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Catiusse Crestani Del ‘ Agnese

**ASSOCIAÇÃO ENTRE PERIODONTITE E QUALIDADE DE VIDA
RELACIONADA À SAÚDE BUCAL: REVISÃO SISTEMÁTICA E
METANÁLISE**

Santa Maria, RS

2021

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Dissertação de Mestrado apresentada ao Curso de Mestrado do Programa de Pós-Graduação em Ciências Odontológicas, da Universidade Federal de Santa Maria (UFSM, RS), como requisito parcial para obtenção do grau de **Mestre em Ciências Odontológicas**.

Orientadora: Prof.^a Dr.^a Raquel Pippi Antoniazzi

Santa Maria, RS
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Catiusse Crestani Del ‘ Agnese

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Santa Maria, RS
2021

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À minha família, meu pai Vilmar e minha mãe Marilene. Dedico também à minha avó, por ser um exemplo de força, persistência e humanidade, e por seu incentivo à educação e ao conhecimento.

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RESUMO

ASSOCIAÇÃO ENTRE PERIODONTITE E QUALIDADE DE VIDA RELACIONADA À SAÚDE BUCAL: REVISÃO SISTEMÁTICA E METANÁLISE

AUTORA: Catiusse Crestani Del ‘ Agnese
ORIENTADORA: Raquel Pippi Antoniazzi

Avaliar a percepção dos indivíduos em relação a sua saúde bucal permite uma análise multidimensional e, portanto, mais abrangente do impacto das diferentes doenças e condições bucais, como a periodontite, sobre a qualidade de vida. O objetivo desse estudo é revisar sistematicamente a associação entre periodontite e qualidade de vida relacionada à saúde bucal (QVRSB) em indivíduos adultos. Pesquisas eletrônicas foram realizadas nas bases de dados PubMed, Embase, Web of Science, LILACS e Scopus até setembro de 2020. Estudos adicionais foram identificados por meio de literatura cinza e por busca manual. Foram incluídos apenas estudos observacionais com exame clínico periodontal, definição de periodontite e um instrumento validado para mensuração da QVRSB. A escala Newcastle-Ottawa foi usada para avaliar o risco de viés. Metanálises de diferenças médias padronizadas (SMD) e diferenças médias (MD) foram realizadas. Sessenta estudos compreendendo um total de 29.924 indivíduos foram incluídos na revisão e 37 estudos foram incluídos nas meta-análises. As meta-análises com todos os instrumentos (OHIP-14/49 e OIDP, SMD 1,24, 95% CI: 0,45 a 2,04; GOHAI-ADD e OHQoL-UK, SMD -0,71, 95% CI: -1,12- a -0,29), bem como as estimativas combinadas com OHIP-14 ([log] OR 1,84, IC 95%: 1,42 a 2,38) mostraram que a periodontite está associada a pior QVRSB. Indivíduos com periodontite apresentaram 84% mais chance de relatar um impacto negativo no QVRSB. Os resultados do subgrupo (OHIP-14, MD 4,42, IC 95%: 3,00 a 5,84) mostraram que desenho do estudo, composição da amostra, comorbidades, classificação econômica do país, parâmetros usados para definir a periodontite e grupo de comparação influenciaram as estimativas combinadas. O grupo de comparação pareceu explicar aproximadamente 20% da heterogeneidade entre os estudos. Um gradiente dose-resposta foi encontrado entre a maior gravidade da doença periodontal e pior QVRSB. Nossos achados sugerem que a periodontite está associada a um impacto negativo na QVRSB. Estudos adicionais de alta qualidade são recomendados para explorar mais esta associação.

Palavras-chave: Doença Periodontal. Periodontite. Qualidade de Vida. Medidas de Resultados Relatados pelo Paciente. Adulto. Saúde Oral. Revisão Sistemática

ABSTRACT

ASSOCIATION BETWEEN PERIODONTITIS AND ORAL HEALTH-RELATED QUALITY OF LIFE: SYSTEMATIC REVIEW AND META-ANALYSIS

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ADSIVER: Raquel Pippi Antoniazzi

Assessing the perception of individuals in relation to their oral health allows for a multidimensional and, therefore, more comprehensive analysis of the impact of different oral diseases and conditions, such as periodontitis, on quality of life. The aim of this study is to systematically review the association between periodontitis and oral health-related quality of life (OHRQoL) in adult individuals. Electronic searches were performed in PubMed, Embase, Web of Science and Scopus databases up to September 2020. Additional studies were identified through grey literature and by manual search. Only observational studies with clinical periodontal examination, definition of periodontitis and a validated instrument for measuring OHRQoL were included. The Newcastle-Ottawa scale was used to assess the risk of bias. Meta-analyses of standardized mean differences (SMD) and mean differences (MD) were performed. Sixty studies comprising a total of 29,924 individuals were included in the review and 37 studies were included in the meta-analyses. The meta-analyses (OHIP-14/49 and OIDP, SMD 1.24, 95% CI: 0.45 to 2.04; GOHAI-ADD and OHQoL-UK, SMD -0.71, 95% CI: -1.12- to -0.29) as well as the pooled estimates with OHIP-14 ([log] OR 1.84, 95% CI: 1.42 to 2.38) showed that periodontitis is associated with impaired OHRQoL. Individuals with periodontitis were 84% more likely to report a negative impact on OHRQoL. The subgroup results (OHIP-14, MD 4.42, 95% CI: 3.00 to 5.84) showed that the study design, composition of the sample, economic classification of the country, parameters used to define periodontitis and type of comparison group influenced the combined estimates. The comparison group seemed to explain approximately 20% of the heterogeneity among studies. A dose-response gradient was found between greater periodontal disease severity and poorer OHRQoL. Our findings suggest that periodontitis is associated with impaired of OHRQoL. Additional high-quality studies are recommended to further explore this association.

Keywords: Periodontal disease. Quality of life. Patient Reported Outcome Measures. Adult. Oral health. Systematic Review

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LISTA DE ABREVIATURAS E SIGLAS

CPI	Índice Periodontal Comunitário
GOHAI	<i>Geriatric Oral Health Assessment Index</i>
MOHRQoL	<i>Michigan Oral Health-Related Quality of Life Scale</i>
NIC	Nível de Inserção Clínica
NOS	<i>Newcastle Ottawa Scale</i>
OHIP	<i>Oral Health Impact Profile</i>
OHRQL	<i>Oral health related QoL</i>
OHQoL-UK	<i>UK Oral Health-Related Quality-of-Life</i>
OIDP	<i>Oral Impacts on Daily Performances</i>
OMS	Organização Mundial da Saúde
PS	Profundidade de Sondagem
QVRSB	Qualidade de Vida Relacionada à Saúde Bucal
SS	Sangramento à Sondagem

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1 INTRODUÇÃO E JUSTIFICATIVA

A periodontite pode ser caracterizada como uma doença crônica, que envolve mecanismos infecciosos e inflamatórios. Seu estabelecimento e progressão são dependentes de uma disbiose entre microrganismos e hospedeiro (TONETTI et al., 2018; PAPAPANOU et al., 2018). Fatores ambientais, comportamentais e genéticos influenciam na ocorrência da doença, o que torna a periodontite multifatorial (MEYLE E CHAPPLE, 2015; PAPAPANOU et al., 2018). A periodontite grave foi considerada a 6ª condição mais prevalente (KASSEBAUM et al., 2014), afetando 9,8% da população mundial, se tornando um grande problema de saúde (BERNABÉ et al., 2020).

A periodontite provoca, como resultado de um processo de desequilíbrio estabelecido, perda dos tecidos de suporte dentário, conseqüente migração apical dos tecidos do periodonto, o que permite a propagação do biofilme bacteriano ao longo da superfície radicular (PAGE et al., 1997; TONETTI et al., 2018). A partir disso, vários outros desfechos bucais podem atingir os indivíduos acometidos por periodontite, como perda dentária, problemas funcionais, estéticos e sociais (TONETTI et al., 2015; PAPAPANOU E SUSIN, 2017; PAPAPANOU et al., 2018). Essas conseqüências estão relacionadas a um impacto negativo na percepção da qualidade de vida relacionada à saúde bucal (QVRSB) (LAWRENCE et al., 2008; BERNABÉ E MARCENES, 2010; AL HABASHNEH et al., 2012; WELLAPULI; EKANAYAKE, 2016; HE et al., 2018; FULLER et al., 2020).

A condição de doenças bucais, como periodontite, geralmente é avaliada com base em exames e parâmetros clínicos objetivos, que não são significativos para os pacientes (SHARMA et al., 2018; LOCKER; ALLEN, 2002). Podemos estabelecer a QVRSB como uma percepção multidimensional, envolvendo aspectos biológicos, sociais, psicológicos e culturais, que nos fornece uma avaliação subjetiva da percepção do indivíduo sobre sua saúde bucal (SISCHO; BRODER, 2011). Assim, a QVRSB é estabelecida como um resultado relatado pelo paciente ou um “desfecho verdadeiro”, onde o indivíduo relata sua compreensão do estado de saúde ou doença (HUJOEL, 2004). Esta informação é importante porque demonstra, de forma mais abrangente, o impacto de doenças ou condições no bem-estar de indivíduos e populações e é complementar às medidas clínicas convencionais (TSAKOS et al., 2012; LOCKER, 2004). Além de garantir que todas as dimensões sejam integradas ao cuidado do paciente (LOCKER, 2004).

Três revisões sistemáticas buscaram associar periodontite e QVRSB, a partir dos diversos instrumentos existentes e validados (AL-HARTHI et al., 2013; BUSET et al., 2016; FERREIRA et al., 2017). Esses estudos não geraram uma estimativa global da associação, mas apresentaram, como resultado da síntese qualitativa, uma pior percepção da QVRSB em indivíduos com periodontite, estabelecendo uma relação dose-resposta entre a gravidade da doença e o impacto negativo causado. Recentemente, uma metanálise sumarizou estudos de um único instrumento (OHIP-14) e demonstrou que a periodontite gerou um impacto negativo, sendo que aumentou em 4,2 a média de QVRSB (PASNIK-CHWALIK E KONOPKA, 2020).

A periodontite parece ter um impacto negativo na QVRSB, especialmente na população adulta. No entanto, em idosos, usando instrumentos específicos, como GOHAI (DARADKEH; KHADER, 2008; APPUKUTTAN et al. 2016; AGUIRRE-BUSTAMANTE et al. 2020) e em populações com comorbidades (ANGST et al., 2020; SCHMALZ et al., 2018), a associação não foi evidenciada. Aspectos relacionados ao desenho do estudo, amostra, país, critérios para definição de periodontite, instrumentos utilizados para mensurar o QVRSB, grupos de comparação, qualidade dos estudos, entre outros fatores, podem explicar os resultados controversos, além das diferentes magnitudes de associação encontradas. Até onde sabemos, nenhuma revisão sistemática anterior explorou esses fatores. Assim, o desenvolvimento de uma revisão com a estimativa global, atualizada e avaliando diferentes fatores relevantes na relação entre periodontite e QVRSB, torna-se muito relevante.

2 REFERENCIAL TEÓRICO

2.1 PERIODONTITE

A periodontite constitui-se por uma doença multifatorial, estabelecida a partir da relação complexa entre o biofilme e a resposta imunoinflamatória do hospedeiro (TONETTI et al., 2018; PAPAPANOU et al., 2018). A destruição dos tecidos de sustentação do dente ocorre a partir de uma inflamação exacerbada, mas ineficaz e sem resolução (KORNMAN, 2008). O estabelecimento e a evolução dessa doença envolvem o desequilíbrio entre múltiplos componentes, ligados a fatores genéticos, comportamentais, sistêmicos e ambientais (GENCO; BORGNAKKE, 2013; MEYLE; CHAPLE, 2015). Os fatores associados a doença podem ser modificáveis ou não modificáveis. A genética é um aspecto que está ligado à suscetibilidade e não passível de mudança. Outros aspectos, como hábitos inadequados de higiene oral, diabetes e tabagismo são passíveis de modulação e contribuem para o desenvolvimento e progressão da periodontite (GENCO; BORGNAKKE, 2013; REYNOLDS 2014; MEYLE; CHAPPLE, 2015; KORNMAN 2018).

A progressão da periodontite leva a perda dos tecidos de suporte dentário, como ligamento periodontal e osso alveolar (PAPAPANOU et al., 2018). Os resultados gerados pelo processo de evolução dessa doença, envolvem desde impactos funcionais (mastigação e fala) e estéticos importantes até à perda do elemento dentário (JOHANSSON et al., 2006; BORGES et al., 2013; TONETTI et al., 2015; PAPAPANOU; SUSIN, 2017).

A prevalência da periodontite é alta em uma perspectiva global. A doença afeta cerca de 42,2% dos adultos com idade maior ou igual a 30 anos nos Estados Unidos, atingindo nas formas leves e moderadas, 34,4% da população (EKE et al., 2018). No Brasil, a prevalência de periodontite moderada a grave em adultos entre 35 e 44 anos é de 15,3% e 5,8%, respectivamente (VETTORE; MARQUES, 2013). Kassebaum et al. (2014) realizaram uma metanálise a fim de avaliar a prevalência global da periodontite grave, a qual foi estimada em 10,8%, atingindo cerca de 734 milhões de pessoas ao redor do mundo no ano de 2010. Entre os anos de 1990 e 2010 a prevalência global, dessa mesma condição, permaneceu em 11,2%. A incidência encontrada por idade no ano de 2010 foi de 701 casos por 100.000 pessoas. Em uma revisão sistemática recente, a estimativa de prevalência global de periodontite grave, no ano de 2017, foi de 9,8%, atingindo 796 milhões de pessoas (BERNABÉ et al., 2020).

A alta ocorrência de periodontite nas diferentes populações faz com que a doença seja considerada um importante problema de saúde pública, a qual pode gerar diversos desfechos e

repercussões negativas, como incapacidades funcionais e estéticas, desigualdade social e influência desfavorável na qualidade de vida (AL HABASHNEH et al., 2012; WELLAPULI; EKANAYAKE, 2016; PAPAPANOU et al., 2018; KARAASLAN; DIKILITAS, 2019).

2.2 QUALIDADE DE VIDA RELACIONADA À SAÚDE BUCAL

O surgimento do modelo médico biopsicossocial, em resposta à mudança do conceito em saúde pela Organização Mundial da Saúde (OMS), determinou a incorporação do bem-estar físico, mental e social à saúde (WORLD HEALTH ORGANIZATION, 1948; ENGEL, 1977). A percepção multidimensional dos indivíduos, de sua posição perante os diferentes aspectos da vida (qualidade de vida), começa a ser considerada uma ferramenta válida para avaliação do paciente em diferentes áreas da saúde, incluindo a saúde bucal (THE WORLD HEALTH ORGANIZATION QUALITY OF LIFE ASSESSMENT, 1995; SISCHO; BRODER, 2011).

A saúde bucal foi definida como um estado de bem-estar funcional, estrutural, estético, fisiológico e psicossocial, sendo ela, fundamental para a saúde e qualidade de vida geral dos indivíduos (GLICK; MEYER, 2014). Dessa forma, a qualidade de vida relacionada à saúde bucal (QVRSB) reflete o conforto dos indivíduos ao comer, dormir, interagir socialmente, sua autoestima e satisfação com sua saúde bucal (DEPARTMENT OF HEALTH AND HUMAN SERVICES, 2000). Compreendendo diversas esferas da qualidade de vida: funcional, psicológica, social, desconforto, além de experiências de dor (INGLEHART; BAGRAMIAN, 2002).

Sischo e Broder (2011) desenvolveram um modelo teórico para definição da QVRSB, que envolve aspectos biológicos, sociais, psicológicos e culturais dispostos em diferentes dimensões (quadro 1). Esse modelo reconhece a influência de fatores relacionados à saúde bucal e também de fatores não bucais, como ambientais e sociais (contexto de trabalho, estrutura familiar, acesso a serviços de saúde bucal) sobre a QVRSB. Assim, Sischo e Broder (2011) definem QVRSB como uma perspectiva subjetiva dos indivíduos, referente aos vários sintomas e experiências relacionadas à saúde bucal.

Quadro1- Dimensões que compõem a QVRSB

QUALIDADE DE VIDA RELACIONADA À SAÚDE BUCAL				
Saúde Oral	Função	Expectativas de Tratamento	Ambiente	Social/emocional
Dor; Sangramento gengival; Espaços entre os dentes.	Mastigar; Falar.	Satisfação	Escola; Trabalho.	Ansiedade; Infelicidade.

Fonte: Adaptação de Sischo e Broder (2011)

A partir da mensuração da QVRSB, a percepção do paciente começa a ser levada em consideração tanto nas intervenções e processos de tomada de decisão clínica, quanto nos desfechos acompanhados pelas pesquisas em saúde (INGLEHART; BAGRAMIAN, 2002). O paciente, passa então, a exercer uma função mais atuante em seu tratamento (NAJMAN; LEVINE, 1981). Além disso, a avaliação da QVRSB nos revela limitações e disparidades existentes em relação aos cuidados em saúde bucal; englobando assim, compreensões positivas e negativas dos indivíduos, a respeito da saúde bucal e dos desfechos em saúde (PETERSEN et al., 2005; BRODER; WILSON-GENDERSON, 2007). A mensuração da QVRSB é um instrumento bastante útil para pesquisas voltadas ao planejamento de serviços de saúde, na tentativa de verificar os rumos e disposições em saúde bucal e as necessidades da população (SISCHO; BRODER, 2011). Essas pesquisas verificam grupos que estão mais associados com uma pobre QVRSB e como certas condições sistêmicas/médicas (STUANI, 2018), dentais (FULLER et al., 2020) e emocionais (LEVIN et al., 2017) estão relacionadas à uma pior percepção da QVRSB.

Assim, os indicadores sociodontários têm sido muito utilizados em epidemiologia, devido ao fato de medidas clínicas não compreenderem de forma integral o impacto das doenças/condições bucais (LOCKER; MILLER, 1994). Antes de serem utilizados, devem passar por estudos epidemiológicos em populações distintas, a fim de compreender uma relação mais sólida entre saúde bucal objetiva e subjetiva (LOCKER; MILLER, 1994). O desenvolvimento de instrumentos para mensuração de QVRSB cresce de forma contínua, principalmente daqueles voltados para condições específicas. Diferentes instrumentos foram

construídos e podem ser classificados como genéricos, medindo a saúde bucal de forma geral; ou específicos, medindo condições/doenças bucais específicas. Além disso, costumam diferir em relação ao número de itens e respostas (escores) (AL SHAMRANY, 2006). Algumas propriedades são essenciais para que esses questionários possam ser utilizados, como validade, aceitabilidade entre os indivíduos, confiabilidade, capacidade de adaptação a mudanças e interpretabilidade (INGLEHART; BAGRAMIAN, 2002). Os principais instrumentos utilizados para mensurar a relação entre periodontite e QVRSB são *Oral Health Impact Profile* (OHIP), *Geriatric Oral Health Assessment Index* (GOHAI), *Oral Impacts on Daily Performances* (OIDP), *UK Oral Health-Related Quality-of-Life* (OHQoL-UK), *Michigan Oral Health-Related Quality of Life* (MOHRQoL), *Scale Oral health related QoL* (OHRQL).

2.2.1 Oral Health Impact Profile (OHIP)

O *Oral Health Impact Profile* é o instrumento mais utilizado para avaliação da QVRSB. Essa ferramenta mensura a percepção dos indivíduos quanto ao impacto causado pelas condições e doenças bucais no seu bem-estar (SLADE, 1997). A sua confiabilidade e validade já estão bem consolidadas (SLADE; SPENCER, 1994). O OHIP-49 é um questionário abrangente, com 49 perguntas relacionadas a diferentes domínios: limitação funcional, dor física, desconforto psicológico, deficiência física, deficiência psicológica, deficiência social e desvantagens. Os indivíduos respondem, com que frequência experimentam o impacto nos últimos 12 meses. Essas respostas são expressas por uma escala Likert nas seguintes codificações: 4 = muito frequentemente, 3 = frequentemente, 2 = ocasionalmente, 1 = quase nunca e 0 = nunca (SLADE, 1997).

Uma versão simplificada confirmada a sua validade, replicabilidade e consistência com a redução de itens em um conjunto de 14 perguntas. O OHIP-14 contendo os mesmos domínios e a mesma dinâmica de aplicação se mostrou confiável, sugerindo ser válido para quantificar o impacto percebido na QVRSB (SLADE, 1997; LOCKER; ALLEN, 2002). A pontuação total do OHIP-14 varia de 0 a 56, com valores mais altos indicando pior QVRSB. Esse questionário também pode ser avaliado de uma forma dicotômica, apresentado a prevalência de indivíduos com pelo menos uma resposta "frequentemente" ou "muito frequentemente" (FOVO), ou ainda, pelo menos uma resposta "ocasionalmente", "frequentemente" ou "muito frequentemente" (OFOVO) (FULLER et al., 2020). Essas respostas indicam um maior impacto em relação aos itens. E a extensão desse impacto também pode ser calculada, a partir do número de itens

relatados com "frequentemente" ou "muito frequentemente" (WELLAPULI; EKANAYAKE, 2016).

2.2.2 Geriatric Oral Health Assessment Index (GOHAI)

O *Geriatric Oral Health Assessment Index* é um dos instrumentos de avaliação da QVRSB mais frequentemente utilizados em populações geriátricas. É uma ferramenta validada e com boa confiabilidade (ATCHISON; DOLAN, 1990; ZULUAGA et al., 2011). O questionário apresenta 12 itens relacionados a 3 dimensões distintas, sendo elas função física, psicossocial e dor ou desconforto. O domínio função inclui questões como engolir, comer e falar; o domínio função psicossocial está relacionado à preocupação e autoconsciência com a saúde bucal, insatisfação com a aparência e evitar contato social devido a problemas bucais; e o domínio dor ou desconforto relacionado a itens como uso de medicação para aliviar dores e desconforto na boca (ATCHISON, 1996; ZULUAGA et al., 2011).

Os itens recebem escores de 0 a 5, a partir de uma Escala Likert, onde 1= sempre, 2=frequentemente, 3= às vezes, 4= raramente e 5= nunca. Os escores totais podem variar de 12 a 60 pontos e as menores pontuações indicam uma influência negativa na QVRSB (ATCHISON; DOLAN, 1990; ZULUAGA et al., 2011). Assim como o OHIP, esse questionário pode ser avaliado de forma dicotômica, com impacto importante nas respostas “às vezes”, “frequentemente” e “sempre”, conforme sua prevalência ou extensão (DARADKEH; KHADER, 2008).

2.2.3 Oral Impacts on Daily Performances (OIDP)

O *Oral Impacts on Daily Performances* é um instrumento de avaliação da QVRSB desenvolvido para mensurar o quanto os problemas bucais impactam na capacidade do indivíduo realizar suas atividades diárias e o quanto eles estão relacionados a aspectos físicos, psicológicos e sociais (ADULYANON et al., 1996; ADULYANON; SHEIHAM, 1996). Ele apresenta alguns pontos positivos como o fato de ser curto e apresentar facilidade de mensuração, já que detecta os impactos sobre as atividades diárias e não sobre as condições de sentimento (ADULYANON; SHEIHAM, 1996).

O questionário apresenta 9 itens associados a 3 domínios diferentes: físico, psicológico e social. Os itens estão relacionados a comer e saborear a comida; falar e pronunciar claramente; sair para fazer compras ou visitar alguém; limpar os dentes/dentaduras; dormir e relaxar; sorrir,

rir e mostrar os dentes sem constrangimento; manter o estado emocional sem ficar irritado; desempenhar importante trabalho ou função social e desfrutar do contato com outras pessoas. Os participantes respondem se experienciaram dificuldades nesses itens devido a problemas na boca ou nos dentes nos últimos 6 meses. Os escores estão relacionados a frequência e gravidade, variando de 0 a 5. Na frequência ou regularidade das experiências, 0 representa “nunca afetado nos últimos 6 meses” e 5 “todos os dias ou quase todos os dias”. Já em relação à gravidade, a qual reflete quantos problemas a questão/item causou na vida diária do indivíduo, 0 representa “nenhum efeito” e 5 “efeito muito grave” (ADULYANON; SHEIHAM, 1996; ÖSTBERG et al., 2008).

Os escores de frequência e gravidade dos 9 itens são multiplicados e divididos pela pontuação máxima obtida (225). Por exemplo, se os itens forem pontuados com o score 5, tanto para gravidade quanto frequência, vamos multiplicar esse valor de cada forma de avaliação pelo item total (9x5x5); posteriormente esse valor deverá ser multiplicado por 100 e dividido por 225 (pontuação máxima possível). Quanto maior for a pontuação, maior o impacto dos problemas bucais na vida diária do indivíduo ou população (ADULYANON; SHEIHAM, 1996).

2.2.4 UK Oral Health-Related Quality-of-Life (OHQoL-UK)

O questionário *UK Oral Health-Related Quality-of-Life (OHQoL-UK)* foi construído a partir da concepção da população do Reino Unido em relação as principais dimensões relacionadas à QVRSB (MCGRATH et al., 2000). Ele apresentou bom desempenho geral, com boas propriedades psicométricas, apresentando confiabilidade e validade. O OHQoL-UK apresenta 16 itens divididos em 3 aspectos distintos: aspecto físico, aspecto social e aspecto psicológico (MCGRATH; BEDI, 2001).

Os indivíduos são questionados em relação aos efeitos de seus dentes, boca e/ou dentadura em cada um dos 16 itens. Os itens recebem escores de 1 a 5, a partir de uma Escala Likert, onde 1= muito ruim; 2= ruim; 3= nenhum; 4= boa; 5= muito bom. As pontuações gerais do OHQoL-UK variam de 16 a 80 (MCGRATH; BEDI 2002). Assim, quando menor o valor geral obtido, temos uma pior percepção da QVRSB. Além da pontuação total, esse instrumento pode ser analisado de modo dicotômico, por meio da prevalência das respostas de maior impacto aos itens: " ruim " ou " muito ruim”.

2.2.5 Michigan Oral Health-Related Quality of Life (MOHRQoL) Scale

A ferramenta validada para avaliação da QVRSB, *Michigan Oral Health-Related Quality of Life Scale* (MOHRQoL) apresenta 14 itens (HENSON et al., 2001). Esses, estão relacionados a 4 domínios: limitação funcional, dor / desconforto, limitação psicológica e preocupação social. As repostas para os 14 itens são dadas em uma escala Likert que varia de 1 a 5, onde 1 representa “não concordo totalmente” e 5 “concordo muito”. Para obter o valor médio total do questionário, basta somar o escore destinado a cada item. Pontuações altas indicam maior deterioração da QVRSB (MUNZ et al., 2011).

2.2.6 Oral health related QoL (OHRQL)

O *Oral health related QoL* (OHRQL) foi desenvolvido a partir do modelo de qualidade de vida relacionado à saúde bucal para higiene dental, o qual foi introduzido em 1998 (WILLIAMS et al., 1998). Esse instrumento facilita o processo de avaliação da qualidade de vida relacionada às condições e cuidados periodontais, pois reflete a visão de higienistas dentais e periodontistas (SAITO et al. 2010).

O OHRQL foi testado em relação a sua confiabilidade e validade, sendo considerado valido e confiável (GADBURY-AMYOT et al., 1999; KESELYAK; GADBURY-AMYOT, 2001). Ele apresenta 7 domínios distintos em sua composição: dor, boca seca, função mastigatória, função de fala, função social, função psicológica e percepção de saúde. No total são 22 itens distribuídos entre os 7 domínios (SAITO et al., 2011). Nos 20 primeiros itens, os indivíduos respondem em relação a 5 scores diferentes, onde 0 representa “nunca” e 4 representa “sempre”. Nos 2 últimos itens os entrevistados respondem como percebem sua saúde bucal e geral em relação aos outros indivíduos da mesma idade. A pontuação geral do OHRQL varia de 0 a 84, onde 0 está relacionado ao menor impacto possível e 84, ao maior impacto (SAITO et al., 2010).

2.3 ASSOCIAÇÃO ENTRE PERIODONTITE E QVRSB

A classificação internacional da funcionalidade, incapacidade e saúde da OMS coloca a periodontite como uma das doenças que causam modificações funcionais, estruturais e na capacidade e performance dos indivíduos. A consequência singular da periodontite é a perda dos tecidos de suporte dentário (inserção periodontal, osso alveolar e recessão gengival). As

consequências em termos de limitação de atividade, estão relacionadas a problemas funcionais e estruturais, como alteração da capacidade de mastigar, comer, falar e sorrir. Esses efeitos podem desenvolver problemas nas situações vivenciadas, como ter suas relações profissionais ou pessoais afetadas, gerando restrição da participação (WORLD HEALTH ORGANIZATION, 2002).

Desse modo, as consequências que são geradas localmente acabam promovendo resultados negativos gerais e de maior extensão. Entre eles a perda dentária, dor orofacial, dano funcional, prejuízo estético, gerado por recessão gengival, migração, mobilidade e perda dentária e halitose (PAPAPANOU; SUSIN, 2017; PAPAPANOU et al., 2018). Esses resultados negativos podem provocar danos psicossociais e alterações na sua percepção em relação à QVRSB. Diversos estudos têm demonstrado essa associação em periodontite e uma pior percepção da QVRSB (LAWRENCE et al., 2008; BERNABÉ; MARCENES, 2010; AL HABASHNEH et al., 2012; WELLAPULI; EKANAYAKE, 2016; HE et al., 2018; FULLER et al., 2020).

Avaliando as características gerais e principais resultados de alguns dos estudos observacionais desenvolvidos com a finalidade de avaliar a associação entre a periodontite e a QVRSB, observamos que a maioria dos estudos apresenta delineamento transversal. Seis dos 21 estudos recrutaram suas amostras de forma aleatória (BERNABÉ; MARCENES, 2010; HABASHNEH et al. 2012; WELLAPULI; EKANAYAKE, 2016; HE et al. 2018; SOUSA et al., 2019; SULAIMAN et al., 2019). E as suas amostras totais variaram de 50 a 3.122.

Dos 21 estudos, seis realizaram ajuste para variáveis de confusão na análise de associação entre periodontite e QVRSB (LAWRENCE et al., 2008; BERNABÉ; MARCENES, 2010; AL HABASHNEH et al., 2012; WELLAPULI; EKANAYAKE, 2016; HE et al., 2018; FULLER et al., 2020). Cinco estudos avaliaram populações específicas ou com comorbidades, como mulheres grávidas, idosos, indivíduos com psoríase, leucemia e doença renal crônica em estágio final (ZENTHÖNFER et al., 2014; SCHMALZ et al., 2020; CARACHO et al., 2020; OLIVEIRA et al., 2020; COSTA et al., 2020). E apenas dois estudos aplicaram a atual definição de caso de periodontite (COSTA et al., 2020; KARAASLAN; DIKILITAS, 2019).

O instrumento de avaliação de QVRSB mais utilizado entre os estudos foi o OHIP-14 (17 estudos). Os questionários GOHAI, OIDP, OHIP-49 e OHQoL-UK foram utilizados nos quatro estudos restantes (DARADKEH; KHADER, 2008; DURHAM et al., 2013; ZENTHÖNFER et al., 2014; COSTA et al., 2020). Os parâmetros periodontais mais aplicados para diagnóstico de periodontite foram PS, NIC e sangramento à sondagem (SS). Dos 17 estudos que descreveram o protocolo de avaliação periodontal, a maioria utilizou o protocolo

completo, examinando todos os dentes; e somente três utilizaram o protocolo parcial, onde apenas alguns dentes índices são examinados (AL HABASHNEH et al., 2012; LEVIN et al., 2017; HE et al., 2018).

A associação significativa entre periodontite e QVRSB foi avaliada por 13 estudos (LAWRENCE et al., 2008; DARADKEH; KHADER, 2008; BERNABÉ; MARCENES, 2010; DURHAM et al., 2013; ELTAS et al., 2016; LEVIN et al., 2017; USTAOGLU et al., 2019; SULAIMAN et al., 2019; SOUSA et al., 2019; FULLER et al., 2020; HUSAIN et al., 2020; COSTA et al., 2020; CARACHO et al., 2020). Onze estudos mostraram maior média de escore total de QVRSB e/ou maior prevalência dos escores de maior impacto nos indivíduos que apresentavam periodontite (DARADKEH; KHADER, 2008; BERNABÉ; MARCENES, 2010; DURHAM et al., 2013; ELTAS et al., 2016; LEVIN et al., 2017; USTAOGLU et al., 2019; SOUSA et al., 2019; FULLER et al., 2020; HUSAIN et al., 2020; COSTA et al., 2020; CARACHO et al., 2020). E seis estudos encontraram um efeito significativo entre periodontite e QVRSB, de modo que a periodontite aumentou a chance ou a prevalência do indivíduo ter pior percepção da QVRSB, quando comparado àqueles sem a condição (LAWRENCE et al., 2008; LEVIN et al., 2017; SOUSA et al., 2019; FULLER et al., 2020; COSTA et al., 2020; CARACHO et al., 2020).

A associação entre a severidade e extensão da periodontite e QVRSB foi apresentada em 12 estudos. Dez deles avaliaram a severidade (AL HABASHNEH et al., 2012; ZENTHÖNFER et al., 2014; MEUSEL et al., 2015; WELLAPULI; EKANAYAKE, 2016; HE et al., 2018; SOUSA et al., 2019; KARAASLAN; DIKILITAS, 2019; OLIVEIRA et al., 2020; FULLER et al., 2020; SCHMALZ et al., 2020). E três avaliaram a extensão (BERNABÉ; MARCENES, 2010; SULAIMAN et al., 2019; SOUSA et al., 2019). Apenas dois, dos dez estudos, não encontraram associação significativa entre a severidade da doença e escore total ou prevalência dos escores de maior impacto na QVRSB (SOUSA et al., 2019; SCHMALZ et al., 2020). Dos três estudos que avaliaram a extensão, um não encontrou diferença significativa entre extensão da periodontite e prevalência de impacto na QVRSB (SOUSA et al., 2019), e os outros dois estudos, encontraram associação significativa apenas na maior extensão da doença (BERNABÉ; MARCENES, 2010; SULAIMAN et al., 2019).

Quatorze estudos buscaram relacionar a periodontite com os diferentes domínios que compõem os questionários de QVRSB (LAWRENCE et al., 2008; AL HABASHNEH et al., 2012; DURHAM et al., 2013; MEUSEL et al., 2015; ELTAS et al., 2016; WELLAPULI; EKANAYAKE, 2016; LEVIN et al., 2017; HE et al., 2018; USTAOGLU et al., 2019; SULAIMAN et al., 2019; SOUSA et al., 2019; KARAASLAN; DIKILITAS, 2019; OLIVEIRA

et al., 2020; FULLER et al., 2020). Seis desses estudos encontraram associação significativa entre periodontite ou gravidade da periodontite e todos os domínios compreendidos na ferramenta avaliada (DURHAM et al., 2013; WELLAPULI; EKANAYAKE, 2016; LEVIN et al., 2017; HE et al., 2018; KARAASLAN; DIKILITAS, 2019; FULLER et al., 2020)

2.3.1 Revisões Sistemáticas

Uma revisão geral das revisões sistemáticas foi realizada por Wong et al. (2021). Os autores resumem que existem na literatura três revisões sistemáticas que abordam a associação entre periodontite e QVRSB, avaliada por meios das diversas ferramentas validadas (AL-HARTHI et al., 2013; BUSET et al., 2016; FERREIRA et al., 2017). Posteriormente, uma metanálise foi publicada buscando avaliar essa associação (PASNIK-CHWALIK E KONOPKA, 2020).

Al-Harti et al. (2013) avaliaram somente estudos observacionais. Apenas sete estudos atenderam aos critérios de inclusão, que incluíam avaliação de perda de inserção por meio de parâmetro clínico, definição de periodontite e instrumento validado de avaliação da QVRSB. Desses sete estudos, seis evidenciaram um impacto negativo da periodontite na QVRSB. As etapas de sua realização não foram detalhadas no estudo; dessa forma, ressaltamos de forma cautelosa, que nos parece que a estratégia de busca foi bastante restrita, incluindo poucos termos.

A revisão sistemática de Buset et al. (2016), com uma estratégia de busca mais abrangente, incluiu 37 estudos, entre eles, 34 estudos observacionais (principalmente transversais) e três em que os participantes receberam intervenção (tratamento periodontal) entre as avaliações. Os estudos incluídos relatavam dados de pacientes com gengivite, periodontite crônica e agressiva, porém, o foco dos dados coletados e dos resultados sumarizados, estava na PS e na periodontite. De modo geral, o OHIP-14 foi o questionário mais utilizado para avaliação da QVRSB e a maioria dos estudos (28) encontrou associação significativa entre PS e QVRSB. Observou-se também influência do protocolo de registro periodontal (PMR- *partial mouth recording* /FMR-*full mouth recording*) na associação observada, de modo que os autores passaram a recomendar registro completo (FMR) em futuras pesquisas. Assim, os autores constataram que há associação significativa entre periodontite e QVRSB, com relação dose-resposta entre o aumento da gravidade da periodontite e a piora na percepção da QVRSB.

A questão de pesquisa de Buset et al. (2016) mostra-se bastante ampla, objetivando responder sobre o impacto de duas condições que afetam o periodonto (gingivite e periodontite) na QVRSB. O que não foi realizando, já que os autores apresentam resultados referentes somente à periodontite. Ocorre que algumas questões de pesquisa são simplesmente muito abrangentes para que, em uma única revisão sistemática, todos os estudos primários relevantes sejam incluídos, o que a torna impraticável ou limitada (THOMAS et al., 2020). Além disso, estudos de diferentes delineamentos foram incluídos na revisão; dois desses estudos apresentavam apenas o grupo de intervenção, não sendo possível realizar comparabilidade. Apenas um estudo foi descrito como ensaio clínico randomizado. Essa variabilidade entre os estudos incluídos, pode ter resultado em uma fragilidade no agrupamento e sumarização dos dados.

Ferreira et al. (2017), de forma semelhante, buscaram verificar a associação entre gingivite, periodontite e QVRSB. Foram incluídos 34 estudos e todos deveriam apresentar desenho transversal e estar no idioma inglês. Nessa revisão, um número consistentemente maior de estudos relatou dados de periodontite. Em conclusão, os autores mencionam que as doenças periodontais (gingivite e periodontite) podem afetar negativamente a percepção dos indivíduos quanto à QVRSB, com aumento desse impacto conforme evolução da gravidade da doença. A sua questão de pesquisa envolveu não só o impacto de duas condições sobre a QVRSB, como também uma ampla faixa etária, recuperando estudos integrados por adolescentes e adultos. O que pode ter contribuído para a dificuldade de síntese e união dos estudos. Apesar da questão de pesquisa ser bastante abrangente, a estratégia de busca realizada se mostrou pouco sensível.

Pasnik-chwalik e Konopka (2020) publicaram a primeira revisão sistemática com metanálise de estudos observacionais com o objetivo de verificar a associação entre periodontite na QVRSB. No entanto, incluíram apenas estudos com o instrumento OHIP-14, o que restringe sua validade externa. Os estudos incluídos deveriam apresentar a definição da doença por meio de medidas clínicas, um grupo controle, exame periodontal completo, desenho transversal ou caso-controle, ajuste para variáveis de confusão e estimativa da medida de efeito. Considerado pelos autores como os melhores estudos para avaliar a questão de pesquisa. Foram incluídos dez estudos, oito transversais e dois caso-controle. Observou-se que indivíduos com periodontite apresentam um impacto negativo no OHIP-14 em 4,2 (IC 95%: 3,10-5,31). Quando se analisou a gravidade da periodontite, não foi observado piora significativa da QVRSB na presença de periodontite leve; enquanto as periodontites moderada e severa aumentaram a probabilidade de deterioração da QVRSB em 1,64 (IC 95%: 1,12–2,40) e 3,5 vezes (IC 95%: 1,32–9,73), respectivamente.

As revisões sistemáticas existentes apresentam algumas fragilidades que acabam limitando sua validade externa, como restrição de idioma, delineamento do estudo, questionário e baixa sensibilidade nas buscas. A metanálise de Pasnik-chwalik e Konopka (2020), em especial, apresentou diversas restrições em seu processo de inclusão de estudos, além da restrição ao questionário, o que resultou em um número bastante reduzido de estudos inseridos. Além disso, fatores como delineamento do estudo, situação econômica do país, tipo de amostra, presença de comorbidades, ajuste para variáveis de confusão, entre outros fatores importantes, e que podem justificar às diferentes magnitudes de associação encontradas nos estudos, não são abordadas e exploradas nessa metanálise. Desse modo, é fundamental a realização de uma nova revisão sistemática da literatura, com atualização dos estudos, envolvendo todos os questionários validados de QVRSB, buscas sensíveis, estimativa global da associação e explorando fatores relevantes e que podem explicar, em partes, a associação apresentada nos estudos.

3 OBJETIVOS

3.1 OBJETIVO GERAL

Revisar sistematicamente estudos observacionais que avaliaram a associação entre periodontite e qualidade de vida relacionada à saúde bucal (QVRSB) em adultos.

3.2 OBJETIVOS ESPECÍFICOS

- Comparar a QVRSB de pacientes adultos com e sem periodontite;
- Avaliar o impacto da gravidade da periodontite na QVRSB;
- Determinar a associação entre periodontite e suas gravidades nos diferentes domínios que compõem a QVRSB;
- Avaliar subgrupos referentes ao delineamento do estudo; amostra; região, classificação econômica do país; instrumento de QVRSB; critérios periodontais; grupo de comparação, comorbidades sistêmicas e risco de viés.

4 HIPÓTESE CONCEITUAL

Nossa hipótese conceitual é que a periodontite está associada negativamente com a qualidade de vida relacionada à saúde bucal; apresentando variações significativas na magnitude de associação conforme o delineamento do estudo; tipo de amostra; região, classificação econômica do país; instrumento de QVRSB; critérios periodontais; grupo de comparação, presença de comorbidades sistêmicas e risco de viés.

ARTIGO – ASSOCIATION BETWEEN PERIODONTITIS AND ORAL HEALTH-RELATED QUALITY OF LIFE: A SYSTEMATIC REVIEW AND META-ANALYSIS

Esse artigo será submetido ao periódico *Journal of Clinical Periodontology* e encontra-se sob suas normas (ANEXO A).

Association between periodontitis and oral health-related quality of life: A systematic review and meta-analysis

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Abstract

Objective: Perform a systematic review addressing the association between periodontitis and oral health-related quality of life (OHRQoL) in adults.

Methods: Electronic searches were performed in the PubMed, Embase, LILACS, Web of Science and Scopus databases for articles published up to September 2020. Only observational studies with a clinical periodontal examination, a definition of periodontitis and the use of a validated instrument for measuring OHRQoL were included. The Newcastle-Ottawa scale was used to assess the risk of bias. Meta-analyses were conducted by subgroups according to the OHRQoL instrument and effect measures.

Results: Sixty studies comprising a total of 29,924 individuals were included in the review and 37 studies were included in the meta-analyses. The meta-analyses (OHIP-14/49 and OIDP, SMD 1.24, 95%CI: 0.45 to 2.04; GOHAI-ADD and OHQoL-UK, SMD -0.71, 95% CI: -1.12- to -0.29) as well as the pooled estimates with OHIP-14 ([log] OR 1.84, 95% CI: 1.42 to 2.38) showed that periodontitis is associated with impaired OHRQoL. The subgroup results showed that the study design, composition of the sample, economic classification of the country, comorbidities, parameters used to define periodontitis and type of comparison group influenced the combined estimates.

Conclusions: Our findings suggest that periodontitis is associated with compromised OHRQoL.

Keywords: Periodontal diseases. Quality of life. Adult. Oral health. Systematic Review

Clinical Relevance

Scientific rationale for the study: Periodontitis appears to have a negative impact on OHRQoL. No robust systematic review has explored the different factors relevant to this association.

Main findings: A positive association was demonstrated between periodontitis and compromised OHRQoL. Different subgroups influenced the magnitude of the estimates.

Practical implications: The results enable a better understanding of the need for policies aimed at the prevention and treatment of periodontal disease to improve OHRQoL, prioritizing certain groups and populations.

Introduction

Periodontitis is characterized as a chronic disease that involves infectious and inflammatory mechanisms. Its establishment and progression are dependent on a dysbiosis between microorganisms and the host (Papapanou et al., 2018; Tonetti, Greenwell, & Kornman, 2018). Environmental, behavioral and genetic factors exert an influence on the occurrence of periodontitis, demonstrating a multifactor etiology (Papapanou et al., 2018; Meyle & Chapple, 2015). Severe periodontitis is considered the 6th most prevalent adverse health condition (Kassebaum et al., 2014), affecting 9.8% of the world population, which makes it a considerable public health problem (Bernabé et al., 2020).

Periodontitis causes the loss of dental support tissues, with the consequent apical migration of periodontal tissues, which enables the propagation of bacterial biofilm along the root surface (Tonetti et al., 2018). As a result, several other adverse oral outcomes can affect individuals with periodontitis, such as tooth loss as well as functional, aesthetic and social problems (Papapanou & Susin, 2017; Tonetti et al., 2015). These consequences have a negative impact on the perception of oral health-related quality of life (Chwalik & Konopka, 2020; Ferreira, Dias-Pereira, Branco-de-Almeida, Martins, & Paiva, 2017; Buset et al., 2016; Al-Harhi, Cullinan, Leichter, & Thomson, 2013).

Oral diseases such as periodontitis are usually assessed based on objective clinical tests and parameters, which are not significant to patients (Sharma, Yonel, Busby, Chapple, & Dietrich, 2018; Locker & Allen, 2002). In contrast, oral health-related quality of life (OHRQoL) is a multidimensional construct involving biological, social, psychological and cultural aspects that provides a subjective assessment of the perceptions of individuals regarding their oral health (Sischo & Broder, 2011). Thus, OHRQoL is a patient-reported outcome by which individuals report their understanding of their state of health or illness (Hujoel, 2004). This is important information, as it more comprehensively demonstrates the impact of diseases or health conditions on the wellbeing of individuals and populations and is complementary to conventional clinical measures (Tsakos, Allen, Steele, & Locker, 2012; Locker, 2004), ensuring that all dimensions are integrated into patient care (Locker, 2004). Three systematic reviews investigated the association between periodontitis and OHRQoL based on the various validated instruments (Ferreira et al., 2017; Buset et al., 2016; Al-Harhi et al., 2013). While these studies did not generate a global estimate of the association, the qualitative synthesis demonstrated a worse perception of OHRQoL in individuals with periodontal disease, establishing a dose-response relationship between disease severity and the negative impact caused. A meta-analysis with 10 studies using the OHIP-14 instrument also demonstrated a negative impact on OHRQoL caused by periodontitis (Pasnik-Chwalik & Konopka, 2020).

Periodontitis appears to have a negative impact on OHRQoL, especially in the adult population. However, the association was not found in older people using specific instruments, such as the Geriatric Oral Health Assessment Index (GOHAI) (Daradkeh, Khader 2008; Appukuttan; Tadeballi, Victor, & Dharuman, 2016; Aguirre-Bustamante, Barón-López, Carmona-González, Pérez-Farinós, & Wärnberg, 2020), or in populations with comorbidities (Angst, Dutra, Manso, Moreira, & Kantorski, 2020; Schmalz et al., 2018). Aspects related to the study design, sample composition, country, criteria for defining periodontitis, instruments used to measure OHRQoL, type of comparison group, quality of the study, etc. may explain the

divergent results and the different magnitudes of association found. To the best of our knowledge, no previous systematic review has explored these factors. Consequently, the development of an updated review with a global estimate and an evaluation of different relevant factors in the association between periodontitis and OHRQoL is needed. Therefore, the aim of this study was to perform a systematic review of observational studies evaluating the association between periodontitis and OHRQoL in adults.

Material and Methods

This systematic review with meta-analysis was reported in accordance with the PRISMA guidelines (Page et al., 2021). The protocol was registered in PROSPERO under registration number CRD42021268748.

Review question

The review was developed to answer the following PECO question: "Is there an association between periodontitis and oral health-related quality of life in adults?" Participants (P): adults; Exposure (E): periodontitis diagnosed using subgingival periodontal clinical parameters - probing depth (PD) and/or clinical attachment level (CAL); Comparison (C): without periodontitis or milder forms of periodontal disease; Outcomes (O): OHRQoL measured using validated instruments.

Eligibility criteria

Observational studies with a cohort, case-control or cross-sectional design that addressed the research question were included. Studies with the following characteristics were excluded: self-reported periodontitis; absence of a definition of periodontitis; exclusive evaluation of gingivitis/gingival inflammation; and periodontitis analyzed together with another disease or oral condition. Non-original studies (literature reviews) and those involving periodontal treatment or interventions were excluded.

Search strategy

Searches were performed of the MEDLINE (via PubMed), EMBASE, LILACS, Web of Science and Scopus databases for relevant studies published up to September 2020. No restrictions were imposed regarding language or year of publication. The search strategy is presented in Table 1 (Appendix 1). Grey literature was search using the OpenGrey database. The Mendeley reference manager was used to remove duplicate studies. Studies published in the journals Journal of Periodontology, Journal of Clinical Periodontology and Journal of Periodontal Research in the previous three years were also analyzed. A hand search was performed of the reference lists of relevant articles and systematic reviews. To avoid the duplicate selection of studies, the names of authors/affiliations and the characteristics of the studies were compared. In cases of doubt, we contacted the corresponding author for clarification.

The selection process was performed independently by two reviewers (C.D and C.S). The titles and abstracts of the studies were screened considering the eligibility criteria. For studies with insufficient information in the title and abstract and those for which the abstract was not available but had a title that indicated our research question, the full text was acquired for analysis. The same reviewers then independently analyzed the full texts. The reasons for the exclusion of studies were recorded. Agreement between the reviewers was tested on 10% of the articles analyzed. Kappa scores for agreement were 81% in the first step (screening of titles and abstracts) and 100% in the second step (screening of full texts). Disagreements between the reviewers were resolved by discussion. If a disagreement persisted, the judgment of a third reviewer (R.P.A) was considered decisive.

Data extraction

Two reviewers (C.D and C.S) independently collected the following data from the studies included: citation (authors, year published); country; study design; sample characteristics (population, sample size and age); periodontal criteria and protocol for evaluating periodontitis; comparison group; OHRQoL assessment instrument; adjustments for potential confounders; presence of comorbidities; association between periodontitis and OHRQoL; presence of dose-response gradient; domains affected by periodontitis; and conclusions.

Risk of bias assessment

The methodological quality of the studies was appraised using the Newcastle-Ottawa scale for cohort studies (Wells et al., 2011) and adapted for cross-sectional studies (Moskalewicz & Oremus, 2020; Ferreira et al., 2017; Chambrone, Guglielmetti, Pannuti, & Chambrone, 2011) (Appendices 2 and 3). For our research question, case-control studies were considered cross-sectional studies with a control group. Two reviewers independently (C.D and C.S) assessed the risk of bias. The Newcastle-Ottawa scale contains eight items distributed among three domains: selection (maximum of three stars); comparability of study groups (maximum of two stars) and outcome assessment (maximum of four stars). The overall score ranges from 0 to 9 points. Scores of 0-3 were considered indicative of a high risk of bias, 4-6 points were indicative of moderate risk and ≥ 7 points were considered indicate of low risk (Lo, Mertz, & Loeb, 2014).

Data synthesis and analysis

Statistical analyses were performed using the R Statistical software (version 1.3.1093). The primary outcome was OHRQoL measured with an overall score (severity), prevalence or the extent of oral impacts. Data from all available estimates of the association between periodontitis and OHRQoL were used for meta-analyses. Three meta-analyses were performed to determine the association between periodontitis and OHRQoL. Continuous data from all OHRQoL assessment instruments were pooled in the standardized mean difference (SMD) meta-analysis. The same data from the OHIP-14 instrument were pooled in a mean difference (MD) meta-analysis. Studies with data to obtain an adjusted estimate of the odds ratio (OR) were included

in another meta-analysis (converted into a log-binomial [log]). In all meta-analyses, effect sizes and respective 95% confidence intervals were estimated using the inverse variance method and DerSimonian and Laird's random effects model. Heterogeneity was assessed by estimating the variance among studies using the Cochran Q test ($p < 0.05$) and the I^2 inconsistency test. The I^2 ranges from 0 to 100%. The 95% prediction interval (PI) was also calculated. In the presence of considerable heterogeneity ($\geq 50\%$) (Higgins et al., 2019), subgroup and/or meta-regression analyses were performed. Subgroups were evaluated according to study design (case-control/cross-sectional or cohort), sample composition (adults or older adults), cultural context in which the study was conducted (Western or Eastern), methodological quality of the studies (low/moderate or high risk of bias), comorbidities (no or yes), parameters used to define periodontitis (CAL and PD or PD alone) and comparison group (no periodontitis or gingivitis/mild periodontitis or mild/moderate periodontitis). Publication bias was analyzed using funnel plots (visually) and Egger's statistical test.

Results

Study selection

The study selection flowchart is shown in Figure 1. Screening was performed of 5742 titles/abstracts and 241 potentially eligible records were submitted to full-text analysis, 60 of which met the eligibility criteria and were included in the present systematic review. No additional studies were identified during the hand search. Among the 60 observational studies included, 23 did not provide enough information to perform meta-analyses. The authors were contacted and only one author responded, stating that the study data was not readily available. The list of studies submitted to full-text analysis and respective reasons for exclusion can be found in Table 2 (Appendix 4).

Study characteristics

Table 3 (Appendix 5) shows the results of the narrative synthesis. A total of 29,924 subjects participated in the 60 studies included. The predominant design was cross-sectional (85%). Only four were cohort studies (Goergen et al., 2021; Sonnenschein, Betzler, Kohnen, Krisam, & Kim, 2018; Goh, Nihalani, Yeung, Corbet, & Leung, 2017; Tsakos et al., 2017). The studies were carried out in 21 different countries. The countries with the highest numbers of studies were Brazil ($n = 14$) and Germany ($n = 9$). Sample size ranged from 6,549 to 29 (Roumeau et al., 2020; Tsakos et al., 2017). The samples consisted of adults and older people ($n = 20,984$), only adults ($n = 7,122$) or only older people ($n = 1,818$). Mean age ranged from 26.8 to 83.0 years (Almoznino et al., 2020; Barbe et al., 2018). Most of the participants were recruited from hospitals and health centers. Four studies defined periodontitis using the current system (Goergen et al., 2021; Caracho et al., 2020; Costa et al., 2020; Karaaslan et al., 2019) and only seven studies performed a partial periodontal examination (Almoznino et al., 2020; Levin et al., 2018; Sheng et al., 2018; Levin et al., 2017; Tsakos et al., 2017; Al Habashneh, Khader, & Salameh, 2012; Slade & Sanders, 2011).

The questionnaire most used to measure OHRQoL was the OHIP (85%), mainly in its simplified version (OHIP-14). Other questionnaires used were the GOHAI in seven studies (Aguirre-Bustamante et al., 2020; Roumeau et al., 2020; Gokturk & Yarkac, 2018a; Gokturk & Yarkac, 2018b; Appukuttan et al., 2016; Zenthöfer, Cabrera, Schröder, & Hassel, 2014; Daradkeh and Khader, 2008), OHQoL-UK in three studies (Vaziri, Haerian, Ali Morowati, Amirian, & Gholamin, 2015; Durham et al., 2013; Lopes, Gusmão, Alves, & Cimões, 2009) and the OIDP in one study (Costa et al., 2020). Among the 37 studies evaluating the association between periodontitis and OHRQoL, nine found no significant association (Aguirre-Bustamante et al., 2020; Angst et al., 2020; Roumeau et al., 2020; Barbe et al., 2020; Gokturk & Yarkaç, 2018a; Kato, Abrahamsson, Wide, & Hakeberg, 2018; Corrêa et al., 2017; Zenthöfer et al., 2014; Cornejo et al., 2013). Among the 28 studies that assessed the dose-response gradient between the severity or extent of periodontitis and OHRQoL, nine found no significant association (Aguirre-Bustamante et al., 2020; Angst et al., 2020; Santos, Pinho, & Cimões, 2020; Schmalz et al., 2020; Sousa, Pinho, Vajgel, Paiva, & Cimões, 2019; Gokturk & Yarkaç, 2018a; Schmalz et al., 2018; Schmalz et al., 2017b; Castrejón-Pérez, Borges-Yáñez, Irigoyen-Camacho, & Cruz-Hervert, 2016). All dimensions that make up instruments used to measure OHRQoL were affected by periodontitis, its severity or extent in seven studies (Fuller, Donos, Suvan, Tsakos, & Nibali, 2020; Karaaslan et al., 2019; Ustaoglu, Göller Bulut, Gümüş, & Ankarali, 2019; He, Wei, Wang, & Ji, 2018; Levin et al., 2017; Wellapuli & Ekanayake, 2016; Durham et al., 2013). In contrast, no domain was significantly associated with periodontitis in two studies (Schmalz et al., 2020; Gokturk & Yarkaç, 2018b). Among the 21 studies that evaluated domains, the most affected by periodontitis were pain, physical disability, psychological discomfort and psychological disability.

Risk of bias

In the appraisal of methodological quality, eight (13.3%), 21 (35%) and 31 (51.7%) studies had a low, moderate and high risk of bias, respectively (Appendix 6; Table 4). Among the four cohort studies, two had a moderate risk (Sonnenschein et al., 2018; Tsakos et al., 2017) and one had a low risk of bias (Goergen et al., 2021). Among the other designs, only seven had a low risk of bias (Sousa et al., 2019; He et al., 2018; Castrejón-Pérez et al., 2016; Wellapuli & Ekanayake, 2016; Al Habashneh et al., 2012; Bernabé & Marcenes, 2010; Lawrence, Thomson, Broadbent, & Poulton, 2008). Most cross-sectional (74.5%) and case-control studies (60.0%) had a high risk of bias. “Selection” was the least fulfilled domain among the studies.

Pooled estimates

Among the 60 studies included in the present systematic review, only 37 fulfilled the criteria to be included in the meta-analysis. Some studies were not included because they did not present continuous data related to the association between periodontitis and OHRQoL. The pooled meta-analysis included 32 studies involving instruments for which a higher total score denoted poorer OHRQoL and showed an association between periodontitis and compromised OHRQoL (SMD 1.24; 95% CI: 0.45 to 2.04; $p=0.002$; Figure 2). The positive pooled coefficient in the random effects model indicated a higher score (poorer OHRQoL) among individuals with

periodontitis. Considerable heterogeneity was found among the studies ($I^2 = 99\%$; $X^2 = 5.18$, $p < 0.01$). Among the studies included, 29 used the OHIP-14, one used the OIDP (Costa et al., 2020) and one used the OHIP-49 (Durham et al., 2013). Another pooled meta-analysis only included 5 studies involving instruments for which lower scores denoted a greater impact on OHRQoL. Four studies used the GOHAI-ADD instrument (Daradkeh & Khader, 2008; Zenthöfer et al., 2014; Appukuttan et al., 2016; Gokturk & Yarkaç, 2018a; Aguirre-Bustamante et al., 2020) and one used the OHQoL-UK (Vaziri et al., 2015). The negative pooled coefficient indicates a lower score (poorer OHRQoL) among individuals with periodontitis (SMD -0.71; 95% CI: -1.12- to -0.29; $p < 0.001$; Figure 2). Substantial heterogeneity was found among the studies ($I^2 = 75\%$; $X^2 = 0.15$, $p < 0.01$).

The meta-analysis of the 29 studies using the OHIP-14 (Figure 3) also showed that individuals with periodontitis had a greater impact on OHRQoL (MD 4.42; 95% CI: 3.00 to 5.84; $p < 0.001$) than their counterparts (clinically healthy periodontium, gingivitis or mild/moderate periodontitis). Considerable heterogeneity was found among the studies ($I^2 = 98\%$; $X^2 = 13.56$, $p < 0.01$). Only nine studies had information for meta-analysis with adjusted pooled estimates (Figure 4). Individuals with periodontitis were 84% more likely to report negative impacts on OHRQoL ([log] OR = 1.84; 95% CI: 1.42 to 2.38; $p < 0.001$) than their counterparts without periodontitis or no/mild periodontitis (two studies). Considerable heterogeneity was found ($I^2 = 87\%$; $X^2 = 36.81$; $p < 0.01$).

Subgroup analyses

Subgroup analyses of the meta-analysis of the studies using the OHIP-14 instrument showed statistically different pooled estimates in the comparison tests between groups, based on study design ($p = 0.001$), sample composition ($p = 0.011$), comorbidities ($p=0.022$), economic classification of the country ($p = 0.006$), comparison group ($p = 0.007$) and criteria employed to determine periodontitis ($p=0.018$) (Table 5). Cohort studies (MD 1.92; 95% CI: 0.48 to 3.36), studies with samples of older people (MD 1.86; 95% CI: 0.23 to 3.49), those conducted in high- and middle-income countries (MD 2.26; 95% CI: 1.19 to 3.33), those in which periodontitis was defined by PD alone (MD 2.19; 95% CI: 0.87 to 3.51) and those with a comparison group of individuals with gingivitis or no/mild periodontitis (MD 2.57; 95% CI: 1.45 to 3.69) showed significantly lower MDs in comparison to the respective counterparts. A stronger association was found (MD 5.89; 95% CI: 4.09 to 7.69) in studies that used comparison groups without periodontitis. When comparison groups involving individuals with mild or moderate periodontitis, no association was found between periodontitis and OHRQoL ($p = 0.154$). There appears to be a dose-response gradient in the analysis of the comparison group covariate. In populations without comorbidity, periodontitis was associated with poorer OHRQoL. In populations with comorbidity, however, the association was not evident (MD 1.05; 95% CI: -1.89 to 4.00). Although stronger associations between periodontitis and OHRQoL were found in studies conducted in Eastern cultures and those with a high risk of bias, comparison tests between groups were not statistically significant ($p > 0.05$).

The meta-regression analysis of studies using the OHIP-14 showed that cultural region, economic classification of the country and comparison group ($p < 0.05$) appeared to explain, in part, the heterogeneity among the studies. The variable that most explained heterogeneity was

comparison group ($R^2 = 22.17\%$). The remaining heterogeneity (43.3%) could not be explained by the covariates explored.

Sensitivity analysis and publication bias

Funnel plots and the results of Egger's regression test of the meta-analyses pooled with SMD ($p = 0.704$) and MD (OHIP-14) ($p = 0.205$) are displayed in Figures 5. No publication bias was evident. A sensitivity analysis was performed to assess the effect of a specific study on the pooled estimates. Studies were excluded one by one, and homogeneity and effect size were analyzed for the remaining studies. No changes in OHRQoL estimates were found, thereby confirming the stability of our results.

Discussion

The present systematic review summarizes evidence from observational studies evaluating the association between periodontitis and OHRQoL. The meta-analysis showed that periodontitis negatively impacts OHRQoL. In the meta-analysis of the different subgroups, a stronger association was found in case/control or cross-sectional studies involving samples of adults, without comorbidities, those conducted in lower middle-income countries, those that employed clinical attachment loss to determine periodontitis and those with a control group of individuals without periodontal disease. One of the strengths of the present review was the thorough, extensive search of the literature, resulting in a large number of studies and samples, which lends support to our overall combined estimates. Moreover, subgroups that could partially explain the heterogeneity were explored. Another important point is the inclusion of studies with any validated questionnaire for the assessment of OHRQoL, despite increasing the variability in the comparison among studies, this inclusion enhanced the external validity of the results.

Nearly all studies showed that periodontitis has a negative impact on OHRQoL. These results were expected, since periodontitis has functional, aesthetic and social consequences and can lead to tooth loss if not treated (Tonetti et al., 2015; Papapanou & Susin, 2017). These findings are in agreement with previous systematic reviews (Al-Harathi et al., 2013; Buset et al., 2016; Ferreira et al., 2017). The single systematic review with meta-analysis found a negative impact of periodontitis on OHRQoL using the OHIP-14, with a 33% increased probability of a reduction in OHRQoL. These data are similar to our findings but were only based on seven and five studies regarding the results of continuous data and adjusted ORs, respectively. This systematic review used a more restricted search strategy and eligibility criteria, resulting in a small number of studies and lower external validity of the results.

Our findings showed an association between periodontitis and impaired OHRQoL regardless of study design, sample composition and economic classification of the country. However, estimates in the meta-analyses with cohort studies were lower than those with case/control and cross-sectional studies. Cohort studies enable causal inferences (Hulley et al., 2015). However, only two cohort studies were analyzed in the meta-analysis, which may have diminished the analytical power. Estimates involving samples of only older adults were also lower. The older population seems to perceive a lower impact of periodontitis on OHRQoL due

to the occurrence of other conditions such individuals consider to be more important, such as the number of medications, level of care, satisfaction with oral health, educational level, marital status, functional dependence, dental caries, dentures (use, functioning and type), tooth loss, reduced sense of taste, loose teeth, halitosis and xerostomia (Zenthöfer et al., 2014; Castrejón-Pérez et al., 2016; Gokturk & Yarkaç, 2018a; Aguirre-Bustamante et al., 2020). Another possible explanation is that the OHIP-14 may underestimate the estimates, as there are specific instruments for assessing the perceptions of older people regarding OHRQoL, such as the GOHAI (El Osta et al., 2012; Ikebe et al., 2012).

Our subgroup and meta-regression analysis showed that economic differences among countries are associated with high statistical heterogeneity across studies. Economically disadvantaged countries tend to have a greater magnitude of effect on OHRQoL. Such countries have considerable socioeconomic inequalities related to oral health, with a tendency toward a reduction in material resources and access to health services among low-income individuals, leading to higher levels of disease (Solar & Irwin, 2010; Pickett & Wilkinson, 2015). No association was found in the meta-analysis of studies involving all participants with comorbidities (chronic kidney disease, leukemia and diabetes). Disorders related to specific comorbidities seem to be more associated with compromised quality of life than oral health, which is considered less important in this population (Schmalz et al., 2016; Schmalz et al., 2017a; Schmalz et al., 2017b; Muhlberg et al., 2017; Schmalz et al., 2018; Schmalz et al., 2020; Santos et al., 2020; Angst et al., 2020).

The subgroup that best explained the heterogeneity among the studies was the comparison group. Individuals with periodontitis had poorer OHRQoL than their counterparts with no/mild periodontitis or only gingivitis. The magnitude of the association was higher when individuals with periodontitis were compared to those with a healthy periodontium, indicating a dose-response gradient in OHRQoL. Severe periodontitis is associated with a greater negative impact on OHRQoL, explained by more clinical symptoms such as gingival bleeding and swelling, gingival recessions, dentin hypersensitivity, halitosis, tooth mobility, pathological migration and tooth loss (Papapanou & Susin, 2017; World Health Organization, 2002). However, in the meta-analysis comparing individuals with severe periodontitis to those with milder forms (mild or mild/moderate periodontitis), no significant association was found between periodontitis and OHRQoL. The variability in the definitions of periodontitis severity and the low number of studies included in this meta-analysis may explain these findings.

The method used to define periodontitis was related to the strength of the association between periodontitis and OHRQoL. Studies that defined periodontitis by probing depth (PD) alone underestimated the association. Clinical attachment loss (CAL) is the primary parameter for determining the occurrence of periodontitis (Tonetti et al., 2018). Moreover, CAL and PD combined are considered the two key variables to evaluate in epidemiological studies (Savage, Eaton, Moles, & Needleman, 2009), making it possible to assess the severity and inflammatory complexity of the disease (Tonetti et al., 2018). Therefore, studies that evaluated CAL and PD and found a stronger association between periodontitis and OHRQoL seem to estimate the presence of periodontitis more precisely.

The present review has some difficulties and limitations related to high heterogeneity, mainly due to the diversity of methods used to assess the outcome and exposure as well as demographic and socioeconomic characteristics. Our review only included studies that defined

periodontitis based on CAL and/or PD clinical parameters, excluding two studies in which the definition was based on radiographic examinations. This decision may have influenced the estimates. However, the primary diagnosis of periodontitis is based on the clinical assessment of CAL, which is complemented when PD is included (Tonetti et al., 2018). Radiographic exams are complementary and underestimate clinical attachment loss (Vandenberghe et al., 2010; Lang & Hill, 1977). Moreover, we only included studies in which periodontitis was defined. The inclusion of studies that related PD or CAL exams to OHRQoL would further increase the heterogeneity among the studies with a diversity of cutoff points, in addition to limiting the clinical implications of the results. Another aspect to consider is that the studies predominantly had a case/control or cross-sectional design, which report exposure and outcome assessed at a single moment in time, thereby hindering the establishment of causal relationships. Cohort studies, on the other hand, enable an assessment of the temporal sequence of variables and the establishment of a causal relationship (Hulley et al., 2015). This may explain the differences in estimates when evaluating the “study design” subgroup. Approximately half of the studies had a high risk of bias, which can lead to inaccuracies and deviations in the results. However, a positive association between periodontitis and OHRQoL was found regardless of study quality, with similar pooled estimates, which diminishes the likelihood of a spurious association. Finally, 4 potentially eligible studies were not retrieved for full-text analysis, which could affect the pooled estimates.

Well-conducted studies are needed for a better clarification of the research question and should involve large representative samples, longitudinal follow-up, comparison groups with unexposed individuals, a definition of periodontitis based on clinical attachment loss, adjustments for confounding variables and high methodological quality. In conclusion, this systematic review provides aggregated information that indicates a negative impact of periodontitis on the OHRQoL of adults. Furthermore, significant impacts on OHRQoL were apparent regardless of the study design, sample composition, comorbidities, economic classification of the country, criteria for defining periodontitis and comparison group employed, despite different magnitudes of associations. While these estimates were generated from a relatively large overall sample, the findings should be interpreted with caution due to the considerable heterogeneity among the studies as well as the high risk of bias found in nearly half, which may have contributed to the direction of the results. As strategies to improve access to services for the prevention and treatment of periodontal disease, oral health policies should be implemented with a focus on the most affected populations to improve OHRQoL throughout life.

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Yadav, T., Chopra, P., & Kapoor, S. (2019). Association between chronic periodontitis and oral health-related quality of life in Indian adults. *Journal of international oral health*, 11(5):280-286. https://doi.org/10.4103/jioh.jioh_50_19

Zenthöfer, A., Rammelsberg, P., Cabrera, T., Schröder, J., & Hassel, A. J. (2014). Determinants of oral health-related quality of life of the institutionalized elderly. *Psychogeriatrics: the official journal of the Japanese Psychogeriatric Society*, 14(4):247-54. <https://doi.org/10.1111/psyg.12077>

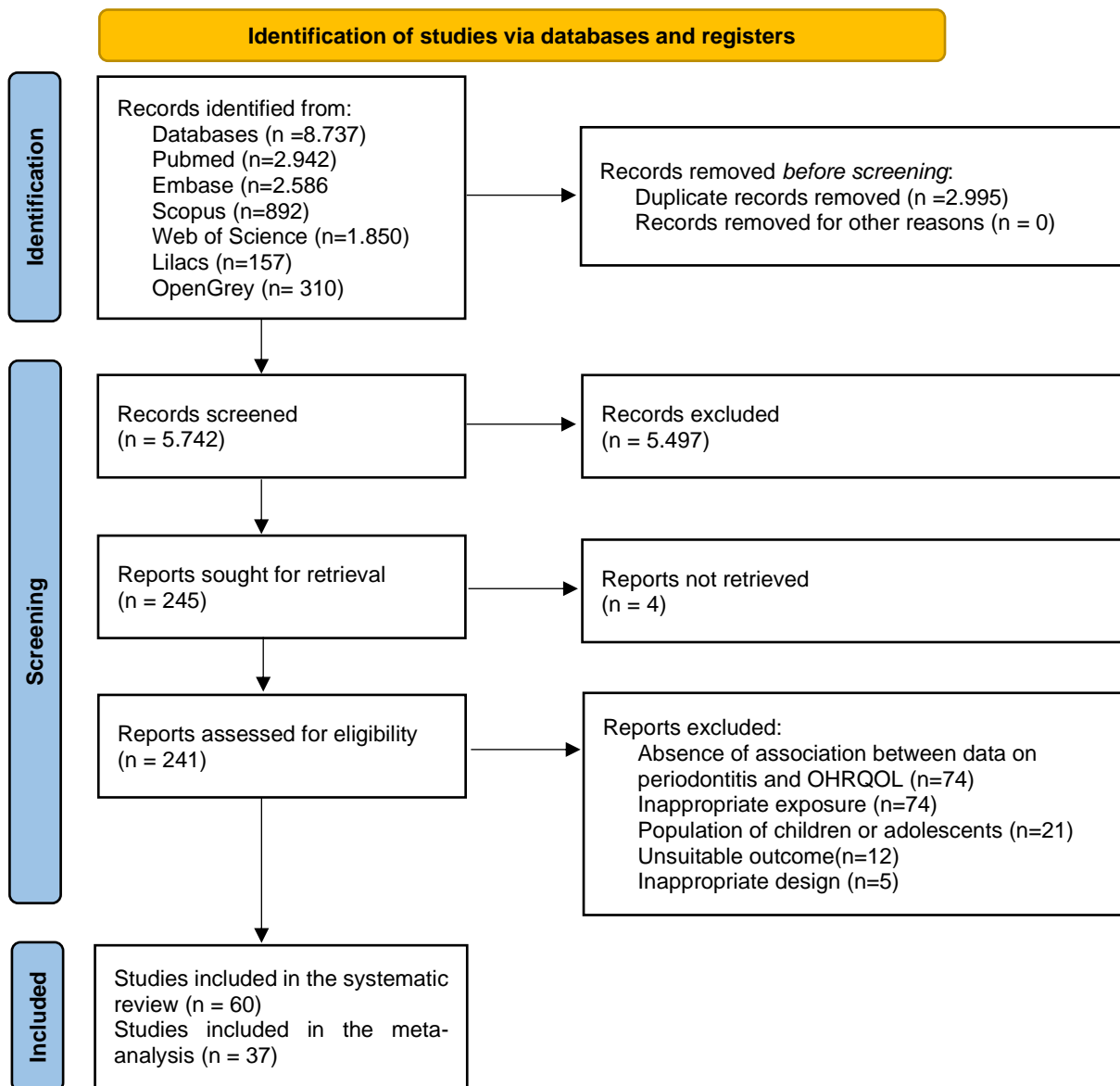


Figure 1. Flowchart of article selection process

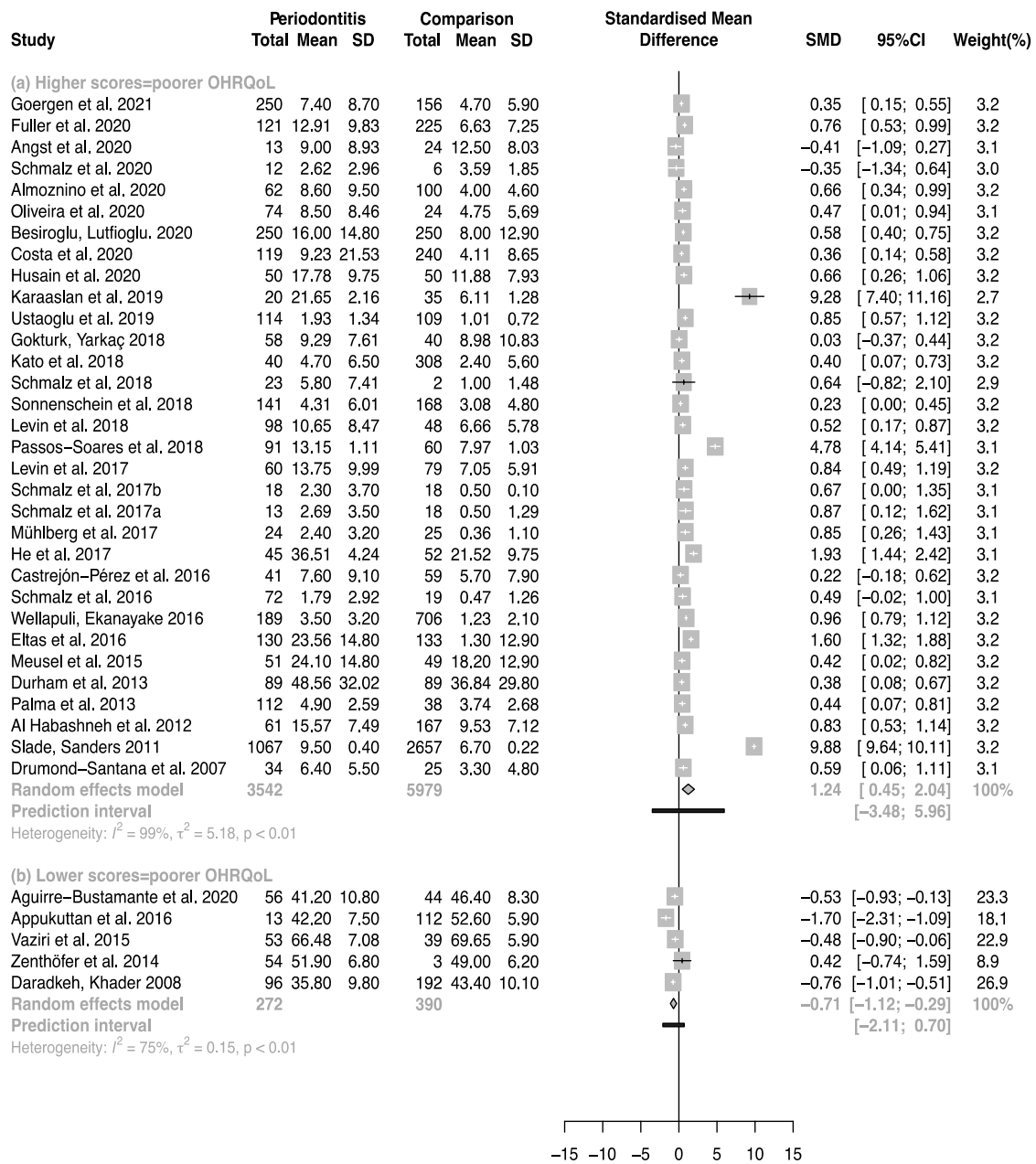


Figure 2. Pooled estimate (SMD) of studies showing association between periodontitis and compromised OHRQoL (a) Higher total OHRQoL scores; (b) Lower total OHRQoL scores.

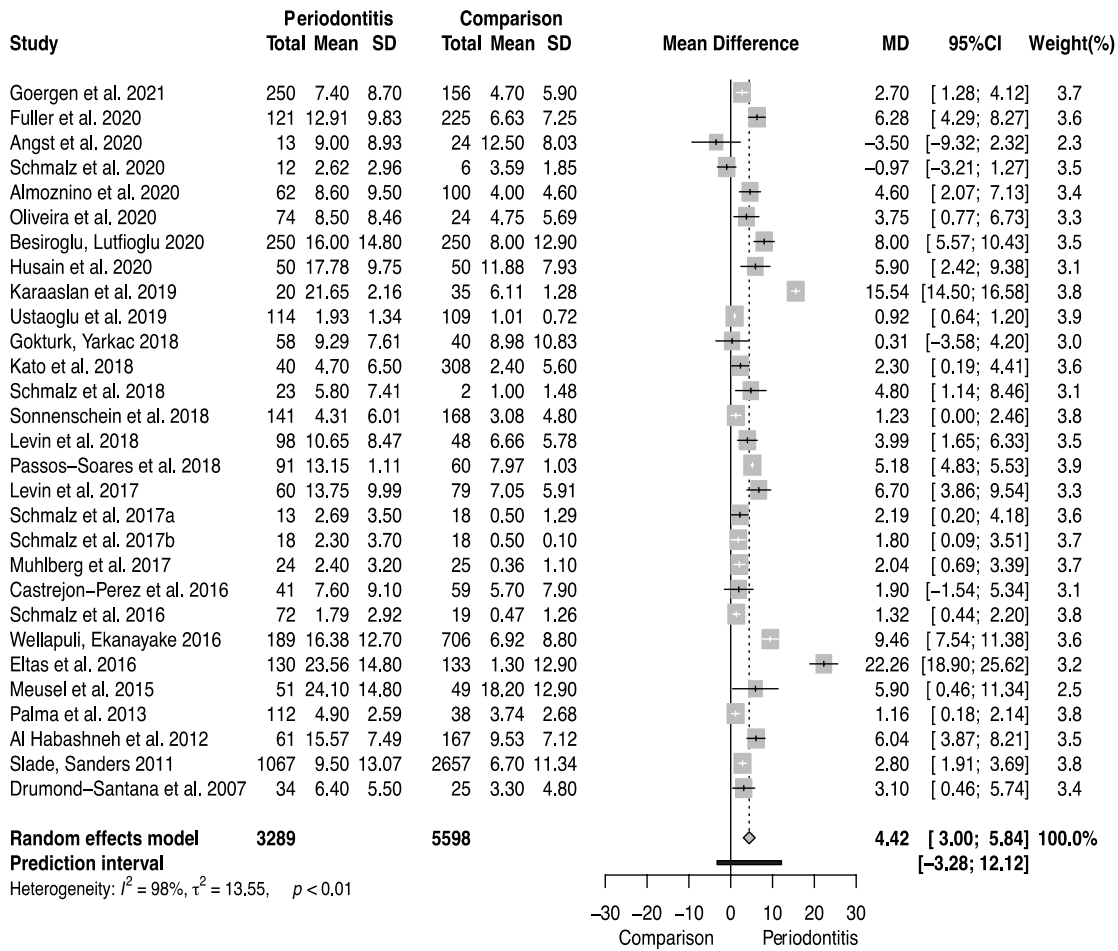


Figure 3. Pooled estimate (MD) of studies with OHIP-14 instrument showing association between periodontitis and compromised OHRQoL.

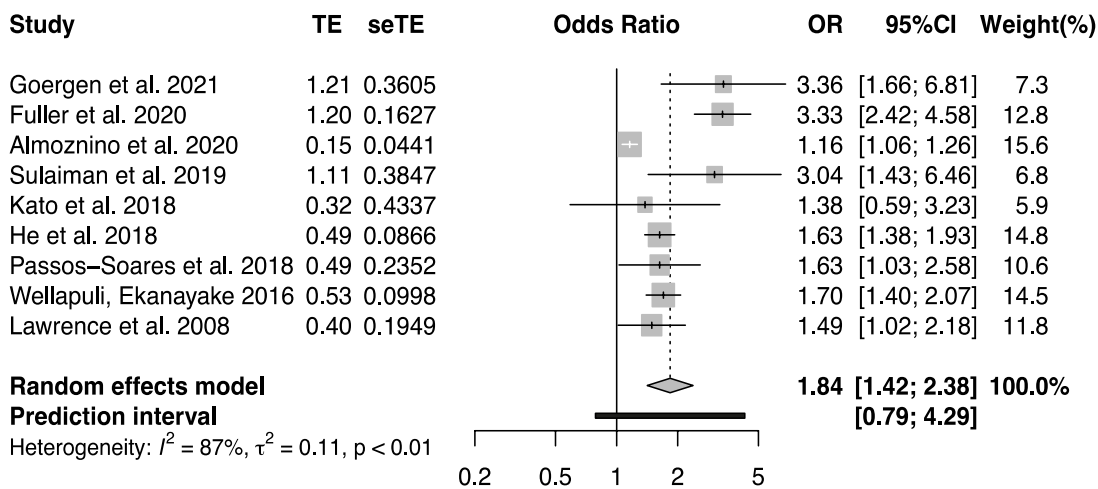


Figure 4. Pooled estimate ([log] adjusted OR) of studies with OHIP-14 instrument showing association between periodontitis and compromised OHRQoL.

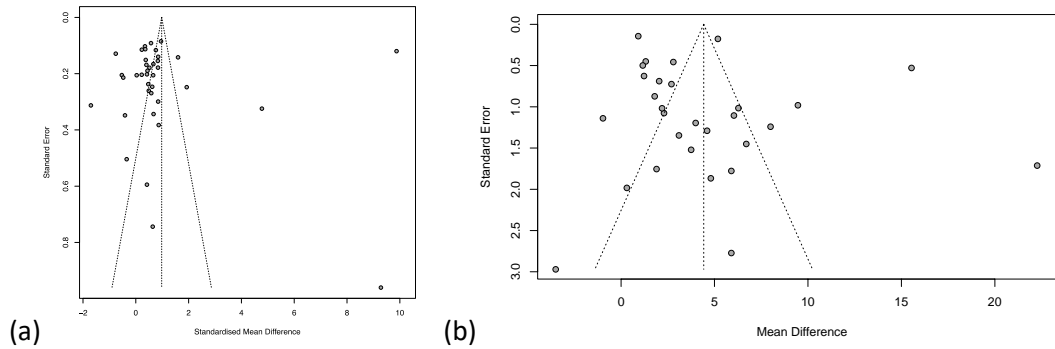


Figure 5. (a) Funnel plot of studies included in the meta-analysis. (a) SMD and (b) MD with the OHIP-14 instrument.

Table 5. Pooled estimate (MD) of association between periodontitis and OHRQoL in studies with OHIP-14 instrument according to different subgroups.

Subgroup	N	MD (95%CI)	I ² (%)	P heterogeneity	P value
Overall	29	4.42 (3.00-5.84)	98	<0.01	<0.001
Study design					0.001
Cohort	2	1.92 (0.48-3.36)	57	0.13	0.008
Case-control	4	5.89 (4.14-6.65)	10	0.34	<0.001
Cross-sectional	23	4.48 (2.82-6.15)	98	<0.01	<0.001
Sample					0.011
Adults	26	4.73 (3.22-6.24)	98	<0.01	<0.001
Older adults	3	1.86 (0.23-3.49)	0	0.68	0.025
Region					0.134
Weastern	23	3.20 (2.23-4.17)	90	<0.01	<0.001
Eastern	6	9.07 (1.45-16.69)	99	<0.01	0.019
Economic country classification					0.006
High or upper-middle income	9	2.26 (1.19-3.33)	76	<0.01	<0.001
Lower-middle income	20	5.39 (3.45-7.32)	98	<0.01	<0.001
Comorbidities					0.022
No	25	4.93 (3.40-6.46)	98	<0.01	<0.001
Yes	4	1.05 (-1.89-4.00)	73	<0.01	0.484
Periodontal criteria					0.018
PD and CAL	25	4.70 (3.10-6.30)	98	<0.01	<0.001
PD alone	4	2.19 (0.87-3.51)	59	0.06	0.001
Comparison group					0.007
No periodontitis	11	5.89 (4.09-7.69)	93	<0.01	<0.001
Gingivitis or no/mild periodontitis	14	2.57 (1.45-3.69)	89	<0.01	<0.001
Mild or mild/moderate periodontitis	4	6.64 (-2.48-50.86)	99	<0.01	0.154
Risk of bias					0.714
Low/moderate	16	4.13 (2.54-5.72)	97	<0.01	<0.001
High	13	4.80 (1.60-8.00)	98	<0.01	0.003

N, number of studies

MD, Mean difference of the association between periodontitis and OHRQoL

CI, Confidence interval.

I², statistics

Appendix 1

Table 1. Search strategies used in the respective electronic databases

Database	Search strategy	Hits
Pubmed/MEDLINE (https://www.ncbi.nlm.nih.gov/pubmed)	((((((((((((((((((((((((((((((((((((((("Periodontal Diseases"[Mesh]) OR (Disease, Periodontal)) OR (Diseases, Periodontal)) OR (Periodontal Disease)) OR (Parodontosis)) OR (Parodontoses)) OR (Pyorrhea Alveolaris)) OR (((("Periodontitis"[Mesh]) OR "Chronic Periodontitis"[Mesh]) OR "Aggressive Periodontitis"[Mesh])) OR (Periodontitides)) OR (Pericementitis)) OR (Pericementitides)) OR (Chronic Periodontitides)) OR (Periodontitides, Chronic)) OR (Periodontitis, Chronic)) OR (Adult Periodontitis)) OR (Adult Periodontitides)) OR (Periodontitides, Adult)) OR (Periodontitis, Adult)) OR (Periodontitis, Aggressive)) OR (Periodontitis, Prepubertal)) OR (Periodontitis, Circumpubertal)) OR (Circumpubertal Periodontitis)) OR (Prepubertal Periodontitis)) OR (Early-Onset Periodontitis)) OR (Early Onset Periodontitis)) OR (Early-Onset Periodontitides)) OR (Periodontitides, Early-Onset)) OR (Periodontitis, Early-Onset)) OR (Juvenile Periodontitis)) OR (Periodontitis, Juvenile)) OR (Juvenile Periodontitides)) OR (Periodontitides, Juvenile)) OR (Periodontosis)) OR (Periodontoses)) OR (Periodontitis, Aggressive, 1)) OR (Periodontal Pocket)) OR (Dental Caries[MeSH Terms])) OR (Dental Decay[Title/Abstract])) OR (Caries, Dental[Title/Abstract])) OR (Decay, Dental[Title/Abstract])) OR (Carious Dentin[Title/Abstract])) OR (Carious Dentins[Title/Abstract])) OR (Dentin, Carious[Title/Abstract])) OR (Dentins, Carious[Title/Abstract])) OR (Tooth Loss[MeSH Terms])) OR (Loss, Tooth[Title/Abstract])) OR (Xerostomia[MeSH Terms])) OR (Xerostomias[Title/Abstract])) OR (Hyposalivation[Title/Abstract])) OR (Hyposalivations[Title/Abstract])) OR (Mouth Dryness[Title/Abstract])) OR (Dryness, Mouth[Title/Abstract])) AND (((((((Quality of Life[MeSH Terms]) OR (Life Quality[Title/Abstract])) OR (Health-Related Quality Of Life[Title/Abstract])) OR (Health Related Quality Of Life[Title/Abstract])) OR (HRQOL[Title/Abstract])) OR (Life Qualities[Title/Abstract])) OR (Oral Health-Related Quality Of Life))	2.942
Embase (https://www.embase.com)	('periodontal disease'/exp OR 'periodontal attachment loss':ti,ab OR 'periodontal near/4 disease':ti,ab OR 'periodontal near/4 diseases':ti,ab OR 'tooth near/4 loss':ti,ab OR 'periodontal near/4 infection':ti,ab OR 'periodontal tissue disease':ti,ab OR 'periodontitis'/exp OR 'chronic periodontitis'/exp OR 'aggressive periodontitis'/exp OR 'periodontal near/4 pocket':ti,ab OR 'dental near/4 caries':ti,ab OR 'dental near/4 decay':ti,ab OR 'tooth near/4 caries':ti,ab OR 'caries, dental':ti,ab OR 'xerostomia':ti,ab OR 'dry near/4 mouth':ti,ab OR 'mouth near/4 dryness':ti,ab OR 'xerostomy':ti,ab) AND ('quality of life'/exp OR 'oral health related quality of life'/exp)	2.586
Scopus (https://www.scopus.com)	(TITLE-ABS ("Periodontal Diseases" OR "Disease, Periodontal" OR "Diseases, Periodontal" OR "Periodontal Disease" OR "Periodontitis" OR "Chronic Periodontitis" OR "Aggressive Periodontitis" OR "Dental Caries" OR "Dental Decay" OR "Tooth Loss" OR "Xerostomia" OR "Hyposalivation" OR "Mouth Dryness") SUBJAREA (dent)) AND (TITLE-ABS ("Quality of Life" OR "Oral Health-Related Quality Of Life") SUBJAREA (dent))	892
Web of Science (https://login.webofknowledge.com)	ab=(Periodontal near/4 diseases OR Disease, Periodontal OR Diseases, Periodontal OR Periodontal near/4 Disease OR periodontitis OR chronic near/4 periodontitis OR Aggressive near/4 Periodontitis OR Dental near/4 Caries OR Dental near/4 Decay OR tooth near/4 loss OR xerostomia OR Hyposalivation OR Mouth near/4 Dryness OR Dental near/4 Caries OR Dental near/4 Decay OR tooth near/4 loss OR xerostomia OR Hyposalivation OR Mouth near/4 Dryness) AND ab=(Quality of Life OR Life near/4 Quality OR HealthRelated Quality Of Life OR Health Related Quality Of Life OR HRQOL OR Oral Health-Related Quality Of Life)	1.850
Lilacs (lilacs.bvsalud.org)	((((((((((((((((((((((((((((((((((((((periodontal diseases) OR (Disease, Periodontal)) OR (Diseases, Periodontal)) OR (Periodontal Disease)) OR (Parodontosis)) OR (Parodontoses)) OR (Pyorrhea Alveolaris)) OR (periodontitis)) OR (chronic periodontitis)) OR (Aggressive Periodontitis)) OR (Periodontitides)) OR (Pericementitis)) OR (Pericementitides)) OR (Chronic Periodontitides)) OR (Periodontitides, Chronic)) OR (Periodontitis,	157

Appendix 2

Newcastle-Ottawa quality assessment scale for cohort studies

Note: A study can be awarded a maximum of one star for each numbered item within the Selection and Outcome categories. A maximum of two stars can be given for Comparability

Selection

- 1) Representativeness of the exposed cohort
 - a) truly representative of the average _____ (describe) in the community *
 - b) somewhat representative of the average _____ in the community *
 - c) selected group of users eg nurses, volunteers
 - d) no description of the derivation of the cohort
- 2) Selection of the non exposed cohort
 - a) drawn from the same community as the exposed cohort *
 - b) drawn from a different source
 - c) no description of the derivation of the non exposed cohort
- 3) Ascertainment of exposure
 - a) secure record (eg surgical records) *
 - b) structured interview *
 - c) written self report
 - d) no description
- 4) Demonstration that outcome of interest was not present at start of study
 - a) yes *
 - b) no

Comparability

- 1) Comparability of cohorts on the basis of the design or analysis
 - a) study controls for _____ (select the most important factor) *
 - b) study controls for any additional factor * (This criteria could be modified to indicate specific control for a second important factor.)

Outcome

- 1) Assessment of outcome
 - a) independent blind assessment *
 - b) record linkage *
 - c) self report
 - d) no description
- 2) Was follow-up long enough for outcomes to occur
 - a) yes (select an adequate follow up period for outcome of interest) *
 - b) no
- 3) Adequacy of follow up of cohorts
 - a) complete follow up - all subjects accounted for *
 - b) subjects lost to follow up unlikely to introduce bias - small number lost - > ____ % (select an adequate %) follow up, or description provided of those lost) *
 - c) follow up rate < ____% (select an adequate %) and no description of those lost
 - d) no statement

Appendix 3

Newcastle-Ottawa quality assessment scale adapted for cross-sectional studies

Note: A maximum of one star (*) is awarded for each numbered item and a maximum of two stars (**) are awarded for the items “Representativeness” and “Adjustment for confounding factors”.

SELECTION (max. 2*)

Representativeness of the sample:

- a) Truly representative of the average in the target population. (**all subjects or random sampling**) **
- b) Somewhat representative of the average in the target population. (**non-random sampling**) *
- c) Selected group of users.
- d) No description of the sampling strategy.

COMPARABILITY (max. 1*)

- a) Presence of control group (without disease) *
- c) Absence of control group

§ For the present systematic review, the control group was without exposure (without periodontal disease or less severe periodontitis).

EXPOSURE § (max. 2*)

- 1) Calibration for exposure:

- a) Calibrated examiner *

Note: Description of training/calibration procedure

- b) non-calibrated examiner

Note: report of absence of calibration; report of calibration, but with no description of procedure; kappa value and no report of whether calibration was performed

- 2) Ascertainment/assessment of periodontal conditions

- a) adequate (diagnosis based on full mouth probing measurements, i.e. PD and CAL or full mouth radiographic evaluation)*

- b) inadequate level-1 (partial mouth recording)

- c) inadequate level-2 (use of indexes with questionable value in describing the true periodontal status such as CPITN or non-probing evaluations,

- d) unclear (methods were not clear or not reported)

OUTCOME § (max. 4*)

- 1) Concealment for evaluation of outcome §

- a) Blind evaluation*

Note: Evaluation of impact concealed when expressed in text, when quality of life assessment tool was self-administered, administered by other researcher or prior to clinical examination

- b) Not blinded

§ For the present systematic review, the examiner was considered to be blinded to exposure (presence of periodontal disease) when evaluating the outcome (impact of periodontal disease on quality of life).

- 2) Adjustments for confounding factors

- a) Adjustment for confounder of outcome *

b) Adjustment for second confounder of outcome **

3) Adequacy of follow up of patients

a) complete follow up - all subjects accounted for *

b) subjects lost to follow up unlikely to introduce bias - small number lost $\geq 70\%$ follow up, or description provided of those lost) *

c) follow up rate $< 70\%$ and no description of those lost

d) no statement

Appendix 4

Table 2. Studies excluded after full text evaluation and reasons for exclusion and studies without access to the full text.

Reference for excluded study	Reason for exclusion
Association between periodontitis and Alzheimer's disease and its impact on the self-perceived oral health status: a case-control study. de Oliveira, A. R. et al. (2020)	Does not associate periodontitis and OHRQoL
Determining the minimal important difference of the Oral Health Impact Profile for Chronic Periodontitis. He, S. L. et al. (2020)	Does not associate periodontitis and OHRQoL
Parkinson's Disease, Periodontitis and Patient-Related Outcomes: A Cross-Sectional Study. Lyra, P. et al. (2020)	Does not associate periodontitis and OHRQoL
Does the third molar position influence periodontal status and overall condition of patients with acute pericoronitis? A cross-sectional study. Santos, J. F. et al. (2020)	Does not associate periodontitis and OHRQoL
Oral Health Status in Subjects with Amnesic Mild Cognitive Impairment and Alzheimer's Disease: Data from the Zabúť Aging Project. Panzarella, V. et al. (2020)	Does not associate periodontitis and OHRQoL
Oral Health-related Quality of Life and Oral Hygiene Practice of Adults with Fixed Dental Prostheses in Riyadh, Saudi Arabia. Alrummyan, A. et al. (2020)	Does not associate periodontitis and OHRQoL
A cohort study of factors that influence oral health-related quality of life from age 12 to 18 in Hong Kong. Sun, L. et al. (2020)	Does not associate periodontitis and OHRQoL and does not define periodontitis
Effects of Renal Transplantation and Hemodialysis on Patient's General Health Perception and Oral Health-Related Quality of Life: A Single-Center Cross-Sectional Study. Oduncuođlu, B. F.(2020)	Does not associate periodontitis and OHRQoL
Oral health and dental behaviour of patients with left ventricular assist device: a cross-sectional study. Garbade, J. et al. (2020)	Does not associate periodontitis and OHRQoL
Disease activity, morning stiffness and missing teeth are associated with oral health-related quality of life in individuals with rheumatoid arthritis. Schmalz, G. et al. (2020)	Does not associate periodontitis and OHRQoL
Impact of periodontal disease and chewing ability on the quality of life of the elderly in an affluent community. Liang, Y. H. et al.(2020)	Self-reported periodontitis
Reducing social inequalities in the oral health of an adult population. Silva Junior, M. F. et al. (2019)	Does not associate periodontitis and OHRQoL
Patients' perception of their oral and periodontal health and its impact: a cross-sectional study in the NHS. Midwood, I. et al.(2019)	Specific questionnaire for another oral condition
Periodontal condition, changes in salivary biochemical parameters, and oral health-related quality of life in patients with anorexia and bulimia nervosa. Chiba, F. Y. et al. (2019)	Does not associate periodontitis and OHRQoL

Oral health in children with sleep-disordered breathing: a cross-sectional study. Grillo, C. et al (2019)	Does not associate periodontitis and OHRQoL and the population is children and adolescents
Comprehensive assessment of dental behaviour and oral status in patients with tongue piercing-results of a cross-sectional study. Ziebolz, D. et al. (2020)	Does not associate periodontitis and OHRQoL
Route of Drug Abuse and its Impact on Oral Health-Related Quality of Life among Drug Addicts. Sharma, A. et al. (2018)	Does not associate periodontitis and OHRQoL
Oral health-related quality of life among individuals with rheumatoid arthritis. de Azevedo Branco, L. G. et al. (2019)	Does not associate periodontitis and OHRQoL
Oral Health Status and Oral Health-related Quality of Life According to Presence or Absence of Mucositis in Head and Neck Cancer Patients. Jung, Y. S. et al. (2019)	Does not associate periodontitis and OHRQoL
Prospective cohort of adult oral health in Piracicaba, SP, Brazil. Silva-Junior, M. F. et al. (2019)	Does not associate periodontitis and OHRQoL
Alveolar bone pattern and salivary leptin levels among premenopausal obese women. Sales-Peres, S. H. C. et al. (2019)	Does not associate periodontitis and OHRQoL
The impact of oral health on quality of life of urban and riverine populations of the Amazon: A multilevel analysis Maia, C. V. R. et al. (2018)	Periodontitis is not defined
Oral health among Dutch elite athletes prior to Rio 2016. Kragt, L. et al. (2019)	Does not associate periodontitis and OHRQoL
Methamphetamine use and oral health-related quality of life. Mukherjee, A. et al. (2018)	Questionnaire not validated
Association of Oral-Health Related Quality of Life and General Health Assessment in Patients with Rheumatoid Arthritis. Tristiu, R. et al. (2018)	Periodontitis is not defined
Impact of Oral Health and Sociodemographic Factors on Quality of Life: A Cross-sectional Study. Leao, R. S. et al. (2018)	Does not associate periodontitis and OHRQoL
Influence of a preventive program on the oral health-related quality of life (OHRQoL) of European pregnant women: a cohort study. Martínez-Beneyto, Y. et al. (2019)	Does not associate periodontitis and OHRQoL
The impact of oral health on quality of life in individuals with head and neck cancer after radiotherapy: the importance of dentistry in psychosocial issues. Santos, P. S. et al. (2017)	Does not associate periodontitis and OHRQoL
The use of crack and other illicit drugs impacts oral health-related quality of life in Brazilians. Antoniazzi, R. P. et al. (2018)	Does not associate periodontitis and OHRQoL
Oral status, quality of life, and anxiety and depression in hemodialysis patients and the effect of the duration of treatment by dialysis on these variables. Camacho-Alonso, F. et al. (2018)	Does not associate periodontitis and OHRQoL
The oral health of individuals with dental phobia: a multivariate analysis of the Adult Dental Health Survey, 2009. Heidari, E. et al. (2017)	Does not associate periodontitis and OHRQoL
Predictors of oral health-related quality of life in Iranian adolescents: A prospective study. Pakpour, A. H. (2018)	Periodontitis is not defined
Clinical registry of dental outcomes in head and neck cancer patients (OraRad): rationale, methods, and recruitment considerations. Lalla, R. V. et al. (2017)	Does not associate periodontitis and OHRQoL

Hyposalivation and xerostomia among Parkinson's disease patients and its impact on quality of life. Barbe, A. G. et al. (2017)	Does not associate periodontitis and OHRQoL
Dental health status and patient-reported outcomes at baseline in patients participating in the osteonecrosis of the jaw registry study, SWOG S0702. Van Poznak, C. H. et al. (2017)	Unspecified questionnaire
Analysis of clinical, demographic, socioeconomic, and psychosocial determinants of quality of life of persons with intellectual disability: a cross-sectional Study. Alves, N. S. (2016)	Periodontitis is not defined
Influence of oral health on quality of life in pregnant women. Moimaz, S. A. et al. (2016)	Periodontitis is not defined
Oral health-related quality of life in the elderly population receiving health care at the public hospital network in Medellín, Colombia, and its related factors. Meneses-Gómez, E. J. et al. (2016)	Self-reported oral conditions and unassessed periodontitis
Gingival recession and oral health-related quality of life: a population-based cross-sectional study in Brazil. Wagner, T. P. et al. (2016)	Periodontitis is not defined
Methods and background characteristics of the TOHNN study: a population-based study of oral health conditions in northern Norway. Holde, G. E. et al. (2016)	Questionnaire not validated and does not associate periodontitis and OHRQoL.
Impact of Oral Health on The Quality of Life of Elementary School Teachers. Lawal, F. B. et al. (2015)	Periodontitis is not defined
Oral health and quality of life: an epidemiological survey of adolescents from settlement in Pontal do Paranapanema/SP, Brazil. Leão, M. M. et al. (2015)	Population of children and adolescents and does not associate periodontitis and OHRQoL
Poor oral health including active caries in 187 UK professional male football players: clinical dental examination performed by dentists. Needleman, I. et al. (2016)	Does not show data about OHRQoL
Validation of an innovative instrument of Positive Oral Health and Well-Being (POHW). Zini, A. et al. (2016)	Periodontitis is not defined
Oral health-related quality of life and related factors among residents in a disaster area of the Great East Japan Earthquake and giant tsunami. Kishi, M. (2015)	Periodontitis is not defined
The evaluation of oral health-related factors on the quality of life of the elderly in Babol. Motallebnejad, M. et al. (2015)	Periodontitis is not defined
The impact of oral health on daily performances and its association with clinical variables in a population in Zambia. Andersson, P. et al. (2017)	Periodontitis is not defined
Assessment of Oral Conditions and Quality of Life in Morbid Obese and Normal Weight Individuals: A Cross-Sectional Study. Yamashita, J. M. et al. (2015)	Does not associate periodontitis and OHRQoL
Impact of periodontal conditions on the quality of life of pregnant women: a cross-sectional study. Lu, H. X. et al. (2015)	Periodontitis is not defined
Periodontal status and oral health-related quality of life in elderly residents of aged care homes in Delhi. Rekhi, A. et al. (2016)	Periodontitis is not defined
Impact of malocclusion and common oral diseases on oral health-related quality of life in young adults. Choi, S. H. et al. (2015)	Periodontitis is not defined
Do oral health conditions adversely impact young adults? Carvalho, J. C. et al. (2015)	Periodontitis is not defined
Impact of Oral Health Status on the Oral Health-Related Quality of Life of Brazilian Male Incarcerated Adolescents. Oliveira, D. C. et al. (2015)	Adolescent population and periodontitis not defined

Impact of periodontal status on oral health-related quality of life in patients with and without type 2 diabetes. Irani, F. C. et al. (2015)	Periodontal treatment between evaluations
Assessment and comparison of clinical dental status and its impact on oral health-related quality of life among rural and urban adults of Udaipur, India: A cross-sectional study. Sanadhya, S. et al. (2015)	Periodontitis is not defined
Oral health-related quality of life and periodontal and dental health status in Iranian hemodialysis patients. Hajian-Tilaki, A. et al. (2014)	Periodontitis is not defined
Impact of periodontal status on oral health-related quality of life among police personnel in Virajpet, India. Abhishek, K. N. (2016)	Periodontitis is not defined
Comparison of two oral health-related quality of life measures among adult dental patients. Lawal, F. B. (2015)	Periodontitis is not defined
A case-control study on oral health-related quality of life in kidney disease patients undergoing haemodialysis. Pakpour, A. H. (2015)	Periodontitis is not defined
How valid are the psychometric properties of the oral health impact profile-14 measure in adult dental patients in Ibadan, Nigeria? Lawal, F. B. et al. (2014)	Periodontitis is not defined
Periodontal treatment needs and workforce requirements: comparisons between the normative and sociodental approaches using different skill mix models. Ab-Murat, N. et al. (2015)	Does not associate periodontitis and OHRQoL
Quality of life and socio-dental impact among underprivileged Brazilian adolescents. Vazquez, F. L. et al. (2015)	Adolescent population and periodontitis not defined
The impacts of oral health on quality of life in working adults. Batista, M. J. et al. (2014)	Periodontitis is not defined
Validation of the Spanish version of the Oral Health Impact Profile (OHIP-14Sp) in elderly Chileans. León, S. et al. (2014)	Periodontitis is not defined
Sociodemographic and clinical aspects of quality of life related to oral health in adolescents. Peres, K. G. et al. (2013)	Adolescent population and periodontitis not defined
Validation of the Spanish version of the oral health impact profile to assess an association between quality of life and oral health of elderly Chileans. León, S. et al. (2016)	Periodontitis is not defined
The Canadian systemic sclerosis oral health study: orofacial manifestations and oral health-related quality of life in systemic sclerosis compared with the general population. Baron, M. et al. (2014)	Does not associate periodontitis and OHRQoL
Oral health-related quality of life and its relationship to self-reported oral discomfort and clinical status. Einarson, S. et al. (2014)	Periodontitis detected radiographically
Association between oral health status and type 2 diabetes mellitus among Sudanese adults: a matched case-control study. Mohamed, H. G. et al. (2013)	Does not associate periodontitis and OHRQoL
Does the mode of administration of the Oral Health Impact Profile-49 affect the outcome score? Desai, R. et al. (2014)	Does not associate periodontitis and OHRQoL
Relationship between oral health and its impact on the quality life of Alzheimer's disease patients: a supportive care trial. Ciccù, M. et al. (2013)	Periodontitis is not defined
Influence of the usual motivation for dental attendance on dental status and oral health-related quality of life. Montero, J. et al. (2014)	Does not associate periodontitis and OHRQoL
Impact of periodontal disease experience on oral health-related quality of life. Jansson, H. et al. (2014)	Periodontitis is not defined

Oral health of female prisoners in HMP Holloway: implications for oral health promotion in UK prisons. Rouxel, P. et al. (2013)	Does not associate periodontitis and OHRQoL
Oral conditions and their social impact among HIV dental patients, 18 years on. Liberali, S. A et al. (2013)	Does not associate periodontitis and OHRQoL
Oral Health-Related Quality of Life in institutionalized elderly in Barcelona (Spain). Cornejo, M. et al. (2013)	Periodontitis is not defined
The relationship between prosthetic status and the Geriatric Oral Health Assessment Index in a group of institutionalized elderly of an Indian city: a cross-sectional study. Shetty, V. D. et al. (2013)	Does not associate periodontitis and OHRQoL
Prevalence of oral diseases and oral-health-related quality of life in people with severe mental illness undertaking community-based psychiatric care. Patel, R. & Gamboa, A. (2012)	Periodontitis is not defined
Impact of periodontal disease on the quality of life of diabetics based on different clinical diagnostic criteria. de Pinho, A. M. et al. (2012)	Periodontitis is not defined
Construct validity of Locker's global oral health item. Thomson, W. M. et al. (2012)	Does not associate periodontitis and OHRQoL
Work stress and oral health-related quality of life among Indian information technology workers: an exploratory study. Acharya, S. & Pentapati, K. C. (2012)	Periodontitis is not defined
Changes in masticatory performance and quality of life in individuals with chronic periodontitis. Borges, T. F. et al. (2013)	Periodontitis detected radiographically
Interfaces between bariatric surgery and oral health: a longitudinal survey. Marsicano, J. A. et al. (2011)	Does not associate periodontitis and OHRQoL
Impact of oral health care needs on health-related quality of life in adult HIV+ patients. Sánchez, G. A. et al. (2011)	Periodontitis is not defined
Impact of clinical status and salivary conditions on xerostomia and oral health-related quality of life of adolescents with type 1 diabetes mellitus. Busato, I. M. et al. (2012)	Adolescent population and periodontitis not defined
Prosthetic rehabilitation and treatment outcome of partially edentulous patients with severe tooth wear: 3-years results. Katsoulis, J. (2011)	Does not present data on periodontitis
Correlation between oral health perception and clinical factors in a Brazilian community. Bandéca, M. C. et al. (2011)	Periodontitis is not defined
Oral impact on daily performance, personality traits, and compliance in periodontal maintenance therapy. Costa, F. O. et al. (2011)	Does not associate periodontitis and OHRQoL
Impact of traumatic dental injuries with unmet treatment need on daily life among Albanian adolescents: a case-control study. Thelen, D. S. et al. (2013)	Does not associate periodontitis and OHRQoL
The impact on life quality due to oral conditions in people fifty years or above. Bianco, V. C. et al. (2010)	Periodontitis is not defined
Psychometric properties of the OHIP-14 and prevalence and severity of oral health impacts in a rural riverine population in Amazonas State, Brazil. Cohen-Carneiro, F. et al. (2010)	Periodontitis is not defined
Oral health care needs and oral health-related quality of life (OHIP-14) in homeless people. Daly, B. et al. (2010)	Periodontitis is not defined
Periodontal status, tooth loss and self-reported periodontal problems effects on oral impacts on daily performances, OIDP, in pregnant women in Uganda: a cross-sectional study. Wandera, M. N. et al. (2009)	Periodontitis is not defined
Oral health-related quality of life and periodontal health status in patients undergoing hemodialysis. Guzeldemir, E. et al. (2009)	Periodontitis is not defined
Dental status of Portuguese HIV+ patients and related variables: a multivariate analysis. Santo, A. E. et al. (2010)	Periodontitis is not defined

Correlation between oral health-related quality of life (OHQoL) and oral disorders in a Turkish patient population. Caglayan, F. et al. (2009)	Does not show how periodontitis was evaluated
Impact of prosthodontic status on oral wellbeing: a cross-sectional cohort study. Montero. J. et al. (2009)	Periodontitis is not defined
Factors affecting oral health-related quality of life among pregnant women. Acharya, S. et al. (2009)	Periodontitis is not defined
Oral health and related quality of life status in patients from UK and Turkey: a comparative study in Behcet's disease. Mumcu, G. et al. (2009)	Periodontitis is not defined
A community study on the relationship of dental anxiety with oral health status and oral health-related quality of life. Ng, S. K. & Leung, W. K. (2008)	Does not associate periodontitis and OHRQoL
Measuring oral health-related quality-of-life using OHQoL-GE in periodontal patients presenting at the University of Berne, Switzerland. Aslund, M. et al. (2008)	Periodontitis is not defined
Validation the Oral Health Impact Profile (OHIP-14sp) for adults in Spain. Montero-Martín, J. et al. (2009)	Periodontitis is not defined
Oral-health-related quality of life during pregnancy. Acharya, S. & Bhat, P. V. (2009)	Periodontitis is not defined
Oral health and its impact on the life quality of homeless people in Hong Kong. Luo, Y. & McGrath, C. (2008)	It does not have a OHRQoL questionnaire.
Oral health-related quality of life among HIV-infected and at-risk women. Mulligan, R. et al. (2008)	Periodontitis is not defined
Relationship between oral health and its impact on quality of life among adolescents. Biazevic, M. G. et al. (2008)	Adolescent population and periodontitis not defined
Self-reported and clinically determined oral health status predictors for quality of life in dentate older migrant adults. Mariño, R. et al. (2008)	Periodontitis is not defined
Oral health impact of periodontal diseases in adolescents. López, R. & Baelum, V. (2007)	Adolescent population
The impact of periodontal disease on the quality of life of individuals with Down syndrome. Amaral Loureiro, A. C. et al. (2007)	Population of children and adolescents
Quality of life and disability weights associated with periodontal disease. Brennan, D. S. et al. (2007)	Uses general health-related quality of life questionnaire
Oral health-related quality of life of periodontal patients. Cunha-Cruz, J. et al. (2007)	Periodontitis is not defined
Predictors of oral health quality of life in older adults. Swoboda, J. et al. (2006)	Periodontitis is not defined
Comparison of patient-based oral health outcome measures. Jones J. A. et al. (2004)	Periodontitis is not defined
Impact of oral health on the life quality of periodontal patients. Needleman, I. et al. (2004)	Periodontitis is not defined
Oral health behind bars: a study of oral disease and its impact on the life quality of an older prison population. McGrath, C. (2002)	Does not associate periodontitis and OHRQoL
Tooth loss in the very old: 13-15-year incidence among elderly Iowans. Warren, J. J. et al. (2002)	Does not associate periodontitis and OHRQoL
The prevalence of dental impacts on daily performances in older people in Northern Thailand. Srisilapanan P. & Sheiham A. (2001)	Periodontitis is not defined
Self-reported and clinical oral health in users of VA health care. Jones, J. A. et al. (2001)	Does not associate periodontitis and OHRQoL
Hepatitis C infection and associated oral health problems. Coates, E. A. et al. (2000)	Does not associate periodontitis and OHRQoL

Variations in the social impact of oral conditions among older adults in South Australia, Ontario, and North Carolina. Slade, G. D. et al. (1996)	Periodontitis is not defined
Oral conditions and their social impact among HIV dental patients. Coates, E. et al. (1996)	Does not associate periodontitis and OHRQoL
Assessing the effect of oral diseases on oral health related quality of life of institutionalized elderly using Oral Health Impact Profile (OHIP-14) questionnaire: a pilot study. Saxena, A. et al. (2020)	Does not associate periodontitis and OHRQoL
Oral Conditions and Oral Health-Related Quality of Life of People with Ehlers-Danlos Syndromes (EDS): A Questionnaire-Based Cross-Sectional Study. Hanisch, M. et al. (2020)	Self-reported periodontitis
Periodontal status, perceived stress, diabetes mellitus and oral hygiene care on quality of life: a structural equation modelling analysis. Machado, V. et al. (2020)	Does not associate periodontitis and OHRQoL
Dentin sensitivity and the impact on the quality of life of patients with chronic periodontitis at the Federal University of Maranhão. Melo, T. L. et al. (2015)	Does not associate periodontitis and OHRQoL
The impact of oral health on quality of life in individual with head and neck cancer after radiotherapy: the importance of dentistry in psychosocial issues. Santos, P. S. S. et al. (2017)	Does not associate periodontitis and OHRQoL
Third molar: evaluation of caries, periodontal disease and quality of life and its variation concerning to dental position. Negreiros, V. & Matalon, R. (2015)	Does not associate periodontitis and OHRQoL
Saúde bucal do binômio mãe-filho: aspectos clínicos, sócio-comportamentais e qualidade de vida / Oral health of both mother and child: clinical, socio-behavioral, and quality of life. Rocha, N. B. (2014)	Periodontitis is not defined
Prospective longitudinal study of oral problems in bariatric surgery. Marsicano, J. A. (2011)	Does not associate periodontitis and OHRQoL
Impact of oral health problems on the quality of life of pregnant women. Rosell, F. L. et al. (2013)	Periodontitis is not defined
Evaluation of the Periodontal Disease/Es impact on the quality of life through the OHIP14. Alessio, L. M. et al. (2012)	Periodontitis is not defined
Interfaces between bariatric surgery and oral health: a longitudinal survey. Marsicano, J. A. et al. (2011)	Does not associate periodontitis and OHRQoL
Indicators of oral health and quality of life. Henriques, C. (2007)	Does not describe how QVRSB was evaluated
Functional Dentition in Brazilian adults: functionality evaluation and association with social determinants of health and quality of life. Hourii, L. & Chalub, L. F. (2015)	Did not show OHRQoL data
Health and quality of life of adolescents who live in a rural settlement in Pontal do Paranapanema-SP. Leão, M. M. (2015)	Adolescent population and does not associate periodontitis and OHRQoL
Cross adaptation quality of life questionnaire for periodontitis patients (Modified Indonesian version) in menopausal women. Wulandari, P. et al. (2020)	Questionnaire not presented
Oral health-related quality of life of institutionalized elderly in Serbia. Petrović, M. et al. (2017)	Does not present data on periodontitis
Spanish version of the Oral Health Impact Profile (OHIP-Sp). Lopez, R. & Baelum, V. et al. (2006)	Adolescent population and periodontitis not defined
Measuring oral health-related quality-of-life using OHQoL-GE in periodontal patients presenting at the University of Berne, Switzerland. Aslund, M. et al. (2017)	Periodontitis is not defined

Dietary habits, oral impact on daily performance and type 2 diabetes: A matched case-control study from Sudan. Mohamed, H. G. et al (2017)	Does not associate periodontitis and OHRQoL
The effects on Oral Related Quality of Life induced by periodontitis in patients with juvenile idiopathic arthritis. Polizzi, A. et al. (2020)	Adolescent population
Oral health related quality of life in patients with diabetes mellitus type 2 in the year 2012. Kakoei, S. et al. (2016)	Periodontitis is not defined
Periodontal disease and oral health-related quality of life. Goh, V. et al. (2015)	Unoriginal study.
Adaptation and content validity by expert judgment of the oral health impact profile applied to periodontal disease Rodríguez, N.I. et al. (2017)	Does not associate periodontitis and OHRQoL
Oral Health and Quality of Life Among Elderly in Thailand. Patcharaphol, S. & Lekatana, H. (2016)	Periodontitis is not defined
Influence of Periodontal Disease on QoL of Periodontal Patients in Riyadh. Al-Kattan, R. et al. (2019)	Periodontitis is not defined
Association between oral health conditions, oral health-related quality of life and nutritional status among older adults. Rosli, T. et al. (2017)	Does not present data on periodontitis
Inequalities in oral health and oral health care delivery among adults in hong kong: An analysis of extant data. McGrath, C. et al. (2011)	Does not associate periodontitis and OHRQoL
The factors that influence oral health-related quality of life in young adults (11 Medical and Health Sciences 1117 Public Health and Health Services 17 Psychology and Cognitive Sciences 1701 Psychology). Sun, L. et al. (2018)	Periodontitis is not defined
Oral health impact profile of residents of poonamallee municipality, Chennai, Tamil Nadu. Babu, N. K. et al. (2018)	Periodontitis is not defined
Relationship between Periodontitis and Psychosocial Impact in Patients with Systemic Sclerosis: A Clinical Study. Polizzi, A. et al. (2020)	Does not associate periodontitis and OHRQoL
Association between oral health status and oral health-related quality of life in diabetes patients. Amalia, Z. et al. (2018)	Periodontitis is not defined
Oral health-related quality of life in diabetic patients: comparison of the Persian version of Geriatric Oral Health Assessment Index and Oral Health Impact Profile: A descriptive-analytic study. Nikbin, A. (2014)	Periodontitis is not defined
Oral health of school's teenager. Filgueira, A. C. G. et al. (2016)	Adolescent population and does not associate periodontitis and OHRQoL
Oral health in patients with systemic sclerosis: An eustar center experience. Ancuta, C. et al. (2017)	Does not associate periodontitis and OHRQoL
Evaluation of the impact of chronic periodontitis on individual's quality of life by a self-developed tool. Musurlieva, N. & Stoykova, M. (2015)	Unidentified OHRQoL questionnaire
Impact of prosthodontic status on oral wellbeing: a cross-sectional cohort study. Montero, J. et al. (2009)	Periodontitis is not defined
Dental Status and its Impact on the Quality of Life of Elderly in Phon Sawan, Nakhon Phanom Province. Ngoenwivatkul, Y. et al. (2014)	Does not associate periodontitis and OHRQoL
Effects of periodontal health and related factors on the oral health-related quality of life in type 2 diabetic patients with chronic periodontitis. Li, Z., et al. (2011)	Periodontitis is not defined
Study references without access to the full text	
An association between periodontal disease, oral health related quality of life and disease activity in patients with ankylosing spondylitis. Suppiah, P. et al. (2013)	
Oral health related quality of life in diabetics with oral problems. Borges-Yañez, P. et al. (2015)	

Validation of Oral Health Impact Profile (OHIP) quality of life questionnaire in Russian patients with evidence of chronic generalized periodontitis. Barer, G. M. et al. (2007)

Clinical and socio-demographic factors influencing the oral health-related quality of life of Chinese elders. Zhao, L. et al. (2011)

Appendix 5

Table 3. Synthesis of data on the characteristics and main results of the studies included in the systematic review (n = 60)

Author Country	Design Sample size age (Mean±SD or Min-Max)	Periodontal criteria OHRQoL instrument	Adjusted for confounders	Association periodontitis and OHRQoL	Dose- response gradient	Domains affected	Conclusions	Risk of bias
Goergen et al. 2021 Brazil	Cohort 599; 37,9 ±13,3	P: PPD and CAL OHIP-14 Total score Prevalence: FOVO	Sex; age; smoking status; systemic diseases; tooth loss of at least one tooth over 5 years; number of teeth at the follow- up examination; dental caries at follow-up and periodontitis stage at baseline	Periodontitis was associated with impaired OHRQoL Periodontitis stage at baseline: Yes Periodontitis stage at follow-up: Yes	Yes	Stage III/IV + grade C Physical pain Physical disability Psychological disability Psychological discomfort Stage III/IV + grade B Physical disability Stage II + grade C Psychological disability	Severity (stage) and progression rate (grade) of periodontitis are associated with poor OHRQoL.	Low
Aguirre-Bustamante et al. 2020 Spain	Cross-sectional 100; 66.0 ± 4.8	P: PPD and CAL GOHAI ADD-GOHAI (57-60 high, 51-56 moderate and ≥50 low) SC-GOHAI (ranges from 0 to 12).	Sex; age; marital status; education level; smoker; self- perceived oral health; number of teeth	Periodontitis was associated with impaired OHRQoL: No	NR	NR	Periodontal disease was not associated with worse perception of OHRQoL as measured by ADD- GOHAI and SC- GOHAI	Moderate
Almoznino et al. 2020 Israel	Case-control Total 162; 26.77 ± 9.11 P: 62; 32.42 ± 10.54 Control: 100; 23.27 ± 5.85	P: PPD, BOP and CAL OHIP-14 Total score	No	Periodontitis was associated with impaired OHRQoL: Yes	NR	Functional limitation Physical pain Psychological discomfort Physical disability Psychological disability Handicap	In this sample of patients, those with periodontitis exhibited impaired diet practices, higher body mass index values, and worse OHRQoL compared to controls.	High

Angst et al. 2020	Cross-sectional	mP: PPD and CAL moP: PPD and CAL SP: PPD and CAL	Hospitalisation; gingivitis; periodontitis	Periodontitis was associated with impaired OHRQoL: No	Not significant	SP a greater prevalence of high scores for the psychosocial disability domain	Leukemia, being able to seriously compromise the systemic health, was associated with a negative influence on OHRQoL. Consequently, the patients were more concerned about their systemic condition than with their oral condition.	High
Brazil	Total 55; 42.09 ± 16.57 No/Mild Gingivitis: 32; 46.25 ± 16.19 Gingivitis: 23; 36.30 ± 15.65 NP/mP: 24; 31.25 ± 15.1 moP: 18; 49.55 ± 130.5 SP: 13; 51.77 ± 11.03	OHIP-14 Prevalence: FOVO						
Beşiroğlu & Lütflüoğlu, 2020	Cross-sectional	P: PPD and CAL	No	Periodontitis was associated with impaired OHRQoL: Yes	NR	NR	OHIP-14 scores indicated periodontal status to have an impact on quality of life.	High
Turkey	H: 250; 31 (18-60) Gingivitis: 250; 35 (18-66) P: 250; 48 (22-61)	OHIP-14 Total score						
Caracho et al. 2020	Cross-sectional	P: PPD and CAL	No	Periodontitis was associated with impaired OHRQoL: Yes	NR	NR	Pregnant women with excessive weight, assisted by the Brazilian public health-care system, presented a high impact on their quality of life during the third trimester	High
Brazil	Total: 50; 27.84 Pre-pregnancy body mass index excessive: 25; 30.08 ± 4.65 Pre-pregnancy body mass index normal: 25; 25.60 ± 6.63	OHIP-14 Total score Categorization: Low impact (< OHIP-14 ≤ 9); Moderate impact (9 < OHIP-14 ≤ 18) High impact (18 < OHIP-14 ≤ 28)						
Costa et al. 2020	Case-control	P: PPD and CAL	Diabetes; anxiolytics use; psoriasis, periodontitis	Periodontitis was associated with impaired OHRQoL: Yes	Yes	NR	It demonstrated that individuals with psoriasis and periodontitis have significantly worse OHRQoL than individuals without psoriasis and periodontitis	Moderate
Brazil	Psoriasis: 259; 49.41 ± 4.17 Control: 359; 47.47 ± 5.06	OIDP Total score						

Fuller et al. 2020 United Kingdom	Case-control AgP: 125; 33.79 ±6.18 CP: 121; 45.12 ±10.05 H: 225; 37.65 ±11.52	P: PPD and CAL OHIP-14: Total score Prevalence: OFOVO/FOVO	Smoking; age; gender; ethnicity; body mass index; Socio-economic factor	Periodontitis was associated with impaired OHRQoL: Yes	Yes	All domains were affected by periodontitis	Patients with periodontitis have worse quality of life than periodontally healthy individuals.	Moderate
Husain et al. 2020 Malaysia	Cross-sectional 100; Median 30 (IQR 29)	P: PPD OHIP-14 Total score	No	Periodontitis was associated with impaired OHRQoL: Yes	NR	NR	Individuals with periodontitis have significantly worse OHRQoL compared to gingivitis	High
Oliveira et al. 2020 Brazil	Cross-sectional 180; 51.98 ± 14.34	mP: PPD and CAL moP: PPD and CAL SP: PPD and CAL OHIP-14 Total score	Skin colour; age; schooling; smoking status; visible plaque index; periodontitis	NR	Yes	SP: Physical pain Psychological discomfort Physical disability Psychological disability mP/moP: Psychological disability	Periodontitis exerts an influence on OHRQoL in individuals with ESRD. Moreover, ESRD patients with severe periodontitis have poorer OHRQoL.	Moderate
Roumeau et al. 2020 France	Cross-sectional 29; 55.2 F 59.1 ± 16.0	P: PPD GOHAI ADD-GOHAI (the sum of all points) SC-GOHAI (OFOVO)	No	Periodontitis was associated with impaired OHRQoL: No	NR	NR	Periodontitis was not associated with change in OHRQoL in patients with acromegaly	High
Santos et al. 2020 Brazil	Cross-sectional 59; NR	P: PPD, BOP and CAL OHIP-14 Total score	No	NR	Not significant	Physical pain	The perception of the quality of life of patients with chronic periodontitis and diabetes mellitus 2 was compromised by the systemic condition, while oral health was secondary	High

Schmalz et al. 2020 Germany	Cross-sectional Total: 77; 55.6 ± 16.21 Leukaemia: 39; 55.59 ± 16.79 H: 38; 55.62 ± 15.84	SP: PPD and CAL moP: PPD and CAL NP/mP: periodontitis neither moP nor SP OHIP-14: categorized into patterns “oral function”, “psychosocial impact”, “oral pain”, and “orofacial appearance	No	NR	Not significant	No patterns was affected by the severity of periodontitis	The severity of periodontitis was not associated with worse OHRQoL, nor its patterns	High
Karaaslan et al. 2019 Turkey	Cross-sectional 99; 30,27 ±5,80	P: PPD and CAL OHIP14 Total score Score higher than the 14- poor OHRQoL	No	NR	Yes	All domains were affected by the stages and degrees of periodontitis	Stage-grade of periodontitis was associated with low OHRQoL.	High
Sousa et al. 2019 Brazil	Cross-sectional 302; 63.1	mP: PPD, BOP and CAL moP: PPD, BOP and CAL SP: PPD, BOP and CAL OHIP-14 Impact: OFOVO Absence of impact: all items were scored ≤ 1 (response options “never” and “rarely”)	Denture need; xerostomia	Periodontitis was associated with impaired OHRQoL: Yes	Not significant	Periodontitis was associated with all domains except social disability	Patients with periodontitis constitute risk for the negative impact oral health-related quality of life, independently of socioeconomic status.	Low
Sulaiman et al. 2019 Malaya	Cross-sectional Severe CP: 65; 30-44 (64.6%) HMP: 65; 30-44 (64.6%)	Severe CP: PPD and CAL OHIP-14 Total score Prevalence: FOVO	No	NR	Yes (extension)	G Severe CP: Functional Limitacion Psychological discomfort	Severe CP has a greater impact than HMP on OHRQoL. Generalised severe CP has more impacts on OHRQoL, compared to localised severe CP.	High
Ustaoglu et al. 2019 Turkey	Cross-sectional Total: 323, NR Gingivitis: 109; 23.71 ± 5.27 GCP: 114; 39.23 ± 11.32 GAgP: 100; 28.88* ± 4.02	GCP: PPD, BOP and CAL GAgP: PPD and CAL OHIP-14 Total score	No	Periodontitis was associated with impaired OHRQoL: Yes	NR	GCP All domains GAgP Physical pain Psychological discomfort Physical disability Psychological disability Handicap	GCP group showed higher disability compared to GAP..	High

Yadav et al. 2019	Cross-sectional	SP: PPD and CAL moP: PPD and CAL	No	NR	Yes	Physical pain Psychological discomfort Physical disability	OHRQoL is strongly influenced by the severity of periodontitis. With the increase in severity of periodontitis, the OHRQoL deteriorates.	High
India	450, 136 (30-40) 219 (41-50) 68 (51-60)	OHIP-14 Total score Prevalence: FOVO Extent: FOVO						
Barbe et al. 2018	Cross-sectional	P: PPD	No	Periodontitis was associated with impaired OHRQoL: No	NR	NR	Periodontitis was not correlated with OHRQoL	High
Germany	Total: 40; 83 ± 7 Fall history group: 28; 84 ± 7 Controls: 12; 81 ± 6	OHIP-14 Total score						
Gokturk and Yarkac. 2018a	Cross-sectional	CP: PPD, BOP and CAL	No	Periodontitis was associated with impaired OHRQoL: No	Not significant	NR	Periodontitis was not associated with worse OHRQoL as measured by OHIP-14 or GOHAI	High
Turkey	155; 78.48 ± 5.20	OHIP-14 GOHAI Total scores						
Gokturk e Yarkaç 2018b	Cross-sectional	moP chronic = PPD and CAL SP chronic = PPD and CAL	No	NR	Yes	No domain was affected by the severity of periodontitis	Severity of periodontitis is associated with worse OHRQoL	High
Turkey	110; 72.13±4.33	GOHAI Total Score						
He et al. 2018	Cross-sectional	mP= PPD and CAL moP= PPD and CAL SP= PPD and CAL	Sociodemographic factors (sex, age, education level, place of residence, household income and smoking history); Other clinical variables (number of teeth, dental prosthesis, and dental caries); Self-reported systemic problems; periodontitis	NR	Yes	All domains were affected by the severity of periodontitis	Chronic periodontitis has a negative impact on OHRQoL. Furthermore, OHRQoL deficiency showed a significant correlation with severity of chronic periodontitis.	Low
China	NP: 184; 35-44 (59.2%); 55-64 (26.6%); 65-74 (14.2%) P: 296; 35-44 (19.9%); 55-64 (37.5%); 65-74 (42.6%)	OHIP14 Total score Score above the median Prevalence: FOVO						
Holde et al. 2018	Cross-sectional	SP: PPD and CAL moP: PPD and CAL mP: PPD and CAL	No	Periodontitis was associated with impaired OHRQoL: Yes	NR	NR	Periodontitis has a negative oral impact affecting OHRQoL	High
Norway	1819; 47.1 ± 15.2	OHIP-14						

Kato et al. 2018	Cross-sectional	P: PPD	Extent of periodontitis; number of teeth; sex; age	Periodontitis was associated with impaired OHRQoL:	Yes (extension)	Domains affected by the extent of periodontitis: Functional limitation Physical pain Physical disability Handicap	Participants with a generalised form of periodontitis demonstrated poorer OHRQoL than the participants without periodontitis and with a localised form of periodontitis.	Moderate
USA	70-y-old men: 235; 70 70-y-old women: 303; 70 78-y-old-women 148; 78 82-y-old women 118; ≥ 82	OHIP-14 Total scores Degree of impact Frequently affected: FOVO Less affected		70 years old men and women: No Women aged 70, 78, 82 year or older: No				
Levin et al. 2018	Case-control	CP: PPD, BOP and CAL	No	Periodontitis was associated with impaired OHRQoL: Yes	NR	Functional limitation Physical disability Psychological disability Social disability Handicap	Patients with chronic periodontitis showed a positive association with higher dental anxiety levels and worse OHRQoL.	High
Israel	CP: 99; 38.8 ± 7.8 Control: 49; 37.7 ± 4.3	OHIP-14						
Passos-Soares et al. 2018	Cross-sectional	P: PPD, BOP and CAL	Age; sex; schooling level; smoking habit; beyond the model's predictive variables (Exposed to caries OR Periodontitis; Exposed to caries AND periodontitis combined)	Periodontitis was associated with impaired OHRQoL: Extent score: Yes Severity score: Yes Prevalence: Yes	NR	With combined caries AND periodontitis: Psychological discomfort Psychological disability	Coexistence of dental caries and periodontitis is associated with worse oral health-related quality of life scores, when compared to those without these diseases,	Moderate
Brazil	Total: 306; 45 ± 14.8 Non-exposed: 60; 18-45 (28.70) 46-80 (27.10) With combined caries AND periodontitis: 91; 18-45 (59.74) 46-80 (60.81)	OHIP-14 Prevalence: FOVO Extent: FOVO Severity: Total score						
Schmalz et al. 2018	Cross-sectional	SP: PPD and CAL moP: PPD and CAL NP/mP: periodontitis	No	NR	Not significant	NR	Periodontal condition showed no significant association to OHIP-14 values	High
Germany	Ankylosing spondylitis: 50; 47.18 ± 15.67 H: 50; 55.82 ± 10.56	Neither "moderate" nor "severe" periodontitis OHIP-14 Total scores						
Sheng et al. 2018	Cross-sectional	moP: PPD or CAL SP: PPD or CAL	No	NR	Yes	NR	Periodontal disease significantly affected the OHRQoL of the elderly.	High
China	687; 60-64 (31.1 %); 65-70 (37.6 %); 71-75 (20.2 %); 76-80 (8.9 %); >80 (2.2 %)	OHIP-14 Total scores						

Sonnenschein et al. 2018	Cohort 309; 63.9 ± 10.6	P: PPD, BOP and CAL OHIP-14 Total scores	Factors risk group; adherence surgery; deep periodontal pockets	NR	Yes	NR	The OHRQoL of patients on long-term supportive periodontal therapy is influenced by periodontal status.	Moderate
Germany								
Corrêa et al. 2017	Cross-sectional Brazil Systemic lupus erythematosus: 75; ≤ 39 (61.3); >39 (38.7) Control: 75; ≤ 39 (44.9); >39 (55.1)	P: PPD and CAL OHIP-49 Total scores	Gender; age; toothbrushing; sialometry (unstimulated); sialometry (stimulated); prosthesis wearing; DMFT; decayed teeth; missing teeth; filled teeth	Periodontitis was associated with impaired OHRQoL: No	NR	NR	Periodontitis was not associated with oral impingement in the quality of life of individuals with systemic lupus erythematosus and control group	High
Geevarghese et al. 2017	Cross-sectional India Total: 300; 18-25 (51.7%); 25-30 (41.3%); ≥ 30 (7.0%)	P: PPD and CAL OHIP-49 Total score	Medication history; pregnancy history (gravida); oral health seeking behavior during pregnancy; self reported dental pain; bleeding while brushing; DMFT; periodontitis; pregnancy status.	Periodontitis was associated with impaired OHRQoL: Yes	NR	NR	Periodontitis had a positive linear relationship with the OHIP-49 scores	High
Goh et al. 2017	Retrospective cohort China Total: 89; 45.9 ± 5.1	AgP: PPD, BOP and CAL OHIP-14 Total scores	NR	Periodontitis was associated with impaired OHRQoL: Yes	NR	NR	Periodontal health in terms of higher mean PPD negatively affected the OHRQoL	High
He et al. 2017	Cross-sectional China 238; 46.8 (18.6 – 78.5)	CP: PPD and CAL OHIP-CP OHIP-49	No	NR	Yes	NR	Severity of periodontitis was associated with worse OHRQoL	High
Levin et al. 2017	Case-control Israel AgP: 60; 24.7 ± 7.7 Control: 80; 27.5 ± 8.8	AgP: PPD and CAL OHIP-14 Total score	Numeric rating scale; plaque index	Periodontitis was associated with impaired OHRQoL: Yes	NR	All domains significantly affected	AgP patients were positively associated with worse OHRQoL.	High

Mühlberg et al. 2017	Cross-sectional	SP: PPD and CAL moP: PPD and CAL NP/mP: periodontitis Neither “moderate” nor “severe” periodontitis OHIP-14	NR	NR	Yes (control group)	NR	In the control group, and periodontal condition had a significant influence on the OHRQoL, while in the rheumatoid arthritis group, no significant relationship was observed.	Moderate
Germany	Rheumatoid arthritis (RA): 103; 55 ± 11 Control Group (HC): 104; 57 ± 12							
Schmalz et al. 2017a	Cross-sectional	SP: PPD and CAL moP: PPD and CAL NP/mP: periodontitis neither moP nor SP OHIP-14	No	NR	Yes (H group)	NR	Only in group H, the periodontal condition negatively influenced OHIP-14 values	High
Germany	Lung transplant: 60; 54.03 ± 9.97 H: 70; 55.44 ± 8.549							
Schmalz et al. 2017b	Cross-sectional	SP: PPD and CAL moP: PPD and CAL NP/mP: periodontitis neither moP nor SP OHIP-14	No	NR	Not significant	NR	For both groups, the severity of periodontitis showed increased OHIP-14 values. However, this increase was not significant.	High
Germany	Before liver transplantation: 24; 54.4 ± 9.5 After liver transplantation: 47; 56.6 ± 12.6 H: 75; 57.1 ± 9.9							
Tsakos et al. 2017	Quasi-cohort	Advanced P: PPD OHIP-14 Total scores Prevalence: OFOVO/ FOVO Extent: OFOVO	Age, gender, marital status, educational attainment, occupational social class, existence of decay or any unsound teeth, number of missing teeth, any pockets ≥6mm	Periodontitis was associated with impaired OHRQoL: Yes	NR	NR	Advanced periodontitis was associated with greater impact on OHRQoL.	Moderate
England	6549; 21-85							
Appukuttan et al. 2016	Cross-sectional	P: PPD or CAL GOHAI ADD-GOHAI: total score SC-GOHAI (number of items with response “sometimes”, “often” or “always”)	No	Periodontitis was associated with impaired OHRQoL: Yes	NR	NR	Periodontitis and its extensions were associated with a greater impact on OHRQoL (SC-GOHAI)	High
India	199; ≤ 30 (48.2%); 31-50 (36.2%); >50 (15.6%)							

Castrejón-Pérez et al. 2016 México	Cross-sectional 655; 79.2 ± 7.1	P: PPD or CAL OHIP-14 Total scores	Gender; xerostomia; self-perception of oral health compared to others same age; general health; dental and periodontal conditions; utilization and functionality of removable partial and complete dentures; cognitive impairment; years of schooling; depression; functional dependence.	NR	Not significant	NR	Periodontal conditions did not show association with OHRQoL	Low
Eltas et al. 2016 Turkey	Cross-sectional H: 133; 29.5 ± 8.5 GIN: 141; 29.7 ± 8.3 CP: 130; 40.3 ± 9.4	CP: PPD and CAL OHIP-14	No	Periodontitis was associated with impaired OHRQoL: Yes	NR	Physical pain Psychological discomfort Physical disability	Periodontitis can significantly affect the quality of life	High
Grover et al. 2016 India	Cross-sectional 100; 43.25 NR	CP: PPD OHIP-14 Total scores	Area; age; gender; education status	Periodontitis was associated with impaired OHRQoL: Yes	NR	Affected by PPD Physical disability	High PPD were associated with higher OHIP-14 scores in rural and urban resistant participants.	High
Schmalz et al. 2016 Germany	Cross-sectional Haemodialysis: 87; 60.98 ± 14.01 Kidney transplantations: 39; 56.51 ± 11.56 H control: 91; 58.31 ± 9.91	SP: PPD and CAL moP: PPD and CAL NP/mP: periodontitis neither moP nor SP OHIP-14 Total scores	No	NR	Yes (H Control)	NR	Periodontitis did not show significantly higher OHIP-14 scores in kidney transplantations patients .In contrast, in H control group, significant differences were found between periodontal condition and OHIP-14 scores	High
Wellapuli & Ekanayake 2016 Sri Lanka	Cross-sectional 1.400; 43.5 ± 9.9	SP: PPD and CAL moP: PPD and CAL OHIP-14 Severity: Total score Prevalence: FOVO Extent: FOVO	Sex; age; education; monthly income; smoking status; periodontitis status; self-reported diabetes; history of dental care	NR	Yes	All domains were affected by the severity of periodontitis	Significant association between chronic periodontitis and OHRQoL and that OHRQoL deteriorates with an increase in severity of the disease.	Low

Meusel et al. 2015 Brazil	Cross-sectional 100; 41.4 ± 7.6	P: PPD, BOP and CAL OHIP-14 Total Score	No	NR	Yes	SP Functional limitation Physical pain Physical incapacity Psychological incapacity	The severity of periodontitis was associated with worse OHRQoL	High
Vaziri et al. 2015 Iran	Cross-sectional 145; 17-70	mP = CAL moP = CAL SP = CAL OHQoL-UK Total Score	No	NR	Yes	Severity of periodontitis: Psychological	The mean quality of life score was significantly lower in patients with severe periodontitis than in patients with mild periodontitis.	High
Fotedar et al. 2014 India	Cross-sectional 351; 35,7 ± 9,33	P: PPD or CAL OHIP-14 Severity: total score Prevalence: FOVO Extent: FOVO	Gender; use of dental services; socioeconomic status	Periodontitis was associated with impaired OHRQoL: Yes	NR	NR	Periodontitis was associated with a higher prevalence of high impact on OHRQoL	High
Grigoras et al. 2014 Romania	Cross-sectional 50; 48,8 ±13,34	CP/AgP: PPD, BOP and CAL OHIP-14 Total score	No	NR	Yes	AgP: Physical pain Physical disability Social disability Handicap subscales.	Periodontal disease had a negative impact on quality of life, and this impact was greater in patients with severe periodontal disease.	High
Zenthöfer et al. 2014 Germany	Cross-sectional 94; 82,9 ± 9,6	P: PPD or CAL GOHAI Total Score	Gender; age; number of drugs; number of diseases; dementia; care level; group (poor oral health/satisfactory oral health); kind of denture; pressures present	Periodontitis was associated with impaired OHRQoL: No	NR	NR	Periodontitis was not associated with worse impact on OHRQoL in institutionalized elderly individuals	High
Cornejo et al. 2013 Argentina	Cross-sectional 80; 25.19 ±6.56	P: CAL OHIP-49 Total Score	No	Periodontitis was associated with impaired OHRQoL: No	NR	NR	Periodontitis was not associated with poor OHRQoL	High
Durham et al. 2013 United Kingdom	Cross-sectional P: 89; 47 ± 9 NP: 89; 47 ±9	P: PPD OHIP-49 Total Score Prevalence: (FOVO) OHQoL-UK Total Score Prevalence: “bad” or “very bad”	No	Periodontitis was associated with impaired OHRQoL: Yes	NR	OHIP49 All domains were affected by periodontitis, except handicap OHQoL-UK All domains were affected by periodontitis	Significant differences exist in OHRQoL between patients with chronic periodontitis and those without,	High

Palma et al. 2013 Brazil	Cross-sectional 150; 47±13,5	P: PPD or CAL OHIP-14 Total score Had an impact: FOVO	No	Periodontitis was associated with impaired OHRQoL: Yes	NR	Psychological discomfort Physical disability	Periodontitis was associated with higher OHIP-14 scores	Moderate
Al Habashneh et al. 2012 Jordan	Cross-sectional 400; 59.0% F; 36,7 ±11,9	P: PPD and CAL mP: CAL moP: CAL SP: CAL OHIP14 Total score Prevalence: FOVO	Age, sex, years of education; medical illnesses; smoking status; family income	NR	Yes	All domains were affected by the severity of periodontitis, except functional limitation	Periodontal disease had a negative impact on quality of life, and this impact was greater in patients with severe periodontal disease	Low
Slade; Sanders 2011 Australia	Cross-sectional 3.724; 15-24: 7,0%; 25-34: 12,2%; 35-44: 21,1%; 45-54: 20,5% 55-64: 22,0% ≥ 65: 17,2%	SP: PPD and CAL moP: PPD and CAL OHIP-14 Total score	No	Periodontitis was associated with impaired OHRQoL: Yes	NR	NR	Periodontitis was associated with worse OHRQoL.	High
Araújo et al. 2010 Brazil	Cross-sectional 401;39,25 ± 13,37	P: PPD, BOP and CAL OHIP-14 Total score Highest impact: FOVO	No	Periodontitis was associated with impaired OHRQoL: Yes	NR	NR	Periodontitis was associated with high impact on OHRQoL	High
Bernabé, & Marcenes 2010 United Kingdom	Cross-sectional 3.122; 41,16±16,17	P: PPD and CAL OHIP-14 Total score	Partially adjusted: sex; age; english region or country; educational attainment; household income; number of teeth; partial denture use Fully adjusted: dental caries; traumatic dental injuries; tooth wear	Periodontitis was associated with impaired OHRQoL: Yes	Yes (extension)	NR	Periodontal disease was associated with poor quality of life.	Low
Lopes et al. 2009 Brazil	Cross-sectional 302; 43,35 ± 9,04	CP: PPD, BOP and CAL mP: CAL moP: CAL SP: CAL OHQoL-UK Total score	No	NR	Yes	NR	Periodontitis had an impact on quality of life and the most prevalent negative aspects were found in patients with severe chronic periodontitis.	High

Daradkeh & Khader 2008 Jordan	Cross-sectional 288; 53.8% M; 33.4 ±13.2	P: PPD and CAL GOHAI Total score ADD-GOHAI: total score SC-GOHAI: Number of items "sometimes", "often" or "always"	No	Periodontitis was associated with impaired OHRQoL: Yes	NR	NR	Periodontitis was associated with worse OHRQoL when assessed by SC-GOHAI and with better OHRQoL when assessed by ADD-GOHAI	High
Lawrence et al. 2008 New Zealand	Cross-sectional 924 (OHIP+ dental examination);; 32 (100%)	P: CAL OHIP-14 Total Score Prevalence: FOVO Extent: FOVO	Socioeconomic status; use of dental services; sex; clinical measures of oral health status	Periodontitis was associated with impaired OHRQoL: Yes	NR	Functional and psychosocial impacts	Periodontitis is associated with a higher OHIP-14 score and a higher prevalence of high impact on OHRQoL.	Low
Drummond-Santana et al. 2007 Brazil	Cross-sectional 159; 14-20: 4,4% 21-40: 21,4% 41-60: 57,2% >60: 17%	P: PPD and CAL OHIP-14 Total Score	No	Periodontitis was associated with impaired OHRQoL: Yes	Yes	NR	Periodontitis was associated with higher means of OHIP-14. However, the severity of periodontitis was not associated with a worse perception of OHRQoL.	High

Abbreviations: AgP=Aggressive Periodontitis; BOP=Bleeding on Probing; CAL=Clinical Attachment Loss; CP=Chronic Periodontitis; CPI=Community Periodontal Index; CPITN=Community Periodontal Index of Treatment Needs; DMFT: Decayed, Missing teeth, and Filled teeth; ESRD=End Stage Renal Disease F=female; FOVO= Fairly Often, Very Often;G= Generalized; GOHAI= Geriatric Oral Health Assessment Index; HMP: Periodontally Health, Gingivitis: Mild Chronic Periodontitis; H=Healthy; IQR= Interquartile Range; L=Localized; M=Male; moP=Moderate Periodontitis; mP=Mild Periodontitis; NP=No Periodontitis; NR=Not Reported; OFOVO= occasionally, fairly often or very often; OHIP-14= Oral Health Impact Profile; OHRQoL=Oral Health-Related Quality of Life; OHQoL-UK: United Kingdom Oral Health-Related Quality of Life; OI DP: Oral Impact on Daily Performances; P=Periodontitis; PPD= Periodontal Probing Depth.

Appendix 6

Table 4. Quality assessment of included studies (n = 60)

Cross-sectional Study	Selection	Comparability	Exposition	Outcome	Max 9*	Max 100%	Risk of bias
Fuller et al. 2020	--	*	**	***	6/9	66.6%	Moderate
Angst et al. 2020	--	--	**	**	4/9	44.4%	Moderate
Schmalz et al. 2020	--	--	*	--	1/9	11.1%	High
Almoznino et al. 2020	--	*	--	**	3/9	33.3%	High
Roumeau et al. 2020	--	*	*	*	3/9	33.3%	High
Aguirre-Bustamante et al. 2020	**	*	*	**	6/9	66.6%	Moderate
Oliveira et al. 2020	*	*	**	**	6/9	66.6%	Moderate
Caracho et al. 2020	--	*	**	*	4/9	44.4%	Moderate
Beşiroğlu, Lütfioglu. 2020	--	*	--	*	2/9	22.2%	High
Costa et al. 2020	--	*	**	**	5/9	55.5%	Moderate
Husain et al. 2020	--	*	--	*	2/9	22.2%	High
Santos et al. 2020	--	--	*	*	2/9	22.2%	High
Sousa et al. 2019	**	*	**	****	9/9	100%	Low
Yadav et al. 2019	--	--	*	--	1/9	11.1%	High
Karaaslan et al. 2019	--	--	**	--	2/9	22.2%	High
Sulaiman et al. 2019	--	--	**	--	2/9	22.2%	High
Ustaoglu et al. 2019	--	*	**	*	4/9	44.4%	Moderate
Gokturk and Yarkac. 2018a	--	*	**	*	4/9	44.4%	Moderate
Gokturk and Yarkac. 2018b	--	*	**	*	4/9	44.4%	Moderate
Kato et al. 2018	**	--	--	***	5/9	55.5%	Moderate
Schmalz et al. 2018	--	*	*	--	2/9	22.2%	High
Levin et al. 2018	--	*	--	--	1/9	11.1%	High
He et al. 2018	**	*	**	**	7/9	77.7%	Low

Passos-Soares et al 2018	--	*	**	***	6/9	66.6%	Moderate
Holde et al 2018	**	--	--	**	4/9	44.4%	Moderate
Barbe et al. 2018	--	--	--	*	1/9	11.1%	High
Sheng et al. 2018	--	*	**	--	3/9	33.3%	High
Levin et al. 2017	--	*	--	*	2/9	22.2%	High
Geevarghese et al 2017	--	--	**	***	5/9	55.5%	Moderate
Schmalz et al. 2017a	*	--	*	--	2/9	22.2%	High
Schmalz et al. 2017b	*	--	*	--	2/9	22.2%	High
Mühlberg et al. 2017	--	*	*	***	5/9	55.5%	Moderate
He et al. 2017	--	*	*	--	2/9	22.2%	High
Corrêa et al. 2017	--	*	--	***	4/9	44.4%	Moderate
Castrejón-Pérez et al. 2016	**	*	**	***	8/9	88.8%	Low
Appukuttan et al. 2016	--	*	*	--	2/9	22.2%	High
Schmalz et al. 2016	*	--	*	--	2/9	22.2%	High
Wellapuli and Ekanayake 2016	**	*	**	**	7/9	77.7%	Low
Eltas et al. 2016	--	*	**	*	4/6	44.4%	Moderate
Grover et al. 2016	--	--	--	**	2/9	22.2%	High
Meusel et al. 2015	--	--	*	*	2/9	22.2%	High
Vaziri et al. 2015	--	--	--	*	1/9	11.1%	High
Fotedar et al. 2014	--	*	--	***	4/9	44.4%	Moderate
Zenthöfer et al. 2014	--	*	--	--	1/9	11.1%	High
Simona et al. 2014	--	--	*	--	1/9	11.1%	High
Durham et al. 2013	--	*	*	*	3/9	33.3%	High
Palma et al. 2013	--	*	*	***	5/9	55.5%	Moderate
Cornejo et al. 2013	--	--	--	--	0/9	0%	High
Al Habashneh et al. 2012	*	*	**	***	7/9	77.7%	Low
Slade and Sanders 2011	**	*	--	--	3/9	33.3%	High
Bernabé & Marcenes 2010	**	*	*	***	7/9	77.7%	Low

Araújo et al. 2010	--	*	--	--	1/9	11.1%	High
Lopes et al. 2009	--	*	--	--	1/9	11,1%	High
Daradkeh & Khader 2008	--	*	*	*	3/9	33.3%	High
Lawrence et al. 2008	**	*	*	***	7/9	77.7%	Low
Drumond-Santana et al. 2007	--	*	**	*	4/9	44,4%	Moderate
Cohort Study	Selection		Comparability	Outcome	Max 9 *	Max 100%	Risk of bias
Goergen et al. 2021	***		**	***	8/9	88.8%	Low
Sonnenschein et al. 2018	*		**	**	5/9	55.5%	Moderate
Goh et al. 2017	*		--	**	3/9	33.3%	High
Tsakos et al. 2017	**		**	*	5/9	55.5%	Moderate

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ANEXO A – NORMAS PARA SUBMISSÃO NO *JOURNAL OF CLINICAL PERIODONTOLOGY*

3. MANUSCRIPT CATEGORIES AND REQUIREMENTS

Journal of Clinical Periodontology publishes original research articles, reviews, clinical innovation reports and case reports. The latter will be published only if they provide new fundamental knowledge and if they use language understandable to the clinician. It is expected that any manuscript submitted represents unpublished original research.

Original Research Articles

Original Research articles must describe significant and original experimental observations and provide sufficient detail so that the observations can be critically evaluated and, if necessary, repeated. Original articles will be published under the heading of clinical periodontology, implant dentistry or pre-clinical sciences and must conform to the highest international standards in the field.

Word limit: 3,500 words maximum, excluding references.

Abstract: 200 words maximum; must be structured, under the sub-headings: Aim(s), Materials and methods, Results, Conclusion(s).

Figures/Tables: Total of no more than 7 figures and tables.

Introduction: should be focused, outlining the historical or logical origins of the study and not summarize the results; exhaustive literature reviews are not appropriate. It should close with the explicit statement of the specific aims of the investigation.

Material and Methods: must contain sufficient detail such that, in combination with the references cited, all clinical trials and experiments reported can be fully reproduced. As a condition of publication, authors are required to make materials and methods used freely available to academic researchers for their own use. This includes antibodies and the constructs used to make transgenic animals, although not the animals themselves.

Results: should present the observations with minimal reference to earlier literature or to possible interpretations.

Discussion: may usefully start with a brief summary of the major findings, but repetition of parts of the abstract or of the results section should be avoided. The discussion section should end with a brief conclusion and a comment on the potential clinical relevance of the findings.

Statements and interpretation of the data should be appropriately supported by original references.

The discussion may usefully be structured with the following points in mind (modified from the proposal by Richard Horton (2002), *The Hidden Research Paper*, *The Journal of the American Medical Association*, 287, 2775-2778). Not all points will apply to all studies and its use is optional, but we believe it will improve the discussion section to keep these points in mind.

Summary of key finding

Primary outcome measure(s)

Secondary outcome measure(s)

Results as they relate to a prior hypothesis

Strengths and Limitations of the Study

Study Question

Study Design

Data Collection

Analysis

Interpretation

Possible effects of bias on outcomes

Interpretation and Implications in the Context of the Totality of Evidence

Is there a systematic review to refer to?

If not, could one be reasonably done here and now?

What this study adds to the available evidence

Effects on patient care and health policy

Possible mechanisms

Controversies Raised by This Study Future Research Directions

For this particular research collaboration

Underlying mechanisms

Clinical research

Clinical Innovation Reports

Clinical Innovation Reports are suited to describe significant improvements in clinical practice such as the report of a novel surgical technique, a breakthrough in technology or practical

approaches to recognized clinical challenges. They should conform to the highest scientific and clinical practice standards.

Word limit: 3,000 words maximum, excluding references.

Main text: should be organized with Introduction; Clinical Innovation Report; Discussion and Conclusion.

Figures/Tables: Total of no more than 12 figures and tables.

Case Reports

Case Reports illustrating unusual and clinically relevant observations are acceptable, but their merit needs to provide high priority for publication in the Journal. On rare occasions, completed cases displaying non-obvious solutions to significant clinical challenges will be considered.

Main text: should be organised with Introduction; Case report; Discussion and Conclusion.

Reviews and Systematic Reviews

Reviews are selected for their broad general interest; all are refereed by experts in the field who are asked to comment on issues such as timeliness, general interest and balanced treatment of controversies, as well as on scientific accuracy. Reviews should take a broad view of the field rather than merely summarizing the authors' own previous work, so extensive citation of the authors' own publications is discouraged.

Wherever possible, reviews should be constructed and submitted as Systematic Reviews, or at the very least provide robust descriptions of the methods that would allow readers to reproduce these. The use of state-of-the-art evidence-based systematic approaches is expected.

Reviews are frequently commissioned by the editors and, as such, authors are encouraged to submit a proposal to the Journal. Review proposals should include a full-page summary of the proposed contents with key references.

Note: For Systematic Reviews, the Journal adheres to the PRISMA reporting guidelines - PRISMA checklists should be included in submissions.

Word limit: 4,000 words maximum, excluding references.

Main text: should be organized with Introduction; Review; Discussion and Conclusion.

Revisions and Resubmissions

Please note that all revisions and resubmissions of papers should also include a separate rebuttal and a tracked changes document to assist in peer review.

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(Why is this important? We need to make sure your manuscript is suitable for review.)

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Conflict of interest disclosure

Statement of funding source

Ethical approval statement

Patient consent statement (if appropriate)

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A separate Conflict of Interest form for each author.

(Why is this important? We need to uphold rigorous ethical standards for the research we consider for publication.)

Your co-author details, including affiliation and email address. (Why is this important? We need to keep all co-authors informed of the outcome of the peer review process.)

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To submit, login at <https://mc.manuscriptcentral.com/jcpe> and create a new submission. Follow the submission steps as required and submit the manuscript.

If you are invited to revise your manuscript after peer review, the journal will also request the revised manuscript to be formatted according to journal requirements as described below.

Cover Letters

Cover letters are not mandatory; however, they may be supplied at the author's discretion.

Parts of the Manuscript

Manuscripts can be uploaded either as a single document (containing the main text, tables and figures), or with figures and tables provided as separate files. Should your manuscript reach revision stage, figures and tables must be provided as separate files. The main manuscript file can be submitted in Microsoft Word (.doc or .docx) format.

Main Text File

Your main document file should include:

A short informative title containing the major key words. The title should not contain abbreviations;

The full names of the authors with institutional affiliations where the work was conducted, with a footnote for the author's present address if different from where the work was conducted;

Acknowledgments;

Abstract structured (intro/methods/results/conclusion) or unstructured;

Up to seven keywords;

Main body: formatted as introduction, materials & methods, results, discussion, conclusion

References

Tables (each table complete with title and footnotes);

Figures: Figure legends must be added beneath each individual image during upload AND as a complete list in the text;

Appendices (if relevant)

Figures and supporting information should be supplied as separate files.

Authorship

Please refer to the journal's authorship policy the Editorial Policies and Ethical Considerations section for details on eligibility for author listing.

Acknowledgments

Contributions from anyone who does not meet the criteria for authorship should be listed, with permission from the contributor, in an Acknowledgments section. Financial and material support should also be mentioned. Thanks to anonymous reviewers are not appropriate.

Conflict of Interest Statement

Authors will be asked to provide a conflict of interest statement during the submission process. For details on what to include in this section, see the section 'Conflict of Interest' in the Editorial Policies and Ethical Considerations section below. Submitting authors should ensure they liaise with all co-authors to confirm agreement with the final statement.

Abstract

The abstract is limited to 200 words in length and should not contain abbreviations or references. The abstract should be organized according to the content of the paper.

For Original Research Articles the abstract should be organized with aim, materials and methods, results and conclusions.

For clinical trials, it is encouraged that the abstract finish with the clinical trial registration number on a free public database such as clinicaltrials.gov.

Keywords

Please provide 1-5 keywords. When appropriate keywords are available, they should be taken from those recommended by the US National Library of Medicine's Medical Subject Headings (MeSH) browser list at www.nlm.nih.gov/mesh. Authors may add specific keywords.

Main Text

All manuscripts should emphasize clarity and brevity. Authors should pay special attention to the presentation of their findings so that they may be communicated clearly. Technical jargon should be avoided as much as possible and be clearly explained where its use is unavoidable.

Clinical Relevance

This section is aimed at giving clinicians a reading light to put the present research in perspective. It should be no more than 100 words and should not be a repetition of the abstract. It should provide a clear and concise explanation of the rationale for the study, of what was

known before and of how the present results advance knowledge of this field. If appropriate, it may also contain suggestions for clinical practice.

It should be structured with the following headings: Scientific rationale for study; Principal findings; Practical implications.

Authors should pay particular attention to this text as it will be published in a highlighted box within their manuscript; ideally, reading this section should leave clinicians wishing to learn more about the topic and encourage them to read the full article.

References

It is the policy of the Journal to encourage reference to the original papers rather than to literature reviews. Authors should therefore keep citations of reviews to the absolute minimum. References should be prepared according to the Publication Manual of the American Psychological Association (6th edition). This means in text citations should follow the author-date method whereby the author's last name and the year of publication for the source should appear in the text, for example, (Jones, 1998). The complete reference list should appear alphabetically by name at the end of the paper.

A sample of the most common entries in reference lists appears below. Please note that a DOI should be provided for all references where available. For more information about APA referencing style, please refer to the APA FAQ. Please note that for journal articles, issue numbers are not included unless each issue in the volume begins with page one.

Journal article

Beers, S. R. , & De Bellis, M. D. (2002). Neuropsychological function in children with maltreatment-related posttraumatic stress disorder. *The American Journal of Psychiatry*, 159, 483–486. doi:10.1176/appi.ajp.159.3.483

Book

Bradley-Johnson, S. (1994). *Psychoeducational assessment of students who are visually impaired or blind: Infancy through high school* (2nd ed.). Austin, TX: Pro-ed.

Chapter in an Edited Book

Borstrøm, I., & Elbro, C. (1997). Prevention of dyslexia in kindergarten: Effects of phoneme awareness training with children of dyslexic parents. In C. Hulme & M. Snowling (Eds.), *Dyslexia: Biology, cognition and intervention* (pp. 235–253). London: Whurr.

Internet Document

Norton, R. (2006, November 4). How to train a cat to operate a light switch [Video file]. Retrieved from <http://www.youtube.com/watch?v=Vja83KLQXZs>

Please note that all unpublished papers (submitted or in press) included in the reference list should be provided in a digital version at submission. The unpublished paper should be uploaded as a supplementary file for review.

Tables

Tables should be self-contained and complement, not duplicate, information contained in the text. They should be supplied as editable files, not pasted as images. Legends should be concise but comprehensive – the table, legend, and footnotes must be understandable without reference to the text. All abbreviations must be defined in footnotes. Footnote symbols: †, ‡, §, ¶, should be used (in that order) and *, **, *** should be reserved for P-values. Statistical measures such as SD or SEM should be identified in the headings.

Figure Legends

Legends should be concise but comprehensive – the figure and its legend must be understandable without reference to the text. Include definitions of any symbols used and define/explain all abbreviations and units of measurement.

Figures

Although authors are encouraged to send the highest-quality figures possible, for peer-review purposes, a wide variety of formats, sizes, and resolutions are accepted.

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The following points provide general advice on formatting and style.

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Resource Identification Initiative

The journal supports the Resource Identification Initiative, which aims to promote research resource identification, discovery, and reuse. This initiative, led by the Neuroscience Information Framework and the Oregon Health & Science University Library, provides unique identifiers for antibodies, model organisms, cell lines, and tools including software and databases. These IDs, called Research Resource Identifiers (RRIDs), are machine-readable and

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Example Citations

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Research Reporting Guidelines

Accurate and complete reporting enables readers to fully appraise research, replicate it, and use it. Authors are required to adhere to recognised research reporting standards. The EQUATOR Network collects more than 370 reporting guidelines for many study types, including for:

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Observational studies : STROBE

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