tooth extraction, as we heard from our participants. Similar to low literacy levels, lack of material resources due to limited income increases the risk of dental decay mostly because of deprivation (Holst, 2001). Moreover, people with a lower household income, as was the case with the majority of our participants, have a much higher chance of having tooth extractions (Bedos *et al.*, 2003) and edentulism (Watt and Sheiham, 1999) when compared to those families with higher incomes.

Transportation System

According to Douglass (1986), perceived barriers due to the lack of appropriate transportation negatively affect oral health outcomes. Participants fully agreed that most people in the municipality did not own or have access to a car until the mid-seventies, and there was also no public transportation until recently in rural areas. Transportation difficulties did not actually prevent access to care, but might have reduced the number and frequency of visits to the dentist. More importantly, it did seem to impinge upon the perception of needs, as voiced by a 73 year-old male from a downtown group:

"[o]ne reason for not going to the dentist was access: it was far from where we lived…and you would have to move around on a horseback because there was no car. The only transportation in that time was a horse. Thus people would withhold [the pain] until they could not stand it anymore, and only then they would look for treatment."

Availability of toothbrushes and fluoride

Although a lack of oral hygiene instruments such as the toothbrush are not directly associated with tooth loss, it can predispose an individual to dental caries (Thylstrup & Ferjerskov, 1986) and periodontal disease (Sbaraglia *et al.*, 2002), which ultimately lead to tooth loss. In fact, a study comparing the use of a chewing-stick and toothbrush for tooth-cleaning showed that tooth loss was higher among the former group (Mumghamba & Fabian, 2005). This might have been the case for most of our participants as they told us that in the past, the choices were sparse in terms of oral hygiene tools and toothbrushes were not available until the late 1960's. The countryside's small markets and rural areas were even more deprived as "*there was no toothbrush, nobody spoke about it, nobody knew about it"* (68-year- old female from a rural area

group). As an alternative for brushing, participants acknowledged that they "*cleaned [the mouth] by gargling water and spitting it out*" (73-year-old, female, from an isolated rural area group).

In communities with fluoridated drinking water, the caries risk and prevalence decrease significantly (Wiktorsson *et al.*, 1992), whereas in others without fluoridation the risk increases (Bedos *et al.*, 2003). None of our participants had contact with fluoridated water until late in life and those living in rural areas still do not have it today. As a result, the benefit of fluoridated water to our participants has been null other than the very few that were exposed to fluoride from toothpaste, but at much later in life (Watt & Sheiham, 1999).

Vulnerability and Gender

According to Casey & Kreuger (2000), when focus groups are somewhat homogeneous, interaction and synergy can encourage participants to share specific information pertaining to those group members. One of our groups was composed exclusively of women so we could elicit information pertaining to gender that could have been otherwise considered stigmatizing and concerning topics too sensitive to explore in mixed groups (Kevern & Webb, 2001; Brondani 2010). For example, participants in the female group explained to us that it was a common practice to have full mouth extraction and dentures at a very young age and before marriage to avoid saddling one's husband or his family with high costs of dental treatment. This behavior was seen as the easiest way to "*solve all dental problems before the wedding"* (72 year old, female, from a rural area group).

Such perceptions substantiate evidence that women's lifetime paid work experiences are generally not comparable to men's. In particular, child rearing and elder

care still fall largely to women (Schulz *et al.*, 1999), and in the case of our study most

female participants were more vulnerable to having mouth clearance as a result of low

income and dependency on their husbands' earnings for dental treatments.

Secondly, a somewhat inexorable scheme comprising old age and lack of

calcium/decalcification was discussed to explain tooth loss by women in different focus

groups comprised in this investigation, as reported in a study conducted in Mexico

(Maupomé *et al.*, 1999), and another FG study with Chinese living in the UK. In the

latter, Kwan & Holmes (1999) found that groups composed exclusively of women

shared the belief that tooth loss was caused by frequent child birth as the newborn

would 'take the calcium' from the woman's body. Participants of both studies believed

these negative sequelae to be in effect even a long time after giving birth.

Furthermore, most women in our study discussed the fact that during pregnancy

they were not encouraged to have dental treatment or visit the dentist even when

experiencing pain because, as discussed by a 67 year-old woman from a group meeting

in the rural area: *"People would say that anesthesia or something else could not be*

used, or that the procedure was harmful. We had to deal with the pain until after the

delivery day." Most of them also told us that it was common to lose the few restorations

they had during pregnancy and that the more children they had, the fewer teeth they

kept. As a result, many women had all their teeth extracted and replaced by dentures,

once they had been pregnant a few times. Older adults of either gender, however, may

share widespread concerns for appearance (Brondani *et al.*, 2008; Brondani, 2010).

Social Norms

The historical circumstances in which individuals are placed influence their

behaviors and attitudes (Glaser & Strauss, 1967). Ettinger (1993) observed a 'cohort

effect' in terms of social and technological developments throughout time in the US, which have influenced people's attitudes towards oral health, and as a consequence impacted on their oral conditions. Taking this perspective into account, our focus group discussions revealed information about how and why participants have engaged in certain health behaviors. We heard that tooth extraction, particularly, would relieve pain and could 'prevent' sound teeth from getting painful. This shared belief, or social norm, that teeth were not reliable and that dentures would solve all problems made participants vulnerable to agreeing to have all their teeth extracted. These findings corroborate previous evidence by Gilbert *et al.* (1998) who noted that under-utilization of ongoing dental services can be associated with a perceived lack of long-term benefit from dental care, based upon sub-group or family norms.

Bouma *et al.* (1987) reported that positive attitudes towards full dentures and a higher prevalence of denture wearers within one's socio-cultural environment tend to behaviors favoring mouth clearance within the community. Such a belief, and the idea that dentures were considered ideal as a preventive measure against pain and further expenditures, was indeed echoed by our participants. A 69 year old woman from a rural area group got others to nod in agreement when she said that:

"When you spoke about that [with the neighbors], they used to say that 'it was good to use dentures. [Natural teeth] would not bother you anymore, so, we would spend to make dentures, but afterwards we would not spend on the teeth anymore."

Most of our participants shared the idea that tooth extraction and subsequent dentures' use were a natural part of life and that teeth could not be maintained for long "*because everybody around you wanted to use dentures at a certain point as teeth would start to fall apart and hurt…you had to extract everything*" (75 year old, female, from a

downtown group). These normative and fatalistic feelings regarding natural teeth and the resignation towards extractions and use of complete dentures have been discussed previously in the literature (Maupomé *et al.*, 1999). Such perceptions about the inevitable decline of health with ageing may result from the social attitude, common in Western societies, where negative stereotypes regarding older age are common and likely to be internalized during life before reaching old age (Macia *et al.*, 2009). Throughout time, people adopt the attitudes of the social group to which they belong (Strauss & Corbin, 1998), and may accept some of these stereotypes and so therefore the idea that the ageing process is inexorably linked with disease, and in particular, with the loss of the natural teeth.

Under these normative and fatalistic feelings, most participants perceived dentists to be pain relievers at best and curative at worst because "*people would go to the dentist only when they had toothache*" (68 years old, male, from downtown) and "*if it was hurting, the solution was to pull the tooth out; if it was with a hole, the solution was the same*" (72 years old, male, from a rural area group). The idea of a dentist practicing in the realm of prevention was nonexistent, and the eminent curative aspect of dentistry has been echoed by others (McCaul *et al.*, 2001). Buoma & Poel (1985) emphasized that the pain-driven motives for visiting a dentist promotes a vicious cycle that might lead to further deterioration of the dentition.

3) Program-dependent Vulnerability

Our third level of analysis referred to program-dependent vulnerability in terms of the degree and quality of the health policies and services available to our participants historically, and their influence on their oral health. Until the late 1960s, the dental care in the city of Carlos Barbosa was provided by private practical dentists, who had attended

only a short educational program with a focus on extractions and fabrication of dentures. Even after graduated dentists arrived in the area, the practical dentists continued to be sought, which further perpetuated the tendency for patients to seek tooth extraction and dentures. At a public level, the local Rural Workers' Syndicate started to provide free dental care in the late 1960's, but it was only by the mid-1970's that the country's National Health Service (INAMPS) (Teles, 1985) started providing dental care at the city health unit, with low attendance seen in the more remote communities resulting from the lack of transportations systems, as already discussed. The INAMPS differed from the current National System of Health (Sistema Único de Saúde/SUS), for it was not a universal system: only employed documented workers could benefit from the health services.

Availability of dental services

Coward *et al.* (1990) observed that even when services are available, the limitations in terms of resources and scope of such services can negatively influence utilization. As we have discussed above, this was the case with our participants, particularly from some rural regions where the services were provided via improvised dental offices, usually set up in community centers or taverns once a week. The blend of dental treatment with other modalities of services such as sales of groceries was also experienced by our participants who told us that in such places, "*some would enter to drink liquor, others would enter to look for the dentist*" (77 years old, female, from rural area group). The improvised dental offices consisted of basically a regular chair along with a pedal machine drill and a few dental instruments, and only very basic restorations or extractions were performed.

Public Health System

According to Holst *et al.* (2001), improved accessibility of dental care is said to optimize preventive and treatment-seeking behavior. Evidence of these associations in England was discussed by Watt & Sheiham (1999) who found poorer oral health in the northern regions, which are more remote, compared to the south. They concluded that such disparity resulted from the lack of obligation for the local northern health authority to provide a primary care dentist for each citizen.

As we discussed before, until the late 1960s all available dental care was privately offered by the practical dentists as the existing INAMPS was introduced by the 1970s in urban areas only (Teles, 1985) and excluded rural undocumented workers. This context was illustrated by one of our participants who told us that *"people would not go to the dentist because there was no money and there was no public dentist. Today there are dentists free of charge. At that time you would have to pay, and we had no money"* (78 years old, male, meeting in a rural area group). Such observation is particularly relevant in the context of the neoliberal and privatization reforms designed to slow the rate of growth in public social security and health systems (Schulz, 1999). While some countries are considering the merits of a variety of approaches to lessen the projected burden of old-age and health support (Schulz, 1999), welfare programs such as SUS and its universal basis of care may be responsible for the decreasing rates of oral diseases in Brazil (Hugo *et al.*, 2007), and potentially in other developing nations.

Quality of dental services

Ettinger (1993) discussed that only recently have modern technologies and philosophies helped to change dental practice. It was just during the 1940's, for example, that improvements in local anesthetics encouraged dentists to develop a more restorative philosophy in the US. Before this period, dentists were more likely to extract than to save teeth (Grossman, 1981), as experienced first-hand by our participants. Group members agreed that the limitations of dental equipment in the past made the treatment uncomfortable and painful because *"before restoring a tooth they have to use that old dry drill … that harmed the tooth…and I remember the smell of burning, but today the machine has water that cools down the tooth"* (75 year old, male, from a group meeting in downtown). As a result, some treatment options were either limited or beyond the scope of the dental practice, including root canal treatment which, when it was attempted, was perceived as a time-consuming and painful treatment – *"worse than an extraction"* (77 years old, female, from rural area). Whether or not related to these limitations in technology and therapies, most participants perceived themselves at the mercy of the dental professionals' will, as exemplified by a 66 years old woman in a group discussion in the rural area: *"we would arrive in the dental office, the dentist would ask what was it… he would not even take a look at it, and would not say anything other than: it has to be extracted."* Analogous observations were also made by Hiramatsu & coworkers (2007) via individual interviews with Brazilian older adults who blamed dentists for decisions favoring tooth extraction.

In conclusion, in this study we analyzed our participants' perceptions about tooth and full mouth extraction through three dimensions of vulnerability, including individual, societal, and program-dependent vulnerability (Ayres *et al.*, 2006). From the information

we gathered, the period in which our participants were highly vulnerable for oral diseases, the inevitable progression of caries to infection and tooth pain were the leading causes for tooth extraction and full mouth extraction as normative procedures to eliminate and prevent toothache. The social and program-dependent contexts played a main role in the development of norms and values, influencing individual beliefs and behaviors that resulted in the high prevalence of tooth loss and edentulism in this population (De Marchi *et al.*, 2008).

The groups in our study were diverse in terms of geographic location and gender composition. This variety of characteristics allowed for the observation of differences in availability and accessibility, as well as in the quality of dental services between groups living in urban and rural areas. The focus group was suitable for the purpose of our study as the group dynamic seems to have encouraged participants to consider and disclose events and beliefs that might not have surfaced in private interviews, as previously discussed by Brondani *et al.* (2008).

The information we gathered is particularly important when dealing with rural populations if we aim to reduce the barriers identified here to decrease people's vulnerability to disease (Coward *et al.*, 1990; Petersen & Yamamoto, 2005). However, our study acknowledges that increasing the availability of dental services in rural communities might not equate to better oral health and utilization of those services if inadequate transportation, lack of educational services, lack of fluoridated water, and unfavorable oral health attitudes persist. In particular, the influence of fatalistic beliefs about the inevitable loss of teeth with age may influence negatively the acceptance of the consequences of tooth loss as detrimental to health, and any intervention to retain teeth may simply be perceived as ineffective. More importantly, older people are unlikely to have a strong motivational impetus to prevent oral disease, or the experiential basis for

linking oral health behaviors to illness (Maupomé *et al.*, 1999), and they may easily construct a vague model of disease subject to ageism biases (Macia *et al.*, 2009).

This study also allowed for the observation of distinct vulnerability issues related to gender, mainly for women. Thus, we suggest that special attention should be paid to older women, who may be more vulnerable to oral disease and more specifically tooth loss and edentulism as a result of norms and beliefs (Kwan & Holmes, 1999; Maupomé *et al.*, 1999). As discussed by Schulz and coworkers (1999), women are more likely than men to lack supplemental sources of retirement income. They also live longer, which places them at greater risk of outliving their spouses and their assets, of living alone, and of needing institutional care. Public health care and health promotion programs should also pay special attention to older women, because they are more likely than men to lack supplemental sources of retirement income (Schulz *et al.*, 1999), and hence be unable to afford the high costs of private dental care. Public health programs and outreach activities should also target social environments such as community and health care centers to enhance awareness of the importance of oral health, and help translate it into practice, particularly amongst older people who have less health literacy.

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Manuscrito 5.

TITLE: Explorations of oral health behavior and dental care decision-making among south Brazilian older adults and oral health care- providers.

ABSTRACT

Although several studies have examined the impact of dental techniques, oral health status, and the treatment preferences of patients and dentists, there is little or no information available on how patients and dentists decide to extract teeth. Consequently, in eight focus groups involving a total of 41 older adults and interviews with two dentists and two dental assistants we explored their beliefs and experiences regarding tooth-extractions within a contextual and historical perspective. Decisions to extract teeth were influenced by limited availability and access to dental treatment, lack of oral hygiene supplies such as toothbrushes, and a culture fostering the wearing of full dentures. Many of the adults felt that the dentists were trained to do little more than extract teeth and make dentures, whereas the dentists complained about having to care for too many patients and a lack of public health services. In all, damaged and sometimes sound teeth were seen as 'problems to be solved', while dentures seemed to offer ideal and predictable solutions for virtually everyone.

INTRODUCTION

With 30 million people older than 60 years in 2025 (15% of the population), Brazil will have the sixth largest elderly population in the world (1). It is expected that a substantial number of people will keep their natural dentition as they age (2). At present, nonetheless, this is not the situation of most Brazilian older adults. According to the

only representative study of the oral health status of the elderly population in Brazil, the number of decayed, missing and filled teeth (DMFT) was 27.8 (out of 32). Missing teeth alone accounted for more than 90% of the total DMFT (3).

Poor oral health seems to be part of the lives of older people (2) and is related to contextual and social factors that influence how diseases develop (4,5,6). In particular, it has been suggested that the risk of edentulism does not increase because of aging but, rather, is a period effect due to today's older people having experienced much higher rates of edentulism than the successive generations (7,8).

Ettinger (1993) noted that historical circumstances influence peoples' behaviors and attitudes towards oral health as a consequence of availability, accessibility and quality of dental treatment (7). Kiyak and Reichmuth (8) also observed that the socioeconomic and dental events of each decade of life impact oral health-related behaviors through a process identified as a 'cohort effect' (7). It has also been suggested that different countries have dealt with similar rates of dental disease in different ways and variances in edentulism rates are an objective measure of this (9,10).

There is a direct relationship between clinical decision-making and the services provided to patients, although other aspects such as technological factors come into play (11-13), particularly in dentistry where styles of clinical practice change over time as dentists are exposed to new techniques and procedures (12). In addition, the propensity for treatment is influenced by psychological and social factors, along with people's perceptions about the need for treatment (14). Hence, older adults tend to maintain, for as long as possible, patterns of oral care established early in life (15,16) in the same way that styles of practice are established and maintained by dentists (11).

The ways in which psychosocial factors influence health behaviors can be explored with the use of qualitative methods (17). The gathering of information of qualitative nature is

usually made via individual interviews or focus groups (FGs) (18). Using FGs

interviews, Brondani *et al.* (2008) noted a positive effect of the interaction among

participants, while building on each other's comments to address issues of the mouth in

older age (19). Kwan & Holmes (1999) studied oral health beliefs of Chinese living in

England, and observed that edentulism was considered a natural consequence of aging

among the FGs' participants (20).

Although qualitative studies have examined the views of patients about different oral

health issues (19-21), none has integrated the investigation of oral health behaviors and

decision-making process through the perceptions of patients and dental professionals

simultaneously, or within a historical perspective. This paper explores the meanings of

oral health and dental treatment among patients and dental care-providers through their

views about each other and themselves within a contextual and historical perspective.

METHODS

We used FGs and individual interviews as means to gather information under the lenses

of symbolic interactionism (SI) (22,23) while drawing on some aspects of grounded

theory to address questions of self-perception and health behavior (24). Eight focus

groups were conducted with 41 older people drawn from the participants in a

longitudinal study on nutrition, quality of life, and the incidence of oral diseases among

older persons in Carlos Barbosa city, southern Brazil (25,26). Ethical approval was

granted by the Ethics Committee of the Faculty of Dentistry at the Federal University of

Rio Grande do Sul (UFRGS) and by the Municipal Government of the City of Carlos

Barbosa, and informed consent was obtained in writing from all of the participants.

The sampling strategy purposefully recruited men and women, with and without teeth

and dentures, and from urban, rural and isolated communities (Table 2). One focus

group was composed exclusively of women and another exclusively of men to avoid potential discomfort with gender-sensitive health-related or behavioral topics (18,19). The different geographical locations allowed us to explore issues related to the quality and accessibility of dental services. In addition to the eight FGs, we conducted four individual interviews with dentists and dental assistants in the area (Table 1).

A series of open-ended questions were developed by the research team before each FG and interview as a general guide or prompt for the facilitator and interviewer. They each lasted about 90 minutes, were tape recorded in Portuguese, transcribed verbatim and translated to English. The transcription of each FG was read several times and analyzed by the first author (RDM). This process was then audited by the fifth author (MAB) to increase rigor in the coding process and conceptual development (24). The analysis was conducted inductively through an interactive process of thematic coding to identify personal experiences with oral health, use of dental services, behaviors and feelings toward oral health, and self-assessed need for treatment. Transcription of the four individual interviews were similarly coded for information from the dentists about the location, equipment, materials and treatments that were available to the communities, and about the response of the community to the dental services. Field-notes written by the interviewer/moderator after each interview and FG captured initial perceptions allowing for preliminary analyses and informing subsequent interviews (24). The transcripts and field-notes were coded using QSR NVivo 8.0™ software. Some aspects of GT such as constant comparison, free-coding and axial coding, and the development of explanatory categories and themes were used. The analysis was based on the theoretical framework of symbolic interactionism, which posits that people's actions are constructed in the course of their interactions with social and physical environments (22,23).

RESULTS

The results are grouped into themes and their respective categories. The analysis began with categories relating to social factors, on the assumption that the behavior of people is a consequence of interactions with their social environment (23). The second theme relates to cultural values where social action is constructed upon interactions between community members (22). The third theme includes the factors related to dental treatment, such as the location of a dental clinic and available treatments, the interactions between patient and healthcare-providers, and how healthcare decisions are made.

Social Factors

Availability and Accessibility of dental services

Several participants identified scarcity of dental services as a problem when "people lived far away and there were just a few dentists; then we would go only when we got pain". [Ө1] Likewise, the lack of transportation within rural areas resulted frequently in tooth extraction. The local dentists, we were told, used to "extract 20 or 30 teeth every day, because people always presented with toothache". [α2] The first graduated dentist [*] to work in the region, an 84 years old man, told us that in the past he used to "take the equipment, install it in a house in a rural community, spend a month or two working in there, and then move out to another community". [α1]

Use of toothbrush

Traditional values influenced oral hygiene and the value attributed to toothbrushes. According to the second graduated dentist in the city [α2], people used to tell him that

[* Licensed dental practitioners (LDP) received a short-period course allowing them to make extractions and fabricate dental prostheses, whereas graduated dentists are those who have a university degree].

"…my father had never brushed his teeth … why I should brush, then?" Thus, although toothbrushes became available "in the city in mid- 1960's" [α1, α2, α3], its utility may not have been necessarily perceived immediately.

Cultural Values

Decision towards extraction of teeth and use of dentures

The 'advantages' of dentures, they told us, was advocated enthusiastically when "people pulled all teeth because using dentures was the latest thing to have… [and] it was good wearing dentures". [φ1] It also seemed that there was no stigma attached to the loss of all teeth and dentures' use, but on the contrary, people were enthusiastic about substituting the natural teeth for prosthetic ones once "it seemed a different person, it looked so much better". [φ1] Moreover, most participants agreed that they were unaware of oral health issues such as hygiene until much later in life, since their "parents had no information about the teeth, like hygiene and dental treatment". [Ө3] Moreover, we heard that the parents "used to bring their children [to the dentist], demanding mouth clearance and dentures' fabrication at young ages". [α3]

Life circumstances: wedding and pregnancy

Some female participants commented that it was a common practice to have all teeth extracted and dentures prepared as a kind of provision for marriage, "to avoid burdening the spouse or his family with dental treatment". [γ4] This behavior was seen as the easiest way to "solve all dental problems before the wedding" [ε1], and also that "extracting all teeth before getting married was more a prevention than anything else". [ε1] However, one dentist placed some of the blame for this approach to care on the dentists, since "the parents demanded to pull all teeth to prepare the women to marry and the dentists just did it." [α1]

Factors related to Dental Treatment

<u>Dental settings and treatments</u>

Until the late 1960's, dental professionals working in the region were usually Licensed Dental Practitioners (LDPs), and their service were limited mostly to tooth-extractions and dentures [α3]. The first graduated dentist to work in the region said that the LDPs "had been trained to perform extractions, golden crowns and complete dentures" [α1], and another graduate dentist told us that people in the region "did not even know that [dental] restorations existed". [α2] FG participants shared the uncertainty about restorative procedures "when the dentists started to ask if we wanted to restore the teeth instead of pulling them". [Φ5] Furthermore, while discussing root-canal therapy we heard that "sometimes one would go five times to get a tooth fixed, but in the end it would fail and had to be extracted". [γ1]

Most participants commented that in a number of communities, the LDPs' clinics were improvised in a grocery store or a private home using "a wooden chair with the pedal [dental handpiece] machine and a few tools" [β5] to provide treatment, which was mostly to extract teeth.

<u>Patient and Professional Interactions</u>

Some FG participants told us that they were afraid of dental treatment and postponed going to a dentist because, as one of them explained, "this generation is traumatized because of that period when we had to go to the dentist, always with toothache… still today we postpone." [Φ2] Nevertheless, we heard how some people now "go to the dentist once every six months for a checkup" [Φ4], and they "do not want to see happening with my children what had happened to [me]". [β2] The changes resulted from dental services that are much more available and accessible in the public health

system where dental treatment is free, and also because dentists "teach you how to take care of your teeth," [γ3] and "they try to save the tooth instead of pulling it". [γ4] However, the focus on prevention may not occur so readily in rural communities because "rural workers who are 40, 50 years old still believe that using dentures is much better than maintaining the teeth; they go for fixing them occasionally, but eventually they ask for complete dentures". [α1]

DISCUSSION

Symbolic interactionism recognizes that people's actions are inherently associated with the meanings they attached to their daily experiences (22,23). In the accounts of the people we interviewed, low availability of dental services was the primary reason for seeking care or delaying dental consultations, except for toothaches. Consequently, the dentists saw patients irregularly and mostly for acute pain when the practical treatment options were limited to the extraction of teeth. Moreover, treatment decisions were based not only on the clinical condition of the tooth, but also on factors such as limitation in accessing dental care, which meant that good teeth were extracted to prevent pain, as well.

The patterns of dental care utilization were also influenced by factors of economic and social disadvantage. All dental care in Brazil was paid for privately before it became part of the National Health System in the mid- 1970s (27). However, most people at that time lived in rural areas without good access to the national system, and restorative dentistry was perceived widely as a luxury. Consequently, in rural areas, dentistry was little more than a series of dental extractions until all of the teeth were removed and dentures made to replace them.

Edentulism seems to have been widely held once there was no stigma attached to dentures' use. On the contrary, the fitting of dentures came along with perceived increases in self-image and social prestige, and was then mostly desired. Dentures were considered better-looking than natural teeth, especially in cases where anterior teeth had been lost. Indeed, it seemed to justify removal of all remaining teeth as soon as a few anterior teeth were lost, according to some FGs' participants and dental care providers. Particularly for women, relative hopelessness was determinant of the extraction-based care they received. Most women in the focus groups described only submissive acceptance of the decision to remove their teeth, as a result of dependency on their parents' or husbands' earnings for dental treatments. A common feature was also that most women accepted the parents' decision on their dental treatment without question. Such as suggested by Kreuger and Casey (2000), when focus groups are somewhat uniform, participants are encouraged to disclosure events and opinions that could otherwise be considered sensitive while interacting in more heterogeneous groups (18). In this study, we were able to discuss topics specific to gender with one of our groups, composed solely of women, which could have been regarded as inappropriate in mixed groups. In this discussion we observed that social values and parental influence were the main determinants compelling young women to obtain complete dentures in preparation for marriage in order to ease the economic burden of the family, following the traditions of their social group (G4). These findings corroborate with Sussex and coworkers (2010), who suggested that social disadvantages may be accountable for the greater prevalence of edentulism among women, as observed in other settings (9), and may as well explain the high levels of edentulism observed among women in this population of south Brazilians (25,26).

Brennam and Spencer (2005) noted that provider-based factors influencing the provision of services can include the provider's consideration of patient demand, patient convenience and social good (13). In this study, dentists stated that they felt compelled to perform this work, accepting the parents' decisions on their daughters' treatments, and hence supporting the culture of complete removal of teeth and the fitting of dentures for young women. This tradition may have functioned as standards of role performance and social control (27). According to Berger and Luckmann (1966), in any given society, traditions are maintained through the social conduct by means of individual roles. In the case of this community such can be presumed for the dentists' and the women's roles in the process of mouth clearance. Both were held responsible for abiding by the standards, and must have agreed to carry on these conventions as a way to prove their qualifications and conformity with prevailing social norms, as expressed in the FG and individual interviews'.

This is in accordance with the notion that there are differences in oral health behaviors based on gender (15,20), and that dentists are influenced also by the culture in which they work (11). Sussex and colleagues (2010) noted that parental authority and how patients demanded extractions, facilitated by an accommodating profession, led to the high prevalence of edentulism in New Zealand (9). This seems to have been the case for most of our participants and for the dentists working in that period as well. Further, in this community this also led to a tradition that meant extracting sound teeth to prevent dental disease, at least for women. Grenbowski and coworkers (1988) observed that patients with similar characteristics and treatment needs receive different services depending partly on provider-and patient preferences (11). Hence, the notion of mouth clearance for men was not as taken for granted as it was for women, even though they lived in the same neighborhoods.

The influence of pain and fear in dentistry seems to be ubiquitously negative, and presumably not only a consequence of negative dental experiences in the past, but also a result of a social learning process (16). In fact, the communication of vicarious experiences with dental treatment by family and community members, in the past, may be accountable for the widespread dental fear mentioned in these FGs. This, despite improvements in pain control and painless dentistry with time, resulted in delaying treatment. The process of not attending the dentist is described as a vicious cycle in which full mouth extraction is the eventual consequence (16), which seems to have been reinforced in this community by the also general satisfaction with dentures. Descriptions of interactions between dentists and patients reflected the interactionist concepts that individuals accommodate the activities of others (23). Within the historical context of this community, the substitution of natural teeth for dentures can be understood as a social institution (22) or tradition (28) in the sense that it represented a common social response to the problem of oral diseases from an earlier period. Such event has been previously observed in other settings, where edentulism was perceived as a natural and inescapable result of aging (16,20,21). This view about the inevitable decline of health with ageing may result from the social attitude (28), based on negative stereotypes about the ageing process as inexorably linked with disease, and in particular, with the loss of the natural teeth.

In this context, the accommodation of university-educated dentists to a former culture of edentulism may have been a result of interaction with a social reality in which preventive and restorative care made no sense. Participants' outlooks on dental treatment, particularly for those living in rural areas, allowed for the observation that social expectations of the life cycle may have resulted in the anticipation of imminent edentulism which, in turn, guided treatment decisions, as discussed by Davis (1981)

(10). Results from this study indicate that in a culture where dentures are considered an inevitable consequence of aging, there is little reason to prevent dental diseases and tooth loss. Restorative dental treatments may be perceived as appropriate only for the young, while for the older people tooth extraction may still be traditional, a practice in which dentists may engage as well (9).

Clearly some of the participants, despite their own edentulous state, recognize that people change their behavior when they have access to new information and more comprehensive dental service available now from the Brazilian National Health System (27). In rural areas, however, when those services exist, they are characterized by offering only dental restorations and tooth extractions. Thus, although it is presumed that the greater availability and accessibility of dental care create better opportunities for prevention and treatment of dental caries (5), such aspect of the delivery system itself may be involved in the progress toward premature tooth loss and the wearing of full dentures (10), in communities where this has been held as common-practice. Hence, the benefits of the new system may be slow to appear in rural areas where access to modern dentistry remains a challenge.

CONCLUSION

- Non-disease-related social factors influenced the decisions taken towards tooth extraction and edentulism, in this sample of south Brazilian older adults.

- Women were particularly more vulnerable to have early removal of all teeth and fitting of dentures, as a result of cultural values.

- Dentists amended their styles of practice to the demands of the populations to whom they provided dental care, which influenced in the development of patterns of dental care for each community as a result of sub-cultural norms.

- The anticipation of full dentures' use resulted in patterns of neglect towards oral health and systematic extraction of teeth, regardless of their health/disease status.

- Increased availability of dental services remains challenged by persistently unfavorable oral health attitudes.

- Health education and promotion should target the needs, beliefs and available services of each community.

Acknowledgments

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Table 1. Dental personnel and associate characteristics

Dental Professional	Gender	Age	Professional Status	Start of activities	Details
α1	Male	84	Graduated Dentist	Early 1950s	Worked since 1952 in the whole region. Working only in the private sector.
α2	Male	72	Graduated Dentist	Mid-1960s	Worked since 1964 in the city. The first dentist in the Public Health System.
α3	Female	93	Dental assistant	Early 1940s	Worked since 1939 as a dental assistant of her husband, who was a Licensed Dentist. Worked predominantly in rural areas until mid-1980s.
α4	Female	62	Dental assistant	Mid-1970s	Worked since 1974 as a dental assistant of a Graduated Dentist in rural area. Still working in the public and private dental care.

Table 2. Focus Groups' and participants' characteristics.

Group	Characteristics	Participant	Gender	Age	Dental status [*]
Group 1 **(G1)**	Countryside, with a relatively easy access to downtown. This area had Licensed Dentists (LD) from 1950s and Graduated Dentists (GD) from mid 1970s.	β1	Female	76	Edentate with the use of both CRD
		β2	Female	66	Edentate with the use of both CRD
		β3	Female	68	Upper and lower natural teeth associated with the use of RPD
		β4	Male	72	Upper CRD and some lower natural teeth
		β5	Female	79	Edentate with the use of both CRD
Group 2 **(G2)**	Downtown, where there had been LDs from mid- 1930s. The GD first arrived in mid- 1960s. The public health system started in late 1970s.	γ1	Female	67	Edentate with the use of both CRD
		γ2	Male	71	Upper denture and lower natural teeth associated with the use of RPD
		γ3	Female	76	Upper denture and lower natural teeth associated with the use of RPD
		γ4	Female	67	Edentate with the use of both CRD
		γ5	Male	73	Edentate with the use of both CRD
Group 3 **(G3)**	Rural and very isolated area, where there has never been any dental service.	δ1	Male	65	Dentate with the use of an upper CRD
		δ2	Female	64	Edentate with the use of both CRD
		δ3	Female	71	Edentate with the use of the upper CRD
		δ4	Female	73	Edentate with the use of the upper CRD
		δ5	Male	76	Edentate with the use of both CRD
		δ6	Male	70	Dentate without the use of any dental prosthesis

[* CRD: Complete removable denture; PRD: Partial removable denture.]

Group 4 **(G4)**	Rural area with a relatively easy access to downtown. This community had LDs from mid 1950s and public health system since early 1980s.	ε1	Female	66	Edentate with the use of both CRD
		ε2	Female	64	Edentate with the use of both CRD
		ε3	Female	75	Edentate with the use of both CRD
		ε4	Female	68	Edentate with the use of the upper CRD
		ε5	Female	84	Edentate with the use of both CRD
Group 5 **(G5)**	Countryside, with a relatively easy access to downtown. This area had Licensed Dentists (LD) from 1950s and Graduated Dentists (GD) from mid 1970s.	Φ1	Male	77	Edentate with the use of both CRD
		Φ2	Male	65	Upper and lower natural teeth associated with the use of PRD
		Φ3	Male	83	Upper denture and lower natural teeth associated with PRD
		Φ4	Male	82	Upper denture and lower natural teeth associated with PRD
		Φ5	Male	74	Upper denture and lower natural teeth associated with PRD
Group 6 **(G6)**	Downtown area, where there had been LDs from mid-1930s. The GD first arrived in mid-1960s. The public health system started there in late 1970s.	Θ1	Male	71	Upper denture and lower natural teeth associated with the use of removable denture
		Θ2	Male	65	Dentate without the use of any removable denture
		Θ3	Female	73	Edentate with the use of both CRD
		Θ4	Female	69	Upper CRD and lower natural teeth
		Θ5	Male	83	Upper and lower natural teeth with the use of PRD

Group 7 **(G7)**	Rural and very isolated area. The only dental service started in late 1980s with the public health system.	Ω1	Male	76	Upper and lower natural teeth without the use of dental prosthesis
		Ω 2	Female	66	Edentate with the use of both CRD
		Ω 3	Female	75	Edentate without the use of dental prosthesis
		Ω 4	Male	77	Edentate in the upper jaw without the use of dental prosthesis and some lower teeth
		Ω 5	Female	72	Edentate with the use of both CRD
Group 8 **(G8)**	Rural area with easy access to downtown, where there has never been a dental service.	Σ1	Female	65	Upper CRD and lower natural teeth with the use of PRD
		Σ2	Male	68	Edentate with the use of both CRD
		Σ3	Male	77	Upper and lower natural teeth without the use of dental prosthesis
		Σ4	Female	76	Edentate with the use of the upper CRD
		Σ5	Female	65	Upper CRD and lower natural teeth

DISCUSSÃO

A perspectiva fundamental desta discussão é a de que as práticas de pesquisa quantitativa e qualitativa não são opostas, mas se posicionam em algum lugar em uma linha contínua entre as duas (Creswell, 2007). Assim, esta inicia com a discussão de elementos da pesquisa quantitativa, onde teorias e conceitos foram testados, e segue com a exploração qualitativa, onde elementos presentes no segmento quantitativo e outros que emergiram a partir do segmento qualitativo do estudo são discutidos.

<u>Segmento quantitativo</u>

Perdas dentárias

No seguimento, informações foram coletadas de 273 dos 388 participantes dentados que foram examinados na linha de base. Na comparação com os participantes mantidos no seguimento, indivíduos perdidos durante o estudo foram mais predispostos a ter menos anos de escolaridade, e a serem mais velhos.

No modelo multivariado final foi observada uma maior chance de incidência de perda dentária para homens; pessoas com 70 ou mais anos de idade; pessoas vivendo em área rural; fumantes; e indivíduos insatisfeitos com a qualidade dos serviços de saúde a que têm acesso. Participantes com quatro ou mais anos de escolaridade apresentaram menor chance de incidência de perda dentária. Entre as variáveis clínicas, o uso de próteses parciais removíveis (PPR), e o Índice de Sangramento Gengival (ISG) estiveram positivamente associados com o desfecho, enquanto um maior fluxo salivar representou proteção para a incidência de perda dentária.

Este é o primeiro estudo, para o nosso conhecimento, demonstrando que determinantes sociais são indicadores da incidência de perda dentária, mesmo após ajuste para fatores comportamentais e clínicos, em idosos brasileiros. Neste estudo, os

homens estiveram mais predispostos à incidência de perdas dentárias, o que poderia ser atribuído ao fato de eles terem apresentado mais dentes presentes na linha de base. Poderia ser sugerido que, neste estudo, o gênero seja um marcador de diferenças em saúde bucal entre os sexos. Como resultado os homens, que mantiveram mais dentes até idades avançadas, podem ser mais susceptíveis às perdas dentárias em consequência de maior exposição a outros fatores de risco para o desfecho.

Participantes com 70 anos ou mais de idade também apresentaram maior chance de incidência de perda dentária. Esse pode ser o resultado de um grande número de fatores, incluindo a redução na destreza manual para realizar os procedimentos de higiene bucal, barreiras para o acesso a serviços de saúde bucal, e o efeito do acúmulo de doenças bucais em idosos.

A maior probabilidade de incidência de perda dentária para idosos vivendo em comunidades rurais pode ser explicada pelo fato de que os serviços odontológicos disponíveis naquelas regiões são oferecidos pela municipalidade, através do SUS, e caracterizados por realizar restaurações dentárias simples, e extrações. Além disso, comunidades rurais de Carlos Barbosa não são providas com fluoretação das águas de abastecimento.

Idosos com menor escolaridade também estiveram mais susceptíveis ao desfecho, o que poder ser interpretado em termos de melhores comportamentos de saúde entre pessoas com maior nível de educação formal, as quais possivelmente tenham sido mais responsivas à informação acerca de saúde bucal, recebida ao longo do tempo.

A associação entre o uso de PPR e perda dentária pode estar ligada aos efeitos do baixo nível socioeconômico nas escolhas pelo tipo de tratamento odontológico, o que pode levar os pacientes a receber extrações dentárias ao invés de tratamentos mais

conservadores. É provável que pessoas que utilizam este tipo de reabilitação protética não sejam capazes de arcar com os altos custos de tratamentos endodônticos e próteses fixas.

<u>Cáries coronárias</u>

No seguimento realizado em 2008, informações foram coletadas de 273 dos 388 participantes dentados que foram examinados na linha de base. Dentre estes, 33 (12,1%) indivíduos tornaram-se edêntulos durante os quatro anos de seguimento. Portanto, os resultados para este desfecho fazem referência aos 240 participantes dentados em ambos os exames. No modelo multivariado final foi observada uma maior chance de incidência de novas cáries e restaurações para homens; indivíduos com 70 ou mais anos de idade; pessoas vivendo em comunidades rurais; fumantes; e para os participantes que referiram sua saúde bucal como ruim ou muito ruim. Entre as variáveis clínicas, o uso de PPR esteve positivamente associado ao desfecho, enquanto um maior fluxo salivar representou um efeito protetor.

Estes resultados são relevantes, uma vez que a cárie é o preditor mais consistente das perdas dentárias, e pela necessidade do desenvolvimento de estratégias efetivas para sua prevenção no nível populacional.

Neste estudo, os homens estiveram mais susceptíveis ao desenvolvimento de novas cáries e restaurações. Os homens nesta amostra apresentaram significativamente mais dentes na linha de base, e possivelmente estejam mais propensos ao desenvolvimento de cáries pela maior exposição a outros fatores envolvidos no desenvolvimento de cáries, como já discutido em relação às perdas dentárias.

Participantes que viviam em área rural apresentaram maior taxa de incidência da doença. Este resultado também pode ser explicado essencialmente pela exposição à água fluoretada, e disponibilidade de serviços odontológicos, também já abordados.

O hábito de fumar esteve associado ao maior risco de incidência da doença. O hábito de fumar poderia ser compreendido como um elemento comportamental indicador de pouco cuidado com a saúde, o que incluiria presumivelmente também um descuido com a higiene bucal, e reduzida procura por atendimento odontológico preventivo.

Neste estudo, o uso de PPR representou maior chance de incidência de cáries, o que poderia indicar uma reduzida qualidade de higiene das próteses. O acúmulo de bactérias nas superfícies das PPR poderia aumentar o risco de cáries como resultado do contato destas superfícies protéticas com as superfícies dentárias adjacentes.

Cáries Radiculares

Dentre os participantes, 33 (12,1%) perderam todos os dentes durante os quatro anos de seguimento, enquanto cinco indivíduos não apresentaram raízes em risco, lesões de cáries ou restaurações radiculares no período. Portanto, os resultados fazem referência aos 235 participantes que eram dentados nos períodos de linha de base e seguimento, e apresentaram ao menos uma raiz em risco durante os quatro anos de observação.

No modelo multivariado final, foi observada uma maior chance de incidência de cáries radiculares para indivíduos vivendo em área rural, e aqueles que não realizavam escovação ao menos diariamente. Idade foi um fator de risco para a incidência de cáries radiculares, enquanto que o maior fluxo salivar representou proteção para este desfecho.

Este estudo indicou que fatores como idade, região de moradia, e comportamentos de saúde bucal podem estar envolvidos na incidência de cáries radiculares em idosos. Estes resultados são relevantes em função da necessidade de identificar preditores da doença e aqueles indivíduos mais vulneráveis à sua incidência.

Neste estudo a chance de incidência de cáries radiculares aumentou com a idade, o que pode ser o resultado de uma maior exposição de raízes dentárias ao meio bucal, em função de recessão gengival.

Outro resultado importante foi a observação de que idosos vivendo em áreas rurais também estiveram mais susceptíveis à incidência de cáries radiculares, o que foi observado neste estudo em relação às cáries coronárias e às perdas dentárias.

Indivíduos que afirmaram escovar os dentes com frequência inferior a uma vez ao dia apresentaram maior chance de incidência para o desfecho, o que é de ser esperado, uma vez que a higiene bucal insuficiente é um dos fatores mais proximais no desenvolvimento das cáries.

As repercussões destes achados para o planejamento de políticas de saúde bucal neste contexto são evidentes, dado o rápido envelhecimento populacional e a tendência de que muitos idosos mantenham os dentes naturais por mais tempo.

Segmento Qualitativo

Diferentes tipos de informação podem de alguma maneira prover diferentes resultados porque modelos de pesquisa distintos são sensíveis às nuances particulares dos universos a que se destinam a investigar. Encontrar inconsistências não deve ser percebido como reduzir a credibilidade dos resultados, mas como uma oportunidade de uma percepção da relação entre o tipo de abordagem de pesquisa e o fenômeno estudado (Creswell, 2007).

Já está bem estabelecido na literatura que determinantes como exposição a fluoretos, práticas de higiene bucal e consumo de açúcar afetam a ocorrência e o desenvolvimento de cáries (Fejerskov, 1997). Nos contextos avaliados historicamente neste estudo, as respostas dos participantes aos questionamentos ilustraram que o desenvolvimento de doenças bucais deveu-se em parte à escassez de informações sobre saúde bucal, a comportamentos de saúde influenciados por pais e parentes, e medo do atendimento odontológico.

O conceito moderno de prevenção não se tornou amplamente aceito pelos dentistas antes dos anos 1970, nos Estados Unidos (Grossman, 1981). Não há evidências, entretanto, sobre esta prática por parte dos profissionais brasileiros, mas seria razoável atribuir o mesmo período, ou um momento ainda posterior. Além disso, há evidências de que as crenças e as atitudes dos pais em relação à saúde bucal influenciam a maneira como eles praticam cuidados de saúde para seus filhos (Wong *et al.*, 2005). Desta forma, não é inesperado que, no tempo em que estes idosos eram jovens, não existisse um conceito de promoção de saúde bucal, educação e prevenção de doenças bucais.

O medo do tratamento odontológico está associado na maioria dos casos a experiências de dor, ou exposição a modelos baseados no medo do profissional (Moore *et al.*, 1991). Na pesquisa de grupos focais, foi observado que a relação entre o paciente e o profissional esteve, em muitas ocasiões, fundamentada no medo. Em alguns casos, devido à natureza do processo de restauração dentária, a experiência de medo, dor e desconforto resultou na escolha pela extração, por este ser um procedimento mais rápido.

Como já discutido, da mesma forma que higiene bucal, micro-organismos e dieta influenciam saúde/doença bucal, fatores sociais e contextuais podem influenciar a forma como doença periodontal (Sbaraglia *et al.*, 2002) e cáries se desenvolvem em indivíduos e populações (Holst *et al.*, 2001).

Neste contexto, respostas aos questionamentos neste estudo indicaram que o desenvolvimento de doenças bucais e a consequente extração dentária estiveram relacionados a baixos níveis de educação formal; baixa renda; falta de sistemas de transporte; limitações na disponibilidade de recursos; vulnerabilidade de gênero; e normas sociais.

Na época em que os participantes deste estudo estavam estudando, havia apenas quatro anos de educação formal e alguns indivíduos não frequentaram a escola durante os quatro anos. Não havia transporte para o colégio, e o principal foco era educar as crianças a ler, escrever e fazer alguns cálculos matemáticos básicos. Este nível limitado de escolaridade pode ter estado associado ao tipo e/ou volume de informação acerca de saúde bucal oferecida e recebida no contexto desta comunidade, como já ilustrado na discussão acerca da educação recebida por familiares.

Evidências indicam que baixo nível de escolaridade influencia os comportamentos de saúde negativamente, aumentando o risco e a prevalência de cáries (Holst *et al.*, 2001), o que também pode ter ocorrido com os participantes deste estudo. Gilbert e Duncan (2006) observaram que um baixo nível de escolaridade está associado a maior probabilidade de perda dentária.

Como em outras áreas do Brasil, em Carlos Barbosa existia uma falta de urbanização, indústrias e possibilidades de trabalho até meados dos anos 1960. A maioria dos habitantes desta cidade trabalhava em agricultura de subsistência, durante sua infância e juventude. Saúde bucal pode não ser uma prioridade para famílias de baixa renda, e tratamentos restauradores podem ser igualmente evitados devido à falta de recursos financeiros. Com o desenvolvimento de cáries, entretanto, dor dentária pode ter sido um fator conduzindo pacientes a ter dentes extraídos com a finalidade de alívio da dor.

De acordo com Douglas (1986), barreiras resultantes da falta de meio de transportes podem afetar negativamente os desfechos de saúde bucal. Problemas de acesso ao tratamento odontológico, neste estudo, foram identificados como reduzida oferta de serviços de saúde, estando os mesmos restritos à área central da cidade, e falta de meios de transporte. Acesso é fundamental para explicar comportamentos de procura pelos serviços de saúde (Andersen, 1995). A falta de meios de transporte, embora não tenha impedido absolutamente o acesso aos serviços, interferiu na percepção da sua necessidade, e até mesmo utilidade.

Embora a falta de instrumentos de higiene como a escova dental não esteja diretamente associada à perda dentária, pode predispor ao desenvolvimento de cáries (Thylstrup e Ferjerskov, 1986) e doença periodontal (Sbaraglia *et al.*, 2002), as quais podem resultar em perda dentária (Mccaul *et al.*, 2001). Esta pode ter sido a realidade para muitos dos participantes deste estudo, pois os mesmos relataram que, quando eram crianças e até mesmo já adultos, não existiam escovas dentais. Estas teriam surgido no mercado ao final dos anos 1960.

Em comunidades com água fluoretada, o risco e a prevalência de cáries são significativamente menores, na comparação com comunidades sem fluoretação da água (Coward *et al.*, 1990). Nenhum dos participantes deste estudo teve contato com água fluoretada desde a infância até uma parte significativa de sua vida adulta, e aqueles que residem em área rural ainda não tem acesso à fluoretação. Como resultado, o benefício preventivo do uso do flúor para esta população de idosos foi nulo, a não ser para os poucos que utilizaram creme dental com flúor, o que também ocorreu bem mais tarde em suas vidas.

Outro elemento importante analisado neste estudo está diretamente ligado à maior vulnerabilidade de mulheres para a extração dentária no passado, quando era um

procedimento comum ter todos os dentes extraídos e dentaduras instaladas em idade muito jovem, como um elemento de preparação para o casamento. Além disso, a maioria das mulheres neste estudo discutiu o fato de que, durante a gravidez, as mulheres eram impedidas de visitar o dentista, mesmo se estivessem sentindo dor. O atendimento odontológico era considerado perigoso para a gestação, e, portanto, elas eram encorajadas a ficar suportando a dor, e procurar atendimento somente após o nascimento do bebê, extraindo todos os dentes que haviam deteriorado no período.

Estes achados estão de acordo com evidências de que a procura por atendimento é um fenômeno complexo, que inclui influências de experiências passadas, família e amigos, e contatos prévios com serviços odontológicos (Anderson e Thomas, 2003). Estudando a relação entre médicos e pacientes, Freidson (1972) introduziu o conceito do 'sistema leigo de referência' (em oposição ao sistema profissional de referência). O autor sugeriu que o processo de procura por serviços envolve uma rede de potenciais consultores, desde os limites íntimos e informais do núcleo familiar, passando por autoridades leigas mais distantes, até que por fim o profissional é procurado. No campo da odontologia, a abordagem baseada em redes sociais como fator explicativo de comportamentos de saúde foi aplicado por Lim e colaboradores (1994). Eles demonstraram uma redução nos níveis de gengivite entre indivíduos que tiveram um maior número de discussões acerca de saúde bucal com seus amigos. Especialmente na situação de extração de todos os dentes, um passo final e drástico, a influência de redes sociais pode ser presumida.

Estes elementos são importantes na contextualização destes achados, que incluem a percepção de que a ideia de um dentista praticando prevenção não existia, no passado. Os resultados observados neste estudo também corroboram com uma ampla revisão da literatura, na qual Kiyak e Reichmuth (2005) demonstraram que as atitudes de muitas pessoas desta geração com relação à saúde bucal eram de que se um indivíduo estava com

dor, o dentista era buscado para remover o dente que estava doendo. As expectativas com relação à boca, em indivíduos desta geração, incluíam o uso de dentaduras como uma parte normal da maturidade e velhice.

Estes resultados precisam ser compreendidos dentro de um contexto no qual, até final dos anos 1960, os serviços odontológicos na cidade de Carlos Barbosa eram providos por dentistas práticos licenciados trabalhando em consultórios particulares, na área central da cidade ou em consultórios improvisados em pequenas comunidades rurais. Estes dentistas práticos eram formados através de um curso de preparação de curta duração, com foco em extração e confecção de dentaduras, e fundições em ouro. Mesmo depois do estabelecimento de dentistas graduados na região, a cultura de extração e fabricação de dentaduras não se modificou prontamente, e até mesmo os dentistas com curso superior tiveram que se adaptar a uma cultura de atendimento motivado pela dor, e com vistas à eliminação dos dentes naturais para confecção de próteses totais.

No nível do atendimento em rede pública, o Sindicato dos Trabalhadores Rurais começou a oferecer serviço de odontologia no final dos anos 1960, mas foi somente na metade dos anos 1970 que o sistema nacional de saúde começou a oferecer atendimento odontológico na unidade de saúde no centro da cidade. Ainda assim, as comunidades rurais tinham pouco ou nenhum acesso a esta unidade de saúde devido a problemas com o transporte, já discutidos. Além disso, o sistema nacional de saúde não tinha uma base universal de atendimento e sim, este era garantido somente aos empregados com carteira assinada (Teles, 1985).

De acordo com Holst e colaboradores (2001), o melhoramento no acesso ao cuidado odontológico presumidamente melhora os comportamentos de procura por procedimentos preventivos. Evidências dessa associação no Reino Unido foram discutidas por Watt e Sheiham (1999), que encontraram piores indicadores de saúde bucal na região

norte da Inglaterra, nas quais a disponibilidade de serviços dentários é menor. Eles concluíram que tal disparidade resulta da falta de obrigação das autoridades locais para prover a atenção primária em saúde bucal para estas comunidades.

Tal observação é particularmente relevante no contexto de políticas neoliberais de privatização, desenhadas para enfraquecer políticas públicas de saúde e segurança social (Schulz *et al.*, 1999). Enquanto alguns países estão considerando a possibilidade de reduzir os custos com suporte social e de saúde para pessoas idosas, programas sociais como o Sistema Único de Saúde e sua base universal de atendimento podem ser responsáveis por reduzir iniquidades em saúde.

Ettinger (1993) discutiu que apenas recentemente os avanços na tecnologia e nas práticas ajudaram a mudar a conduta odontológica. Foi somente nos anos de 1940, por exemplo, que melhoramentos nos anestésicos locais encorajaram dentistas a desenvolver um modelo restaurador nos Estados Unidos (Grossman, 1981). Antes deste período, os dentistas eram mais propensos a extrair dentes medianamente comprometidos do que tratá-los (Grossman, 1976). Embora não existam evidências acerca das práticas odontológicas sob uma perspectiva histórica no Brasil, poder-se-ia assumir que os melhoramentos tecnológicos neste país seguiram com certo atraso àqueles observados em países desenvolvidos como os Estados Unidos.

Em outro aspecto, quando analisando os transcritos dos grupos focais, fica claro que a forma como os dentistas trabalhavam, em termos de sua relação interpessoal com os pacientes, permanecem nas lembranças nas quais os pacientes baseiam suas percepções sobre odontologia. De um modo geral, os participantes demonstraram insatisfação com profissionais que tinham uma atitude rude, paternalista e pouco cuidadosa, no passado.

Além disso, experiências de dor e insucesso com terapias como a endodontia (Grossman *et al.*, 1976), no passado, podem ter influenciado o processo de decisão clínica, bem como os comportamentos de higiene bucal e procura por atendimento, ao ponto no qual os pacientes e até mesmo os dentistas não confiavam em procedimentos com o objetivo de preservar dentes naturais.

Embora muitos participantes sejam edêntulos e não procurem tratamento odontológico atualmente, alguns reconheceram que as pessoas modificaram seus comportamentos de saúde como resultado de maior acesso a informações, à inclusão do serviço odontológico ao sistema público de saúde, sua maior disponibilidade e melhoramentos no acesso em termos de transporte, bem como a avanços na tecnologia associada ao tratamento odontológico.

De forma mais importante, entretanto, participantes atribuíram modificações positivas nos comportamentos de saúde à nova abordagem dos profissionais, atualmente. Tais percepções de um novo paradigma com relação à saúde bucal podem ter resultado da evolução nos tratamentos odontológicos (Ettinger, 1993; Kiyak e Reichmuth, 2005), educação em saúde (McGrath e Bedi, 2002) e em melhores atitudes dos dentistas (Kay e Blinkhorn, 1996). Entretanto, estas mudanças são mais prováveis de ocorrer em áreas urbanas, onde estes fatores acima identificados são mais proeminentes. Por outro lado, o mesmo pode não ocorrer em comunidades rurais. De fato, existem evidências de que pessoas que vivem em área rural são mais vulneráveis às doenças bucais em função de terem recebido pouca informação acerca de saúde bucal, não ter acesso a água fluoretada, e enfrentar barreiras para alcançar os serviços odontológicos (Heaton *et al.*, 2004).

CONSIDERAÇÕES FINAIS

As circunstâncias históricas nas quais um indivíduo está influenciam seus comportamentos e atitudes. Diante desta perspectiva, participantes do presente estudo revelaram informações acerca das razões pelas quais os indivíduos assumiram determinados comportamentos de saúde. De acordo com as percepções dos participantes dos grupos focais, as limitações no acesso a serviços odontológicos; a falta de meios de transporte; a inexistência de um sistema público de saúde; reduzido poder aquisitivo; limitações nas tecnologias e terapias odontológicas; atitudes dos dentistas; e crenças acerca da inevitável perda dentária foram os principais fatores contribuindo para a definição da extração dentária como a norma para tratamento odontológico durante um período que perdurou por décadas, e que corresponde à sua juventude e idade adulta.

Com base nas informações provenientes das discussões de grupos focais, durante o período em que os participantes estiveram altamente vulneráveis ao desenvolvimento de doenças bucais, o progresso inevitável de cáries para infecções e dor dentária foram as causas fundamentais para as extrações de um e finalmente de todos os dentes, como um procedimento normativo visando à eliminação e a prevenção de dor. Os componentes programáticos tiveram um papel fundamental no desenvolvimento de normas e valores sociais, influenciando crenças individuais e comportamentos que resultaram na grande prevalência de perda dental e edentulismo observada nesta população.

A percepção amplamente disseminada de que os dentes não eram confiáveis, e que as dentaduras iriam solucionar os problemas bucais de uma só vez, tornaram estas pessoas susceptíveis a ter todos os dentes extraídos. As informações obtidas neste estudo são particularmente importantes para a atenção de populações rurais. Por exemplo, os resultados deste trabalho indicam que simplesmente aumentar a oferta de serviços

odontológicos em comunidades rurais pode não resultar em sua maior utilização se problemas com transporte, falta de educação em saúde, e se comportamentos desfavoráveis de saúde bucal persistirem.

Particularmente, convicções fatalistas acerca da perda dentária como consequência inevitável do envelhecimento, podem influenciar negativamente ou mesmo impedir a aceitação de que a perda dentária é prejudicial à saúde, e desta forma as intervenções visando à manutenção dos dentes podem ser percebidas como inúteis.

Estas percepções normativas e fatalistas acerca dos dentes naturais e percepções sobre o inevitável declínio da saúde com o envelhecimento podem ser uma expressão de uma atitude social onde estereótipos negativos acerca da velhice são comuns, como observado na sociedade contemporânea. Ao longo do tempo, as pessoas podem então aceitar estes estereótipos e consequentemente, a ideia de que o envelhecimento está inexoravelmente ligado à doença, e em particular, à perda dentária.

Legislação, desenvolvimentos científicos, e eventos socioeconômicos têm influenciado uma variedade de grupos de idosos de formas diferentes. Como resultado, diferenças com relação a comportamentos de saúde bucal existem entre diferentes coortes de idosos, variando dos idosos mais velhos aos mais jovens. Presume-se que os idosos irão apresentar maiores demandas por cuidados odontológicos à medida que eles envelhecem, e esta demanda irá refletir uma diversidade muito maior de procedimentos de cuidado bucal do que a ênfase em dentaduras, correspondente ao passado.

Assim, uma interpretação prática deste trabalho é a de que profissionais de saúde bucal, pesquisadores e pessoas envolvidas com políticas de saúde devem compreender os significados compartilhados atribuídos à saúde bucal em comunidades ou grupos sociais, para abordar corretamente os problemas enfrentados individualmente e coletivamente. Por exemplo, a influência de convicções fatalistas acerca da inevitável

perda dentária com o avanço da idade, memórias negativas acerca de modelos inapropriados de prática profissional, ansiedade e falta de confiança em terapias dentárias podem influenciar negativamente a aceitação de intervenções preventivas e curativas.

Portanto, programas de saúde pública deveriam aplicar as estratégias apropriadas para educar a população acerca da importância da saúde bucal. Por exemplo, atividades de educação em saúde na comunidade deveriam visar ambientes sociais como os centros de saúde e centros comunitários, uma vez que idosos provavelmente não receberam educação em saúde bucal quando mais jovens. Enquanto avanços em tecnologia e melhoramentos em segmentos dos ambientes físico e social podem ter um impacto positivo na saúde bucal de populações, ainda existe a necessidade de que profissionais de saúde bucal eduquem seus pacientes de acordo com suas necessidades específicas, e suportem suas habilidades para manter sua saúde bucal.

Baseado em princípios de significados compartilhados e na linguagem encontrados em uma comunidade ou grupo social, é possível desenvolver programas educacionais e no curso de sua aplicação, incorporar novo conhecimento às tradições de uma coletividade. Novas definições podem entrar no repertório de significados de um grupo, resultando em melhores práticas de saúde bucal no nível populacional. Modelos de educação e promoção em saúde bucal devem assegurar que intervenções sejam planejadas para abordar as necessidades particulares de idosos, através de modelos de atenção culturalmente apropriados.

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ANEXO 1

TERMO DE CONSENTIMENTO LIVRE E ESCLARECIDO

AOS VOLUNTÁRIOS DA PESQUISA

I – Saber conhecer o que causa as cáries dentárias entre idosos é muito importante. Entender até que ponto os sentimentos, a qualidade de vida e o desenvolvimento social têm relação com os problemas bucais vai ajudar as pessoas que trabalham com saúde da boca identificar mais cedo as pessoas que podem desenvolver estes problemas e tratar melhor as que já tem estes problemas.

O objetivo desse estudo é avaliar quanto a Depressão, Relações Sociais e a Qualidade de Vida têm de relação com a saúde da boca, especialmente com cáries e perdas dentárias, em idosos da cidade de Carlos Barbosa.

II – Os participantes deste estudo responderão a questionários com perguntas sobre saúde geral e da boca, sobre seus sentimentos e qualidade de vida. Os dentistas responsáveis pelo estudo vão explicar como está a situação da boca de todos os que forem examinados, e os dados obtidos com a realização do estudo vão servir como base para atividades educativas para a comunidade. Além dos questionários, serão realizados exames da boca e avaliação do peso corporal.

III – Não haverá riscos para os participantes do estudo, pois serão realizados apenas preenchimento de questionários, exame da boca e tomada do peso corporal.

IV – O benefício esperado é conhecer melhor quais os riscos para se ter cáries dentárias e quais as coisas que protegem contra o surgimento de doenças da boca, especialmente as cáries dentárias em idosos.

V – Todos aqueles que necessitarem de atendimentos de urgência e os que manifestarem interesse em ser atendidos devido a problemas bucais serão encaminhados para as unidades de

atenção básica do município de Carlos Barbosa. As informações obtidas da realização desse estudo servirão de base para elaboração de uma cartilha sobre saúde bucal para ser distribuída na comunidade.

Pelo presente consentimento informado, declaro que fui esclarecido, de forma clara e detalhada, livre de qualquer forma de constrangimento e obrigação, dos objetivos, da justificativa, dos procedimentos a que serei submetido, dos riscos, desconfortos e benefícios do presente projeto de pesquisa, todos acima citados.

Fui igualmente informado:

- da garantia de receber resposta a qualquer pergunta ou esclarecimento a qualquer dúvida acerca dos procedimentos, riscos, benefícios e outros assuntos relacionados com a pesquisa;

- da liberdade de retirar meu consentimento a qualquer momento, e deixar de participar do estudo, sem que isto traga prejuízo à continuação do meu cuidado e tratamento;

- da segurança que não serei identificado, e que se manterá o caráter confidencial das informações relacionadas com a minha privacidade;

- do compromisso de proporcionar informação atualizada obtida durante o estudo;

Pesquisador Responsável por esse projeto é Dalva Maria Padilha, fone (51) 99648321, tendo este documento sido revisado e aprovado pelo Comitê de Ética em Pesquisa Faculdade de Odontologia da UFRGS em / / .

Para qualquer esclarecimento ou dúvidas, antes e durante a pesquisa, entre em contato com os pesquisadores: Renato De Marchi e Dalva Maria Padilha, nos telefones (51) 91756396 e (51) 99648321.

Eu, _____, declaro que, após ler as informações acima e estar suficientemente esclarecido(a) estou plenamente de acordo com a realização do estudo. Assim, garanto minha colaboração e autorizo a minha participação, sendo responsável por ela.

DATA:

ASSINATURA: _____.

R.G:_____.

Atenção: A sua participação em qualquer tipo de pesquisa é voluntária. Em caso de dúvida quanto aos seus direitos, escreva para o Comitê de Ética em Pesquisa da Faculdade de Odontologia da UFRGS. Endereço: Av Ramiro Barcelos, 2492, CEP 90035-130, Bom Fim, PORTO ALEGRE, RS.

ANEXO 2

ENTREVISTADOR: Leia cada questão e cada resposta possível alto para os entrevistados).

1. Qual das afirmações abaixo melhor descreve a sua procura por cuidados odontológico, nos últimos quatro anos?

1. Eu nuca vou ao dentista.
2. Eu vou ao dentista quando eu tenho um problema ou quando sei que preciso ter alguma coisa (dente ou prótese) arrumada.
3. Eu vou ao dentista ocasionalmente, tenha ou não algum tipo de problema.
4. Eu vou ao dentista regularmente.

(**ENTREVISTADOR**: Leia alto cada questão e cada resposta possível para os entrevistados).

2. Com que frequência você escova os dentes?

1. Nunca.
2. Menos que uma vez por semana.
3. Uma vez por semana.

4. Uma vez a cada três ou quatro dias.

5. Uma vez por dia.

6. Duas vezes por dia.

7. Mais do que duas vezes por dia.

3. Você costuma sentir sua boca seca?

1. Sim

2. Não.

Agora vou ler uma série de questões sobre coisas que podem ou não ter acontecido com você.

4. Você teve algum dente extraído (arrancado) nos últimos quatro anos?

1. Sim.
2. Não.

5. Pensando na última consulta em que você teve um ou mais dentes extraídos nos últimos quatro anos, porque você teve dentes extraídos ao invés de mantê-los?

(**ENTREVISTADOR:** registre a razão para o primeiro dente extraído na consulta.)

Dente #1

1. Nenhum tratamento poderia ser feito para salvar o dente.
2. Outros tratamentos teriam custado muito.
3. Não valeria a pena o esforço e o tempo necessários para salvá-lo, mas não por causa do custo.
4. Precisava fazer espaço para uma ponte móvel/dentadura.
5. Outros tratamentos teriam sido muito dolorosos.
6. Porque não tive muito sucesso com outros tratamentos no passado.

7. Por que o dentista quis.

8. Outra razão, especifique _____.

9. Não se aplica.

Agora, algumas questões gerais.

6. Quando você nasceu? __ __/__ __/19__ __.

7. Qual seu sexo?

1. Masculino.

2. Feminino.

8. Qual sua raça?_____.

9. Qual seu estado civil?

1. Solteiro.

2. Casado.

3. Separado.

4. Viúvo.

5. Outro.

10. Você fuma cigarros agora?

1. Sim.

2. Não. (VÁ PARA A #13)

11. Até que ponto (série) você estudou?

1. Menos que a quarta série.

2. Completou a quarta série.

3. Menos que a oitava série.

4. Completou a oitava série.

5. Menos que o Ensino secundário.

6. Completou o Ensino secundário.

7. Ensino Superior incompleto.

8. Ensino Superior completo.

9. Pós-graduação.

12. Qual a sua renda mensal (em reais)?

_____ R$.

13. Você participa de algum grupo de terceira idade de sua comunidade, ou dos encontros de convivência de idosos de sua ou de outra comunidade?

1. Sim

2. Não

14. Com relação à moradia:

1. Moro sozinho(a).

2. Moro com familiares.

3. Moro com companheiro(a), somente.

Alguma vez um médico lhe disse que você tem:

15. Diabetes, que alguns chamam de açúcar elevado no sangue?

1. Sim.
2. Não. (VÁ PARA A 23)

16. Você ainda tem este problema?

1. Sim.
2. Não

17. Um problema do coração de qualquer tipo?

1. Sim.

2. Não.

3. Não sei.

18. Doença renal que necessite de diálise?

1. Sim.

2. Não.

3. Não sei.

19. Você tem osteoporose?

1. Sim.

2. Não.

3. Não sei.

20. Quantos medicamentos você consome por dia?

Número de medicamentos _____

Diga aos entrevistados: "Este é o final da entrevista. Nós gostaríamos de agradecê-los por serem tão simpáticos respondendo todas estas perguntas. Antes de encerrarmos, vocês tem alguma pergunta sobre como a entrevista ou as informações vão ser utilizadas por nós".

(**ENTREVISTADOR**: revise todas as páginas para verificar se alguma ficou em branco ou foi esquecida inadvertidamente).

ANEXO 3

Ficha Clínica

Nome do paciente:_____ID:_____
Data: _____ Examinador:_____

IPV

18			17			16			15			14			13			12			11		
dv	v	mv	dv	v	mv	dv	v	mv	dv	v	mv	dv	v	mv	dv	v	mv	dv	v	mv	dv	v	mv
dp	p	mp	dp	p	mp	dp	p	mp	dp	p	mp	dp	p	mp	dp	p	mp	dp	p	mp	dp	p	mp

21			22			23			24			25			26			27			28		
mv	v	dv	mv	v	dv	mv	v	dv	mv	v	dv	mv	v	dv	mv	v	dv	mv	v	dv	mv	v	dv

mp	p	dp	mp	p	dp	mp	p	dp	mp	p	dp	mp	p	dp	mp	p	dp	mp	p	dp	mp	p	dp

mv	v	dv	mv	v	dv	mv	v	dv	mv	v	dv	mv	v	dv	mv	v	dv	mv	v	dv	mv	v	dv
ml	p	dl	ml	p	dl	ml	p	dl	ml	p	dl	ml	p	dl	ml	p	dl	ml	p	dl	ml	p	dl
31			32			33			34			35			36			37			38		

mv	v	dv	mv	v	dv	mv	v	dv	mv	v	dv	mv	v	dv	mv	v	dv	mv	v	dv	mv	v	dv
ml	p	dl	ml	p	dl	ml	p	dl	ml	p	dl	ml	p	dl	ml	p	dl	ml	p	dl	ml	p	dl
48			47			46			45			44			43			42			41		

ÍNDICE CPOD

Coroa																
Raiz																
	48	47	46	45	44	43	42	41	31	32	33	34	35	36	37	38

	18	17	16	15	14	13	12	11	21	22	23	24	25	26	27	28
Coroa																
Raiz																

ANEXO 4

GDS

Escala de Depressão Geriátrica versão reduzida (GDS-15).

		Não	Sim
1	Você está basicamente satisfeito com sua vida?	1	0
2	Você deixou muito de seus interesses e atividades?	0	1
3	Você sente que sua vida está vazia?	0	1
4	Você se aborrece com freqüência?	0	1
5	Você se sente de bom humor a maior parte do tempo?	1	0
6	Você tem medo que algum mal vá lhe acontecer?	0	1
7	Você se sente feliz a maior parte do tempo?	1	0
8	Você sente que a sua situação não tem saída?	0	1
9	Você prefere ficar em casa a sair e fazer coisas novas?	0	1
100	Você se sente com mais problemas de memória do que a maioria das pessoas da sua idade?	0	1
11	Você acha maravilhoso estar vivo?	1	0
12	Você se sente um inútil nas atuais circunstâncias?	0	1
13	Você se sente cheio de energia?	1	0
14	Você acha que a sua situação é sem esperanças?	0	1
15	Você sente que a maioria das pessoas da sua idade está melhor que você?	0	1

ANEXO 5

WHOQOL-breve

Instruções

Este questionário é sobre como você se sente a respeito de sua qualidade de vida, saúde e outras áreas de sua vida. **Por favor, responda a todas as questões**. Se você não tem certeza sobre que resposta dar em uma questão, por favor, escolha entre as alternativas a que lhe parece mais apropriada. Esta, muitas vezes, poderá ser sua primeira escolha. Por favor, tenha em mente seus valores, aspirações, prazeres e preocupações. Nós estamos perguntando o que você acha de sua vida, tomando como referência as **duas últimas semanas** . Por exemplo, pensando nas últimas duas semanas, uma questão poderia ser:

	Nada	Muito pouco	Médio	Muito	Completamente

Você recebe dos outros o apoio de que necessita?	1	2	3	4	5

Você deve circular o número que melhor corresponde ao quanto você recebe dos outros o apoio de que necessita nestas últimas duas semanas. Portanto, você deve circular o número 4 se você recebeu "muito" apoio como abaixo.

	Nada	Muito pouco	Médio	Muito	Completamente
Você recebe dos outros o apoio de que necessita?	1	2	3	4	5

Você deve circular o número 1 se você não recebeu "nada" de apoio.

Por favor, leia cada questão, veja o que você acha e circule no número e lhe parece a melhor resposta.

		Muito ruim	Ruim	Nem ruim nem boa	Boa	Muito boa
1	Como você avaliaria sua qualidade de vida	1	2	3	4	5

		Muito insatisfeito	Insatisfeito	Nem satisfeito nem insatisfeito	Satisfeito	Muito satifeito

2	Quão satisfeito(a) você está com a sua saúde?	1	2	3	4	5

As questões seguintes são sobre **o quanto** você tem sentido algumas coisas nas últimas duas semanas.

		Nada	Muito pouco	Mais ou menos	Bastante	Extremamente
3	Em que medida você acha que sua dor (física) impede você de fazer o que você precisa?	1	2	3	4	5
4	O quanto você precisa de algum tratamento médico para levar sua vida diária?	1	2	3	4	5
5	O quanto você aproveita a vida?	1	2	3	4	5
6	Em que medida você acha que a sua vida tem sentido?	1	2	3	4	5
7	O quanto você consegue se concentrar?	1	2	3	4	5
8	Quão seguro(a) você se sente em sua vida diária?	1	2	3	4	5
9	Quão saudável é o seu ambiente físico	1	2	3	4	5

	(clima, barulho, poluição, atrativos)?				

As questões seguintes perguntam sobre **quão completamente** você tem sentido ou é capaz de fazer certas coisas nestas últimas duas semanas.

		Nada	Muito pouco	Médio	Muito	Completamente
10	Você tem energia suficiente para seu dia-a-dia?	1	2	3	4	5
11	Você é capaz de aceitar sua aparência física?	1	2	3	4	5
12	Você tem dinheiro suficiente para satisfazer suas necessidades?	1	2	3	4	5
13	Quão disponíveis para você estão as informações que precisa no seu dia-a-dia?	1	2	3	4	5
14	Em que medida você tem oportunidades de atividade de lazer?	1	2	3	4	5

As questões seguintes perguntam sobre **quão bem ou satisfeito** você se sentiu a respeito de vários aspectos de sua vida nas últimas duas semanas.

		Muito ruim	Ruim	Nem ruim nem bom	Bom	Muito bom
15	Quão bem você é capaz de se locomover?	1	2	3	4	5

		Muito insatisfeito	Insatisfeito	Nem satisfeito nem insatisfeito	Satisfeito	Muito satisfeito
16	Quão satisfeito(a) você está com o seu sono?	1	2	3	4	5
17	Quão satisfeito(a) você está com sua capacidade de desempenhar as atividades do seu dia-a-dia?	1	2	3	4	5
18	Quão satisfeito(a) você está com sua capacidade para o trabalho?	1	2	3	4	5
19	Quão satisfeito(a) você está consigo mesmo?	1	2	3	4	5
20	Quão satisfeito(a) você está com suas relações pessoais (amigos, parentes, conhecidos, colegas)?	1	2	3	4	5
21	Quão satisfeito(a) você está com sua vida sexual?	1	2	3	4	5
22	Quão satisfeito(a) você está com o apoio que você recebe de seus	1	2	3	4	5

	amigos?					
23	Quão satisfeito(a) você está com as condições do local onde mora?	1	2	3	4	5
24	Quão satisfeito(a) você está com o seu acesso aos serviços de saúde?	1	2	3	4	5
25	Quão satisfeito(a) você está com o seu meio de transporte?	1	2	3	4	5

As questões seguintes referem-se a **com que freqüência** você sentiu ou experimentou certas coisas nas últimas duas semanas.

		Nunca	Algumas vezes	Frequen-temente	Muito Frequente-mente	Sempre
26	Com que freqüência você tem sentimentos negativos tais como mau humor, desespero, ansiedade, depressão?	1	2	3	4	5