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LAURO TAQUES NETO

QUALIDADE DE RELATO E SÍNTESE DE EVIDÊNCIAS SOBRE O TRATAMENTO DA HIPERSENSIBILIDADE DENTINÁRIA: ADESÃO AO CONSORT EM ENSAIOS CLÍNICOS RANDOMIZADOS COM ENXAGUATÓRIOS BUCAIS E OVERVIEW DE REVISÕES SISTEMÁTICAS SOBRE DENTIFRÍCIOS DESSENSIBILIZANTES

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DADOS CURRICULARES

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RESUMO

A hipersensibilidade dentinária (HD) é uma condição clínica prevalente, para a qual diferentes agentes dessensibilizantes têm sido amplamente investigados. No entanto, a confiabilidade das evidências disponíveis depende diretamente da qualidade metodológica dos estudos primários e da transparência de seu relato, bem como da qualidade das revisões sistemáticas que sintetizam esses dados. Assim, esta tese teve como objetivo avaliar criticamente a qualidade da evidência científica sobre o tratamento da HD, por meio de dois estudos complementares: (1) a análise da adesão de ensaios clínicos randomizados (ECRs) à Declaração CONSORT e do risco de viés desses estudos, e (2) a avaliação da qualidade metodológica de revisões sistemáticas sobre dentifrícios dessensibilizantes, utilizando a ferramenta AMSTAR 2. No Estudo 1, as bases de dados Cochrane Library, MEDLINE, Embase, BBO, LILACS, Scopus e Web of Science foram sistematicamente pesquisadas entre agosto e outubro de 2024 para identificar ECRs que avaliassem a eficácia de enxaguatórios bucais dessensibilizantes. A adesão às recomendações da Declaração CONSORT foi avaliada por meio de uma ferramenta específica, enquanto a ferramenta Cochrane de risco de viés, versão 2 (RoB 2), foi utilizada para avaliar a qualidade individual dos estudos incluídos. Dos 2.883 artigos recuperados, 36 foram incluídos na análise qualitativa. A pontuação média geral do CONSORT foi de 23,3 ± 1,4, de um máximo de 32 pontos. Os itens referentes à intervenção, desfechos, testes de hipótese e tamanho de efeito foram os mais detalhadamente descritos. Em contrapartida, os itens "settings" e "*protocol*" foram descritos em apenas 12,5% dos artigos. Diferenças significativas nas pontuações CONSORT foram identificadas de acordo com o periódico e o ano de publicação. Foi identificado baixo risco de viés em 14 estudos, dois artigos foram julgados como de risco incerto, e nenhum estudo apresentou alto risco de viés. Nenhum dos estudos analisados atingiu adesão plena às recomendações da Declaração CONSORT; entretanto, a maioria apresentou baixo risco de viés. No Estudo 2, as buscas foram realizadas nas bases de dados PubMed, Cochrane Library, Web of Science, Scopus, Embase e LILACS, sem restrições de idioma ou data de publicação. Dois revisores selecionaram os estudos de forma independente, extraíram os dados e avaliaram a qualidade metodológica utilizando a ferramenta AMSTAR 2. Foram considerados elegíveis estudos do tipo revisão sistemática de ECRs que avaliaram a eficácia clínica de dentifrícios dessensibilizantes em adultos com HD. De um total de 1.256 registros identificados, 14 revisões sistemáticas publicadas entre 2006 e 2021 foram incluídas, abrangendo 114 ECRs e 11.213 participantes. As revisões avaliaram dentifrícios contendo arginina, sais de potássio, biovidro, estrôncio, fluoreto estanhoso, nano-hidroxiapatita, oxalatos, agentes herbais e polímeros. A qualidade metodológica foi classificada como criticamente baixa em 10 estudos e baixa em 4. As principais fragilidades incluíram a ausência de registro de protocolo, estratégias de busca incompletas e avaliação limitada do viés de publicação. Entre os pontos fortes destacaram-se a formulação clara das questões de pesquisa segundo o modelo PICO e a extração de dados em duplicata. De modo geral, as revisões incluídas relataram que os agentes dessensibilizantes proporcionam reduções clinicamente significativas da HD. No entanto, de forma global, as revisões sistemáticas sobre dentifrícios dessensibilizantes apresentaram baixa qualidade metodológica. Em conjunto, os resultados demonstram que, embora existam evidências sugerindo eficácia clínica no manejo da HD, fragilidades no relato dos ECRs e na condução das revisões

sistemáticas reduzem a confiabilidade das conclusões. O fortalecimento das práticas metodológicas e de relato é essencial para a produção de evidências mais robustas e para o suporte confiável à tomada de decisão clínica.

Palavras-chave: Hipersensibilidade Dentinária; Antissépticos Bucais; Dentifrícios; Revisão Sistemática; Ensaio Clínico Randomizado.

ABSTRACT

Dentin hypersensitivity (DH) is a prevalent clinical condition for which different desensitizing agents have been widely investigated. However, the reliability of the available evidence depends directly on the methodological quality of primary studies and the transparency of their reporting, as well as on the quality of the systematic reviews that synthesize these data. Thus, this thesis aimed to critically evaluate the quality of the scientific evidence regarding the treatment of DH through two complementary studies: (1) an assessment of adherence of randomized clinical trials (RCTs) to the CONSORT Statement and the risk of bias of these studies, and (2) an evaluation of the methodological quality of systematic reviews on desensitizing dentifrices using the AMSTAR 2 tool. In Study 1, the Cochrane Library, MEDLINE, Embase, BBO, LILACS, Scopus, and Web of Science databases were systematically searched between August and October 2024 to identify RCTs evaluating the effectiveness of desensitizing mouthwashes. Adherence to the CONSORT Statement was assessed using a specific tool, while the Cochrane Risk of Bias tool, version 2 (RoB 2), was used to evaluate the individual quality of the included studies. Of the 2,883 records retrieved, 36 studies were included in the qualitative analysis. The mean overall CONSORT score was 23.3 ± 1.4 out of a maximum of 32 points. Items related to interventions, outcomes, hypothesis testing, and effect size were the most comprehensively reported, whereas the “settings” and “protocol” items were described in only 12.5% of the articles. Significant differences in CONSORT scores were identified according to journal and year of publication. Low risk of bias was identified in 14 studies, two studies were judged as having unclear risk, and no studies were classified as having high risk of bias. Although full adherence to CONSORT recommendations was not achieved in any of the included studies, most trials demonstrated a low risk of bias. In Study 2, searches were conducted in PubMed, Cochrane Library, Web of Science, Scopus, Embase, and LILACS, without language or date restrictions. Two reviewers independently selected studies, extracted data, and assessed methodological quality using the AMSTAR 2 tool. Eligible studies were systematic reviews of RCTs evaluating the clinical effectiveness of desensitizing dentifrices in adults with DH. From 1,256 identified records, 14 systematic reviews published between 2006 and 2021 were included, encompassing 114 RCTs and 11,213 participants. The reviews evaluated dentifrices containing arginine, potassium salts, bioactive glass, strontium, stannous fluoride, nano-hydroxyapatite, oxalates, herbal agents, and polymers. Methodological quality was classified as critically low in 10 reviews and low in four. The main weaknesses included lack of protocol registration, incomplete search strategies, and limited assessment of publication bias. Strengths included clearly formulated PICO research questions and duplicate data extraction. Overall, the included reviews reported that desensitizing agents provide clinically meaningful reductions in DH; however, systematic reviews on desensitizing dentifrices generally showed low methodological quality. Taken together, the findings indicate that although evidence suggests clinical efficacy of desensitizing agents in the management of DH, shortcomings in the reporting of RCTs and in the conduct of systematic reviews reduce the reliability of the conclusions. Strengthening methodological rigor and reporting practices is essential to produce more robust evidence and to provide reliable support for clinical decision-making.

Keywords: Dentin Hypersensitivity; Mouthwashes; Dentifrices; Systematic Review; Randomized Clinical Trial.

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LISTA DE ABREVIATURAS E SIGLAS

HD	Hipersensibilidade dentinária
MD	*Mean Difference* (Diferença Média)
SMD	*Standardized Mean Difference* (Diferença Média Padronizada)
RCT / RCTs	*Randomized Clinical Trial(s*) (Ensaio(s) clínico(s) randomizado(s))
NRS	*Numeric Rating Scale* (Escala Numérica)
VRS	*Verbal Rating Scale* (Escala Verbal)
VAS	*Visual Analog Scale (Escala Visual Analógica)*
I^2	*I-squared statistic* (Estatística I^2 – heterogeneidade)
AMSTAR-2	*A Measurement Tool to Assess Systematic Reviews 2* (Ferramenta para Avaliação da Qualidade Metodológica de Revisões Sistemáticas)
CI	*Confidence Interval* (Intervalo de Confiança)
n-HAP	*Nano-hydroxyapatite* (Nano-hidroxiapatita)
CONSORT	*Consolidated Standards of Reporting Trials* (Padrões Consolidados para o Relato de Ensaios Clínicos)
p	*p-value* (valor de p)
ECRs	Ensaios clínicos randomizados
RoB2	*Cochrane Risk-of-Bias* 2 (Cochrane Risco de Viés 2)
PRISMA	*Preferred Reporting Items for Systematic Reviews and Meta-Analyses* (Itens de Relato Preferenciais para Revisões Sistemáticas e Meta-análises)
DH	*Dentin Hypersensitivity* (Hipersensibilidade dentinária)

LISTA DE SÍMBOLOS

%	Porcentagem
<	Menor que
±	Mais ou menos
=	Igual
™	Marca registrada

SUMÁRIO

1 INTRODUÇÃO

A hipersensibilidade dentinária (HD) é uma condição caracterizada por episódios breves e agudos de dor que ocorrem na ausência de qualquer outra patologia dentária.1,2 Resulta, principalmente, da exposição da dentina, causando sensibilidade a estímulos térmicos (quente ou frio), agentes químicos (alimentos doces, salgados ou ácidos) e fatores mecânicos (escovação dental vigorosa). A prevalência da HD pode variar de 1,3% a 92,1%, sendo a prevalência média de aproximadamente 30%.3 As principais causas de HD estão associadas à recessão gengival e à perda de esmalte, que podem por abrasão, abfração ou erosão.4 A incidência de HD vem aumentando, em grande parte, devido a fatores como recessão gengival, tratamentos periodontais, clareamento dental, procedimentos ortodônticos e a manutenção prolongada de dentes vitais ou minimamente restaurados ao longo da vida.5,6

A explicação mais amplamente aceita para a HD é a teoria hidrodinâmica de Brännström, que propõe que a dor ocorre quando um estímulo interage com a dentina exposta, provocando um movimento rápido do fluido dentinário que estimula as terminações nervosas pulpares.7 A maioria das abordagens terapêuticas concentra-se em reduzir o fluxo de fluido nos túbulos dentinários, minimizando a ativação neural. As duas estratégias principais redução da HD envolvem a limitação da transmissão neural e a oclusão física dos túbulos dentinários expostos.8

Inúmeros produtos têm sido sugeridos para o tratamento da HD.2 Entre as opções de tratamento menos invasivas, destacam-se os dentifrícios e os enxaguatórios bucais dessensibilizantes, amplamente utilizados devido ao baixo custo, fácil acesso e possibilidade de uso domiciliar. Diversos agentes ativos têm sido incorporados a essas formulações, como fluoretos, nitrato de potássio, arginina, oxalatos, fosfatos, cálcio, óxido de estanho e compostos bioativos, dentre outros, que atuam tanto na oclusão tubular quanto na modulação da resposta neural.9,10

Embora existam inúmeros ensaios clínicos avaliando a eficácia desses produtos, os resultados permanecem heterogêneos e, em alguns casos, conflitantes. No caso dos dentifrícios dessensibilizantes, revisões sistemáticas e meta-análises têm buscado sintetizar as evidências sobre sua efetividade.11–13 Entretanto, a qualidade metodológica dessas revisões pode variar, o que pode comprometer a confiabilidade de suas conclusões.14 Nesse contexto, a realização de um overview

de revisões sistemáticas, aliado à avaliação crítica da qualidade metodológica com o uso da ferramenta AMSTAR-2 (A Measurement Tool to Assess Systematic Reviews 2), é essencial para fornecer uma síntese abrangente e confiável sobre a efetividade dos dentifrícios no manejo da HD.15

Por outro lado, no nível dos ensaios clínicos randomizados (ECRs), os enxaguatórios bucais têm sido amplamente estudados como alternativa terapêutica. Os ECRs são considerados o padrão-ouro para avaliar intervenções clínicas, pois reduzem vieses e fatores de confusão em comparação com outros delineamentos.16 Apesar de sua importância, problemas na metodologia e no delineamento do estudo podem introduzir vieses, erros aleatórios ou limitar a generalização dos ECRs.17 Para melhorar a transparência e a padronização na apresentação desses estudos, foi desenvolvida a declaração CONSORT (Consolidated Standards of Reporting Trials), composta por um checklist de 25 itens que orienta pesquisadores na elaboração de relatos claros, completos e confiáveis.18,19 Apesar de sua adoção por periódicos odontológicos, revisões demonstram que a adesão ao CONSORT ainda é incompleta em várias áreas da odontologia.20–22 Até o momento, não há estudos que tenham avaliado a conformidade dos ECRs sobre o uso de enxaguatórios dessensibilizantes no tratamento da HD com essas diretrizes.

Portanto, o presente estudo tem como objetivos: (1) realizar um overview de revisões sistemáticas para avaliar criticamente, por meio do AMSTAR-2, a qualidade metodológica das evidências sobre dentifrícios dessensibilizantes no tratamento da HD; e (2) uma avaliação da adesão à declaração CONSORT em ECRs que avaliaram o uso de enxaguatórios bucais para o tratamento da HD. Essa abordagem integrada permite uma visão ampla e crítica da qualidade das evidências disponíveis, tanto em nível secundário (revisões sistemáticas) quanto primário (ECRs), contribuindo para fundamentar a prática clínica baseada em evidências e orientar futuras pesquisas na área.

2 OBJETIVOS

2.1 OBJETIVO GERAL

Avaliar a qualidade da evidência científica sobre o tratamento da HD com dentifrícios e enxaguatórios dessensibilizantes, por meio de um *overview* de revisões sistemáticas (AMSTAR-2) e da análise da adesão à declaração CONSORT em ECRs.

2.2 OBJETIVOS ESPECÍFICOS

1. Realizar um *overview* de revisões sistemáticas que avaliaram a eficácia de dentifrícios dessensibilizantes no tratamento da HD.
2. Analisar qualidade metodológica dessas revisões por meio da ferramenta AMSTAR-2.
3. Identificar os agentes ativos mais investigados, seus mecanismos de ação e os principais desfechos clínicos relatados.
4. Mapear as lacunas de evidência e inconsistências existentes na literatura.
5. Identificar e analisar ECRs que avaliaram a eficácia de enxaguatórios bucais dessensibilizantes no tratamento da HD.
6. Avaliar a adesão dos estudos à declaração CONSORT, verificando a qualidade e a transparência no relato metodológico.
7. Avaliar o risco de viés dos ECRs incluídos.
8. Comparar a qualidade metodológica e de relato entre os diferentes periódicos e agentes avaliados.

3 MATERIAL E MÉTODOS

A descrição abrangente dos materiais e métodos utilizados em cada estudo pode ser encontrada na próxima seção de cada artigo individual, oferecendo aos leitores uma compreensão detalhada da metodologia empregada em cada estudo.

4 ARTIGO 1 ADHERENCE TO THE CONSORT STATEMENT OF RANDOMIZED CLINICAL TRIALS ON DENTIN HYPERSENSITIVITY TREATMENT USING MOUTHWASHES

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Abstract

Following the publication of the CONSORT statement, numerous dental journals have recommended its use for the reporting of randomized clinical trials (RCTs). While numerous RCTs have been published assessing the efficacy of desensitizing mouthwashes for treating dentin hypersensitivity (DH), none of these studies have been evaluated for their quality using CONSORT guidelines. This study assessed RCTs investigating mouthwashes for DH treatment for adherence to CONSORT guidelines and their risk of bias. The databases of Cochrane Library, MEDLINE, Embase, BBO, LILACS, Scopus, and Web of Science were systematically searched from August to October 2024 for RCTs assessing the effectiveness of desensitizing mouthwashes. Adherence to CONSORT recommendations was evaluated using a specific tool, while the Cochrane risk-of-bias tool 2 was employed to assess the individual quality of the included papers. Out of the 2,883 papers retrieved, 16 were included in the qualitative analysis. The mean overall CONSORT score was 23.3 ± 1.4, out of a maximum of 32 points. Intervention, outcomes, hypothesis testing, and effect size were the most comprehensively described elements. Meanwhile, settings and protocol registration were only described by 12.5% of the articles. Significant differences in CONSORT scores were identified based on journal and publication dates. Low risk of bias was identified in 14 studies, two papers were judged to have an unclear risk, and no articles showed a high risk of bias. Full adherence to CONSORT recommendations was not attained in the analyzed papers, but most of the papers had a low risk of bias.

Keywords
Dentin sensitivity, Mouthwashes, Systematic review, Randomized controlled trial

Introduction

Dentin hypersensitivity (DH) is a prevalent clinical condition characterized by brief and sharp instances of pain that occur in the absence of any other dentin-related pathology (Cartwright 2014; West et al. 2015). It primarily results from dentin exposure, causing sensitivity to thermal stimuli (hot or cold), chemical agents (sweet, salty, or acidic foods), and mechanical factors (vigorous tooth brushing). A systematic review on the prevalence of DH found that rates can range from as low as 1.3% to as high as 92.1%. However, when considering all studies, the average prevalence is approximately 30% (Zeola et al. 2019). The main causes of DH are linked to gingival recession and enamel loss, which may result from friction, abrasion, abfraction, or erosion (West et al. 2013). The incidence of DH is increasing, largely due to factors such as gingival recession, periodontal treatments, teeth whitening, orthodontic procedures, and the prolonged retention of vital or minimally restored teeth over a person's lifetime (Douglas-de-Oliveira et al. 2018; Goh et al. 2016).

The widely accepted explanation for DH is Brännström's hydrodynamic theory, which suggests that pain arises when a stimulus interacts with exposed dentin, causing a rapid movement of dentinal fluid that stimulates pulpal nerve endings (Brännström and Aström 1972). Most treatment approaches focus on reducing fluid flow within tubules to minimize neural activation. The two primary strategies for managing DH involve limiting neural transmission and physically occluding open dentinal tubules (Scherman and Jacobsen 1992).

Numerous products have been suggested for the treatment of DH (West et al. 2015). While there is no universally ideal treatment, initial approaches should prioritize less invasive and readily accessible options. Desensitizing mouthwashes often serve as a first-line treatment due to their low cost, ease of use, home application, and daily habit (Khot et al. 2023). Effective mouthwashes contain desensitizing agents such as fluorides, arginine, oxalates, phosphates, calcium, and potassium nitrate (Silva et al. 2023).

The use of such mouthwashes for DH treatment should be guided by the principles of evidence-based dentistry, which emphasize the integration of the best available scientific evidence into clinical decision-making. This approach helps reduce

systematic biases and ensures more reliable and effective treatment outcomes (Ballini et al. 2007). For assessing therapeutic effectiveness, randomized clinical trials (RCTs) are the gold standard source of evidence, as they reduce the influence of confounding factors on cause-and-effect relation-ships compared to other study designs (Juni 2001). Despite their importance, issues in the methodology and study design can introduce bias, random error, or limit the generalizability of RCTs (Spieth et al. 2016; Wambier et al. 2022).

The transparent and comprehensive reporting of RCTs is essential to identify and resolve these issues. The CONSORT statement (Consolidated Standards of Reporting Trials) was introduced in 1996 for this purpose. CONSORT offers authors a standardized framework of essential components for RCT reporting, consisting of a checklist of 25 items that aids authors in reporting their research. This guideline encourages the production of transparent and scientifically sound studies (Moher et al. 2010; Begg et al. 1996).

Following the publication of the CONSORT statement, numerous dental journals have recommended its use for the reporting of RCTs (Sarkis-Onofre et al. 2015). However, reviews have found that adherence to the guidelines remains incomplete across various domains of dentistry (Meyer et al. 2023; Sarkis-Onofre et al. 2019). Within periodontics, the quality of reported abstracts has already been studied. However, despite the numerous RCTs assessing the efficacy of desensitizing mouthwashes for the treatment of DH, none of these studies have been evaluated for their quality or adherence to CONSORT guidelines. Therefore, this study systematically reviewed the adherence of RCTs investigating mouthwashes for DH treatment to the CONSORT recommendations and assessed their risk of bias.

Methods

Protocol and registration

This systematic literature review adhered to the guidelines outlined in PRISMA 2020 (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) (Page et al. 2021) for research reporting, and was carried out between August and October, 2024. The study was registered on International Prospective Register of Systematic Reviews (PROSPERO registration # CRD42022379556).

Sources of information and search strategy

We searched eligible studies in the following electronic databases: Cochrane Library, MEDLINE via PubMed, Embase, Brazilian Library in Dentistry (BBO), Latin American and Caribbean Literature in Health Sciences (LILACS), Scopus, and Web of Science. Additionally, we manually searched the reference lists of all primary studies. Gray literature was not consulted because this research evaluated the quality of studies published in indexed peer-reviewed journals.

The initial search strategy was constructed for MEDLINE via PubMed by combining Medical Subject Headings (MeSH terms) and free terms found in titles and abstracts. Boolean operators,"OR"within concepts and"AND"across different concepts, were used. The search strategy was subsequently adapted to other databases (Fig. 1).

Pubmed = 982 (20/07/2024)	
#1 ((((((((((((((((Dentition, Permanent[MeSH Terms]) OR (Dentin Sensitivity[MeSH Terms])) OR (Gingival Recession[MeSH Terms]))) OR ("Dentition Permanent"[Title/Abstract])) OR ("Dentin Sensitivity"[Title/Abstract])) OR ("Gingival Recession"[Title/Abstract])) OR ("Dentine Sensitivity"[Title/Abstract])) OR ("Dentine Hypersensitivity"[Title/Abstract])) OR ("Dentin sensitivities"[Title/Abstract])) OR ("permanent tooth"[Title/Abstract])) OR ("permanent teeth"[Title/Abstract])) OR ("Tooth sensitivity"[Title/Abstract])) OR ("Tooth sensitivities"[Title/Abstract])) OR ("gum recession"[Title/Abstract]))))	**#2** ((((((((((((((((((((((((Dentin Desensitizing Agents[MeSH Terms]) OR (Tooth Remineralization[MeSH Terms])) OR (Hydroxyapatites[MeSH Terms])) OR (Arginine[MeSH Terms])) OR (Gluconates[MeSH Terms])) OR (Chlorides[MeSH Terms])) OR (Calcium Carbonate[MeSH Terms])) OR (Potassium nitrate[Supplementary Concept])) OR (Strontium acetate[Supplementary Concept])) OR ("Dentin Desensitizing Agents"[Title/Abstract])) OR ("Tooth Remineralization"[Title/Abstract])) OR (Hydroxyapatites[Title/Abstract])) OR (Arginine[Title/Abstract])) OR (Gluconates[Title/Abstract])) OR (Chlorides[Title/Abstract])) OR ("Calcium Carbonate"[Title/Abstract])) OR ("Potassium nitrate"[Title/Abstract])) OR ("Strontium acetate"[Title/Abstract])) OR ("Dental Polishes"[Title/Abstract])) OR (Nanohydroxyapatite[Title/Abstract])) OR ("desensitizing agent"[Title/Abstract])) OR (Mouthwashes[Title/Abstract])) OR ("Mouth Bath"[Title/Abstract])) OR ("Mouth Rinse"[Title/Abstract])) OR (Placebos[Title/Abstract]))
#1 AND #2	
Scopus = 932 (20/07/2024)	

#1 (TITLE-ABS-KEY ("Dentition Permanent") OR TITLE-ABS-KEY ("Dentin *Sensitivity") OR TITLE-ABS-KEY ("Gingival Recession") OR TITLE-ABS-KEY ("Dentin$ Sensitivity") OR TITLE-ABS-KEY ("permanent t$th") OR TITLE-ABS-KEY ("Tooth sensitivit*") OR TITLE-ABS-KEY ("T?th sensitivity"))	#2 (TITLE-ABS-KEY ("dentin desensitizing agents") OR TITLE-ABS-KEY ("t$th remineralization") OR TITLE-ABS-KEY (hydroxyapatites) OR TITLE-ABS-KEY (arginine) OR TITLE-ABS-KEY (gluconates) OR TITLE-ABS-KEY (chlorides) OR TITLE-ABS-KEY ("calcium carbonate") OR TITLE-ABS-KEY ("potassium nitrate") OR TITLE-ABS-KEY ("strontium acetate") OR TITLE-ABS-KEY ("dental polish*") OR TITLE-ABS-KEY (nanohydroxyapatite) OR TITLE-ABS-KEY ("desensitizing agent") OR TITLE-ABS-KEY (mouthwash*) OR TITLE-ABS-KEY ("mouth bath") OR TITLE-ABS-KEY ("mouth rinse") OR TITLE-ABS-KEY (placebos)) AND (LIMIT-TO (SUBJAREA , "DENT")) AND (LIMIT-TO (DOCTYPE , "ar"))
#1 AND #2	
Web of Science = 350 (20/07/2024)	
#1 "Dentition Permanent" (Topic) OR "Dentin$ *Sensitivity" (Topic) OR "Gingival Recession" (Topic) OR "permanent t?th" (Topic) OR "T?th sensitivit*" (Topic)	**#2** "dentin desensitizing agents" (Topic) or "t$th remineralization" (Topic) or hydroxyapatites (Topic) or arginine (Topic) or gluconate (Topic) or chlorides (Topic) or "calcium carbonate" (Topic) or "potassium nitrate" (Topic) or "strontium acetate" (Topic) or "dental polish*" (Topic) or nanohydroxyapatite (Topic) or "desensitizing agent" (Topic) or mouthwash* (Topic) or "mouth bath" (Topic) or "mouth rinse" (Topic) or placebos (Topic) " (Topic) OR placebos (Topic) OR placebos (Topic)
#1 AND #2	
Lilacs and BBO = 86 (20/07/2024)	
#1 ((mh:(Dentition, Permanent) OR mh:(Dentin Sensitivity) OR mh: (Gingival Recession)) OR ((("Dentine Sensitivity" OR "Dentine Hypersensitivity" OR "Dentin sensitivities" OR "permanent tooth" OR "permanent teeth" OR "Tooth sensitivity" OR "Tooth sensitivities" OR "gum recession" OR "Sensibilidade dentinária" OR "Hipersensibilidade dentinária" OR "dente permanente" OR "dentes permanentes" OR "Sensibilidade dentária" OR "recessão gengival" OR "Sensibilidad de la dentina" OR "Hipersensibilidad de la dentina" OR "diente permanente" OR "dientes permanentes" OR "Sensibilidad dental" OR "Sensibilidad dental" OR "recesión de las encías"))))	**#2** ((mh:(Dentin Desensitizing Agents)) OR (mh:(Tooth Remineralization)) OR (mh:(Hydroxyapatites)) OR (mh:(Gluconates)) OR (mh:(Chlorides)) OR (mh:(Calcium Carbonate)) OR ("Potassium nitrate") OR ("Strontium acetate") OR ("Dental Polishes") OR (Nanohydroxyapatite) OR ("desensitizing agent") OR (Mouthwashes) OR ("Mouth Bath") OR ("Mouth Rinse") OR (Placebos) OR ("Nitrato de potássio") OR ("Acetato de estrôncio") OR ("Esmaltes Dentários") OR (Nanohidroxiapatita) OR ("agente dessensibilizante") OR (colutorios) OR ("lavagem bucal") OR ("Enxágue Bucal") OR ("Nitrato de potasio") OR ("acetato de estroncio") OR ("Esmaltes dentales") OR (nanohidroxiapatita) OR ("agente desensibilizante") OR ("Enjuagues bucales") OR ("Baño bucal") OR ("Enjuague bucal"))
#1 AND #2	
Cochrane Library = 402 (20/07/2024)	

#1 MeSH descriptor: [Dentition, Permanent] explode all trees **#2** MeSH descriptor: [Dentin Sensitivity] explode all trees **#3** MeSH descriptor: [Gingival Recession] explode all trees **#4** ("Gingival Recession"):ti,ab,kw OR (Dentine *Sensitivity):ti,ab,kw (Word variations have been searched) **#5** (permanent t?th):ti,ab,kw OR (Tooth sensitivit*):ti,ab,kw OR (Dentin near sensitivit*):ti,ab,kw (Word variations have been searched) **#6** ("gum recession"):ti,ab,kw (Word variations have been searched) **#7** #1 OR #2 OR #3 OR #4 OR #5 OR #6	**#8** MeSH descriptor: [Dentin Desensitizing Agents] explode all trees **#9** MeSH descriptor: [Tooth Remineralization] explode all trees **#10** MeSH descriptor: [Hydroxyapatites] explode all trees **#11** MeSH descriptor: [Arginine] explode all trees **#12** MeSH descriptor: [Gluconates] explode all trees **#13** MeSH descriptor: [Chlorides] explode all trees **#14** MeSH descriptor: [Calcium Carbonate] explode all trees **#15** ("Potassium nitrate"):ti,ab,kw OR ("Strontium acetate"):ti,ab,kw OR (Dental Polish*):ti,ab,kw OR (Nanohydroxyapatite):ti,ab,kw OR (desensitizing agent*):ti,ab,kw (Word variations have been searched) **#16** (Placebos):ti,ab,kw OR ("Mouth Rinse"):ti,ab,kw OR ("Mouth Bath"):ti,ab,kw OR (Mouthwash*):ti,ab,kw **#17** #8 OR #9 OR #10 OR #11 OR #12 OR #13 OR #14 OR #15 OR #16
#7 AND # 17	
EMBASE = 131 (20/07/2024)	
#1 'dentition,permanent'/exp OR dentition,permanent OR (('dentin'/exp OR dentin) AND ('sensitivity'/exp OR sensitivity)) OR (gingival AND recession) OR 'dentition permanent'/exp OR 'dentition permanent' OR 'dentin sensitivity'/exp OR 'dentin sensitivity' OR 'gingival recession'/exp OR 'gingival recession' OR 'dentine sensitivity'/exp OR 'dentine sensitivity' OR 'dentine hypersensitivity'/exp OR 'dentine hypersensitivity' OR 'dentin sensitivities' OR 'permanent tooth'/exp OR 'permanent tooth' OR 'permanent teeth'/exp OR 'permanent teeth' OR 'tooth sensitivity'/exp OR 'tooth sensitivity' OR 'tooth sensitivities' OR 'gum recession'	**#2** ('dentin'/exp OR dentin) AND desensitizing AND agents OR (('tooth'/exp OR tooth) AND ('remineralization'/exp OR remineralization)) OR (('calcium'/exp OR calcium) AND ('carbonate'/exp OR carbonate)) OR (('potassium'/exp OR potassium) AND ('nitrate'/exp OR nitrate)) OR (('strontium'/exp OR strontium) AND ('acetate'/exp OR acetate)) OR 'dentin desensitizing agents'/exp OR 'dentin desensitizing agents' OR 'tooth remineralization'/exp OR 'tooth remineralization' OR 'hydroxyapatites'/exp OR hydroxyapatites OR 'arginine'/exp OR arginine OR 'gluconates'/exp OR gluconates OR 'chlorides'/exp OR chlorides OR 'calcium carbonate'/exp OR 'calcium carbonate' OR 'potassium nitrate'/exp OR 'potassium nitrate' OR 'strontium acetate'/exp OR 'strontium acetate' OR 'dental polishes' OR 'nanohydroxyapatite'/exp OR nanohydroxyapatite OR 'desensitizing agent'/exp OR 'desensitizing agent' OR 'mouthwashes'/exp OR mouthwashes OR 'mouth bath' OR 'mouth rinse'/exp OR 'mouth rinse' OR 'placebos'/exp OR placebos AND 'randomized controlled trial'/de
#1 AND #2	

Fig. 1 Search strategy in the different databases (August 20, 2024)

Eligibility criteria

Papers included were RCTs that evaluated the efficacy of desensitizing mouthwashes for the treatment of DH in adult patients. As the CONSORT statement was published in 1996, studies published before 1996 were excluded. Reports that evaluated post-surgical DH, those with follow-up periods different from 4 to 8 weeks, and those published in any media other than peer-reviewed journals were excluded. No language restriction was applied.

Selection of studies and data collection process

Papers were selected based on their titles and abstracts; duplicates were excluded. In papers where the title and abstract did not provide sufficient information to make a clear decision, full-text articles were obtained and screened. Subsequently, studies meeting the inclusion criteria were classified by two reviewers. Data were extracted using customized forms, which included information about the journal, year of publication, the country of the main author, study design, follow-up period, number of patients enrolled, protocol for mouthwash use, and DH assessment tool, among other details. If multiple papers from the same experiment were found, such as reports on different follow-up periods, data were extracted from the most recent report. If information about adherence to CONSORT was missing in these cases, the earlier reports from the same research were searched for the absent information. In such cases, the set of papers was considered as one entry.

Compliance with the CONSORT statement

The evaluation of compliance with the CONSORT statement was performed using a previously validated tool that has been applied in other studies (Loguercio et al. 2017; Reis et al. 2018). The CONSORT assessment tool was established in the CONSORT Declaration of 2010 (Moher et al. 2010).

The tool incorporates 12 criteria from the CONSORT statement, leading to the assessment of 16 items, including subdivisions. Each item is scored from 0 to 2 (0 = no description, 1 = poor description, 2 = adequate description). Before the evaluation, the instrument was reviewed, and all items were discussed by two authors. They then independently assessed the included studies using the CONSORT tool. Any scoring discrepancies were resolved through consultation with a third author.

Blinding the evaluators to the authorship of the papers was not feasible due to their familiarity with the subject and existing publications. Moreover, the identities of research centers were often easily identifiable within the articles.

Risk of bias in individual studies

The assessment of the risk of bias was carried out by two independent reviewers using the Cochrane risk-of-bias 2 (RoB2) tool, which assesses five domains: bias arising from the randomization process, deviations from intended interventions, missing outcome data, measurement of the outcome, and selection of the reported result.

The assessment of each entry involves categorization as 'yes' or ‘probably yes’, indicating a low risk of bias; 'no' or ‘probably no’, indicating a high risk of bias; and 'no information', indicating that insufficient details are reported to reasonably respond ‘probably yes’ or ‘probably no’. In the course of the quality assessment of individual studies, any disparities between reviewers were resolved through discussion, and when necessary, a third reviewer was consulted.

The studies were categorized as having a 'low' risk of bias if all the domains demonstrated a low risk, as 'some concerns' if at least one domain showed some risk, but with no domain exhibiting high risk, and as 'high' risk of bias if at least one domain showed high risk of bias or multiple domains exhibited some concerns, in a manner that significantly diminished confidence in the result.

Scoring system and statistical analysis

Data on the included papers were assigned to four categories: journal of publication, year of publication, follow-up period, and country of the first author. Descriptive data and mean scores obtained with the CONSORT tool were included. As the Shapiro–Wilk test for normality indicated that the data did not follow normal distribution, comparisons within each factor of the CONSORT score were conducted using ANOVA with the Kruskal–Wallis test (95% confidence interval and a significance level of 0.05) (SigmaPlot, Systat Software Inc., Germany).

Results

Study selection

After searching six databases and manually searching the relevant references from the retrieved papers, 2,883 articles were identified, from which 753 duplicates were removed. After screening titles and abstracts, a further 2,107 articles that did not meet the inclusion criteria were removed. We reviewed the full texts of the remaining 23 articles. From these, 7 were excluded for the following reasons: a) two studies did not evaluate the outcome of interest; (Ajdaharian et al. 2017; Petersson et al. 2007) b) one study included the use of dentifrice with a desensitizing agent; (Han et al. 2017) c) one study was not randomized; (Jankowska et al. 2015) d) one study had a different follow-up period; (Sharma et al. 2013a) e) two studies were commentaries on other studies (Brignardello-Petersen 2019; Pashley 2013) (Fig. 2). In the final qualitative analysis, 16 clinical RCTs were included. No more than one article on the same research was found.

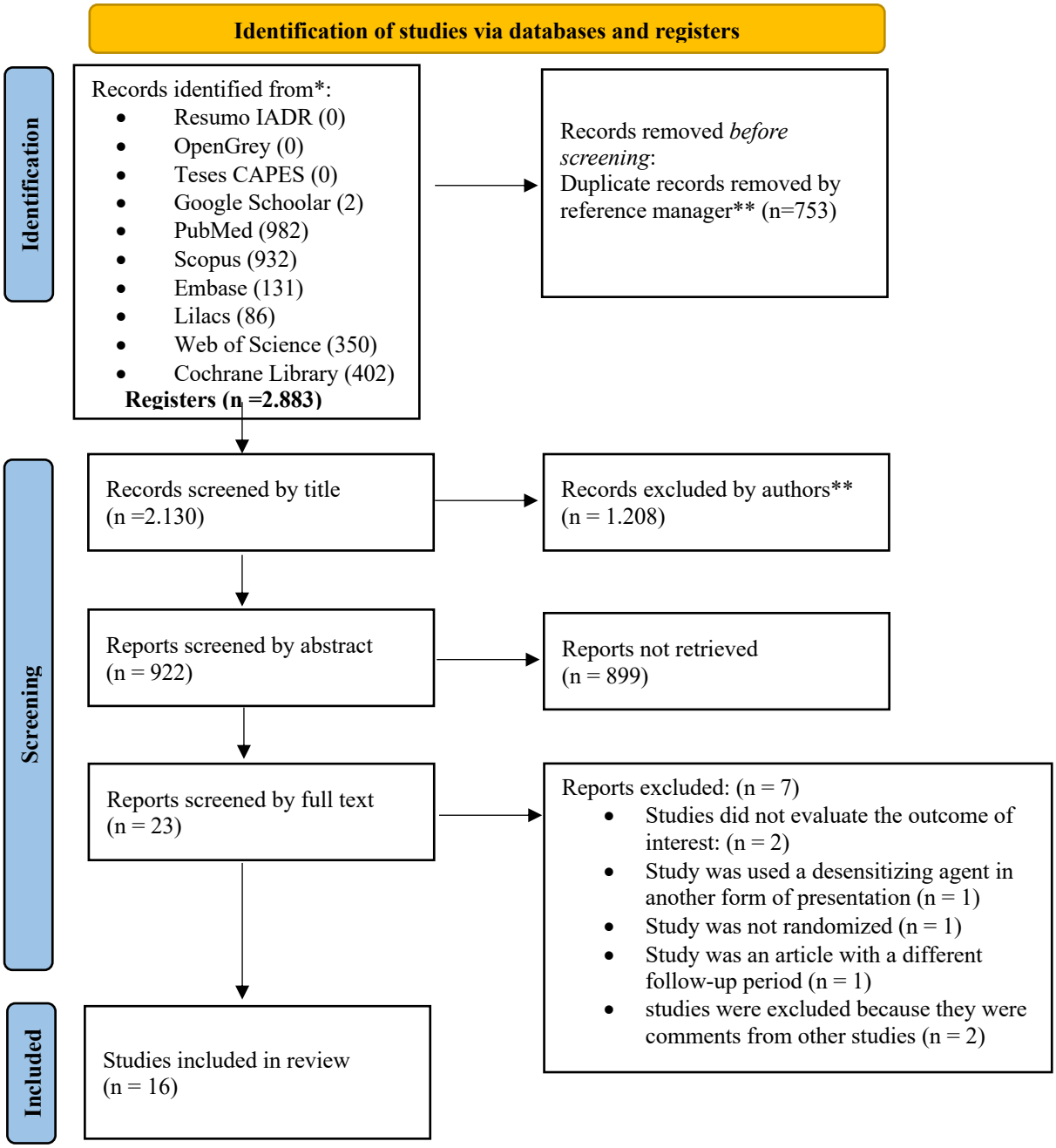

Fig. 2 Flowchart of the search strategy steps in databases

Study characteristics

In the 16 studies, 2,507 participants were included (details in Table 1). The articles were published between 1996 and 2019. The studies were conducted in the United Kingdom (n = 6), (Hall et al. 2017a, b, 2019; Gillam et al. 1996; Yates et al. 1998, 2004) the United States (n = 5), (Boneta et al. 2013a; Burnett et al. 2018; Lynch et al. 2018; Sharma et al. 2013b; Boneta et al. 2013b) Brazil (n = 1), (Pereira and Chava 2001) China (n = 1), (Hu et al. 2013) India (n = 1), (Sharda et al. 2018) Japan (n = 1), (Higuchi et al. 1996) and South Korea (n = 1) (Hong et al. 2016). Their follow-

up times ranged from 4 to 8 weeks. The papers were published in the following journals: the Journal of Dentistry (n = 5), the Journal of Clinical Periodontology (n = 3), the American Journal of Dentistry (n = 2), the Journal of the American Dental Association (n = 2), Contemporary Clinical Dentistry (n = 1), the Journal of Clinical Dentistry (n = 1), Journal Periodontology (n = 1), and the Journal of Periodontal & Implant Science (n = 1) (Table 2).

Table 1 Characteristics of the included studies

Identification of articles (author, date)	Protocol registration	Protocol of use	Experimental rinse groups	Control group	Sample (test/control)	CONSORT included in the Journal guidelines/CONSORT Score
Boneta et al. (2013a)[36]	n.r	20 mL for 30 s 2x/day after brushing with toothpaste + water rinse	EG1: 0.8% arginine, polyvinylmethylether/maleic acid copolymer + pyrophosphates + 0.05% sodium fluoride EG2: 2.4% potassium nitrate + 0.002% sodium fluoride	Mouthwash: 0.05% sodium fluoride	75 (25/25/25)	YES/27
Boneta et al. (2013b)[40]	n.r	15 mL for 60 s 2x/day after brushing with toothpaste + water rinse	EG1: 0.8% arginine, polyvinylmethylether/maleic acid copolymer + pyrophosphates + 0.05% sodium fluoride EG2: 0.51% potassium chloride + 230 ppm sodium fluoride + alcohol base	Mouthwash: without active ingredients Toothpaste: 1450 ppm fluoride + di-calcium phosphate base	118 (40/40/38)	YES/26
Burnett et al. 2018 (1)[37]	Yes	10 mL for 60 s 2x/day after brushing with toothpaste + water rinse	EG1: 1.5% dipotassium oxalate monohydrate + sodium benzoate + phosphoric acid + water + glycerol + Cemophor RH60 + cocamidopropyl betaine + sodium saccharin EG2: 1.5% dipotassium oxalate monohydrate + methyl parahydroxybenzoate + propyl hydroxybenzoate + anhydrous sodium phosphate + water + glycerol + Cemophor RH60 + cocamidopropyl betaine + sodium saccharin	Mouthwash: Sodium benzoate + water + glycerol + Cemophor RH60 + cocamidopropyl betaine + sodium saccharin	240 (79/80/81)	YES/28
Burnett et al. 2018 (2)[37]	Yes	10 mL for 60 s 2x/day after brushing with toothpaste + water rinse	EG1: 1.5% dipotassium oxalate monohydrate + sodium benzoate + phosphoric acid + water + glycerol + Ccemophor RH60 + cocamidopropyl betaine + sodium saccharin EG2: 2% dipotassium oxalate monohydrate + 45 ppm sodium fluoride + sodium benzoate + phosphoric acid + water + glycerol + Cemophor RH60 + cocamidopropyl betaine + sodium saccharin	Mouthwash: Sodium benzoate + water + glycerol + Cemophor RH60 + cocamidopropyl betaine + sodium saccharin	240 (79/80/81)	YES/28

Identification of articles (author, date)	Protocol registration	Protocol of use	Experimental rinse groups	Control group	Sample (test/control)	CONSORT included in the Journal guidelines/CONSORT Score
Burnett et al. 2018 (3)[37]	Yes	10 mL for 60 s 2x/day after brushing with toothpaste + water rinse	EG1: 1.5% dipotassium oxalate monohydrate + methyl parahydroxybenzoate + propyl hydroxybenzoate + anhydrous sodium phosphate + water + glycerol + Cemophor RH60 + cocamidopropyl betaine + sodium saccharin EG2: 2% dipotassium oxalate monohydrate + 45 ppm sodium fluoride + sodium benzoate + phosphoric acid + water + glycerol + Cemophor RH60 + cocamidopropyl betaine + sodium saccharin	Mouthwash: Sodium benzoate + water + glycerol + Cemophor RH60 + cocamidopropyl betaine + sodium saccharin	221 74/74/73	YES/28
Gillam et al. 1996[33]	n.r	15 mL for 60 s 2x/day after brushing with toothpaste + water rinse	3% potassium nitrate + 3% sílica + 0,05% sodium fluoride	Mouthwash: 0.05% sodium fluoride + 3% silica	47 (24/23)	YES/18
Hall et al. 2017a, b[30]	n.r	10 mL for 60 s 2x/day after brushing with toothpaste + water rinse	3% potassium nitrate + 45 ppm sodium fluoride	Toothpaste: sodium fluoride (concentrations not available)	214 (108/106)	YES/26
Hall et al. 2017b[31]	n.r	10 mL for 60 s 2x/day after brushing with toothpaste + water rinse	3% potassium nitrate + 45 ppm sodium fluoride	Toothpaste: sodium fluoride (concentrations not available)	135 (66/69)	YES/28
Hall et al. 2019[32]	Yes	10 mL for 60 s 2x/day after brushing with toothpaste + water rinse	3% potassium nitrate + 45 ppm sodium fluoride	Toothpaste: sodium fluoride (concentrations not available)	191 (95/96)	YES/29
Higuchi et al. 1996[44]	n.r	10 mL for 30 s 2x/day after brushing with toothpaste + water rinse	2.8% aluminum lactate	Mouthwash: without active ingredients	56 (27/29)	YES/16
Hong et al. 2016[45]	n.r	10–15 mL for 60 s 3x/day after brushing without toothpaste, with water only	Potassium nitrate + sodium fluoride + cetylpyridine chloride (concentrations not avaliable)	Mouthwash: without active ingredients	82 (40/42)	NO/23
Hu et al. 2013[42]	n.r	20 mL for 30 s 2x/day after brushing with toothpaste + water rinse	0.8% arginine + polyvinylmethyl ether/maleic acid copolymer + pyrophosphates + 0.05% sodium fluoride	Mouthwash: without active ingredients	90 (45/45)	YES/27

Identification of articles (author, date)	Protocol registration	Protocol of use	Experimental rinse groups	Control group	Sample (test/control)	CONSORT included in the Journal guidelines/CONSORT Score
Lynch et al. 2018[38]	n.r	10 mL for 60 s 2x/day after brushing with toothpaste + water rinse	1.4% potassium oxalate	Mouthwash: without active ingredients	375 (189/186)	YES/30
Pereira and Chava 2001[41]	n.r	15 mL for 60 s 2x/day after brushing with toothpaste + water rinse	3% potassium nitrate + 0.2% sodium fluoride	Mouthwash: 0.2% sodium fluoride	n.r	YES/13
Sharda et al. 2018[43]	n.r	10 mL for 30 s 2x/day after brushing with toothpaste + water rinse	Calcium sodium phosphosilicate (concentrations not avaliable)	Toothpaste: Calcium sodium phosphosilicate (concentrations not avaliable)	26 (13/13)	YES/21
Sharma et al. 2013b[39]	n.r	10 mL for 60 s 2x/day after brushing with toothpaste + water rinse	1.4% potassium oxalate	Toothpaste: sodium fluoride (concentrations not available) Toothpaste: 5% potassium nitrate	223 (74/73/76)	YES/20
Yates et al. 1998[34]	n.r	10 mL for 30 s 2x/day after brushing with toothpaste + water rinse	2% Tripotassium citrate monohydrate + 0.05% sodium fluoride + monosodium phosphate + disodium phosphate + alcohol base + sweetener + colorants + preservatives	Mouthwash: without active ingredients	83 (41/42)	YES/17
Yates et al. 2004[35]	n.r	10 mL for 30 s 2x/day after brushing with toothpaste + water rinse	Potassium fluoride + amine fluoride + film-building (Polyvinyl pyrrolidone/dimethylaminoethyl-mathacrylate polycarbamyl polyglycol ester (concentrations not avaliable)	Mouthwash: without active ingredients	91 (46/45)	YES/15

EG experimental group
n.r. not reported
s seconds

Table 2 Characteristics of the included studies by category

Category	Number of studies	Percentage
Journal		
Journal of Dentistry	5	31.3%
Journal of Clinical Periodontology	3	18.7%
American Journal of Dentistry	2	12.5%
Journal of the American Dental Association	2	12.5%
Other*	4	25.0%
Country		
United Kingdon	6	37.4%
United States	5	31.3%
Other**	5	31.3%
Publication date		
1996 – 2004	5	31.3%
2005 – 2013	4	25.0%
2014 – 2019	7	43.7%
Follow-up period (week)		
4 week	3	18.7%
6 week	5	31.3%
8 week	8	50.0%

*Other: 4 journals (Journal of Clinical Dentistry, Journal of Periodontal & Implant Science, Journal Periodontology, Contemporary Clinical Dentistry); **Other: 5 countries (Brazil, China, India, Japan, Korea).

The mouth rinses evaluated by the 16 studies contained potassium nitrate (n = 7), sodium fluoride (n = 3), potassium oxalate (3), arginine (n = 2), potassium chloride (n = 1), aluminum lactate (n = 1), potassium citrate (n = 1), potassium fluoride (n = 1), and potassium nitrate silica (n = 1). Each of the studies exhibited a parallel design.

Compliance with the CONSORT tools

Figure 3 depicts the percentage of adherence exhibited by the included studies to each item outlined in the CONSORT evaluation tool. The best described items were effect size, hypothesis testing, outcomes, and intervention, which were reported appropriately by all included papers. Complete descriptions of randomization sequences and blinding were found in 37.5% of the papers, and losses/exclusions in 31.3%. Protocol and settings were adequately described by only 12.5% of papers.

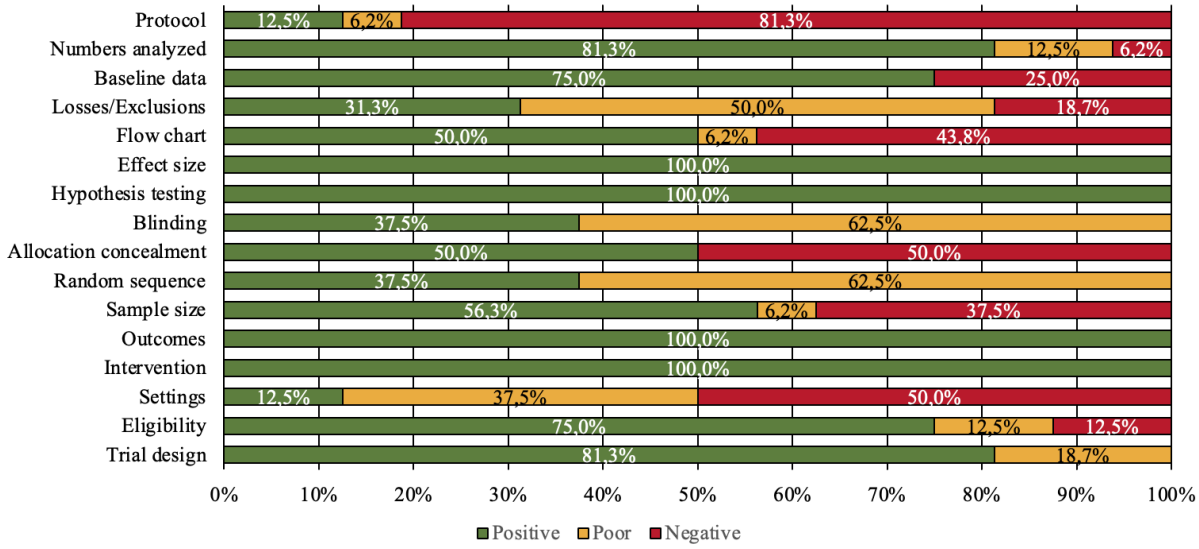

Fig. 3 Percentage of studies according to CONSORT scores for each analyzed criterion

CONSORT mean scores according to study characteristics

The included studies achieved an overall CONSORT score of 23.3 ± 1.4, representing 70.1% of the maximum CONSORT score (32 points). There were significant differences in the mean CONSORT scores when the data were analyzed according to journal and publication dates (Table 3). The Journal of the American Dental Association had the best scores in its two included papers (29.5 ± 0.5), followed by the American Journal of Dentistry (27.0 ± 1.0). More recently published papers (2014–2019) exhibited higher mean CONSORT scores (26.4 ± 1.2), when compared to studies conducted from 1996 to 2004 (15.8 ± 0.7). No significant differences in CONSORT mean scores were detected between different countries or follow-up periods.

Table 3 Analysis of the scores obtained from CONSORT according to different categories (journals, countries, time period, and follow-up time (ANOVA by posts with Kruskal-Wallis-test)

Category	Mean ± Standart Deviation	Median (interquartile range)	p-value
Journal			
Journal of Dentistry (n = 5)	25.6 ± 1.4	27.0 (20.0 – 28.0)	
Journal of Clinical Periodontology (n = 3)	16.7 ± 0.9	17.0 (15.0 – 18.0)	
American Journal of Dentistry (n = 2)	27.0 ± 1.0	27.0 (26.0 – 28.0)	p = 0.021
Journal of the American Dental Association (n = 2)	29.5 ± 0.5	29.5 (29.0 – 30.0)	
Other* (n = 4)	18.3 ± 2.3	18.5 (13.0 – 23.0)	
Country			
United Kingdom (n = 6)	22.2 ± 2.5	22.0 (15.0 – 29.0)	
United States (n = 5)	26.2 ± 1.7	27.0 (20.0 – 30.0)	p = 0.218
Other** (n = 5)	20.0 ± 2.5	21.0 (13. – 27.0)	
Publication date			
1996 – 2004 (n = 5)	15.8 ± 0.7	16.0 (13.0 – 18.0)	
2005 – 2013 (n = 4)	25.0 ± 1.7	26.5 (20.0 – 27.0)	p = 0.006
2014 – 2019 (n = 7)	26.4 ± 1.2	28.0 (21.0 – 30.0)	
Follow-up period (week)			
4 week (n = 3)	23.7 ± 3.2	21.0 (20.0 – 30.0)	
6 week (n = 5)	19.4 ± 2.5	18.0 (13.0 – 27.0)	p = 0.282
8 week (n = 8)	24.5 ± 1.9	26.5 (15.0 – 29.0)	

*Other: 4 journals (Journal of Clinical Dentistry, Journal of Periodontal & Implant Science, Journal Periodontology, Contemporary Clinical Dentistry); **Other: 5 countries (Brazil, China, India, Japan, Korea).

Risk of BIAS of the included studies

Among the 16 studies included, a low risk of bias was identified in 14 papers (Hall et al. 2017a, b, 2019; Yates et al. 1998, 2004; Boneta et al. 2013a; Lynch et al. 2018; Sharma et al. 2013b; Boneta et al. 2013b; Pereira and Chava 2001; Hu et al. 2013; Sharda et al. 2018; Higuchi et al. 1996; Hong et al. 2016). Only two papers were judged to have an unclear risk, (Gillam et al. 1996; Burnett et al. 2018) and no articles were found to have a high risk of bias (Fig. 4).

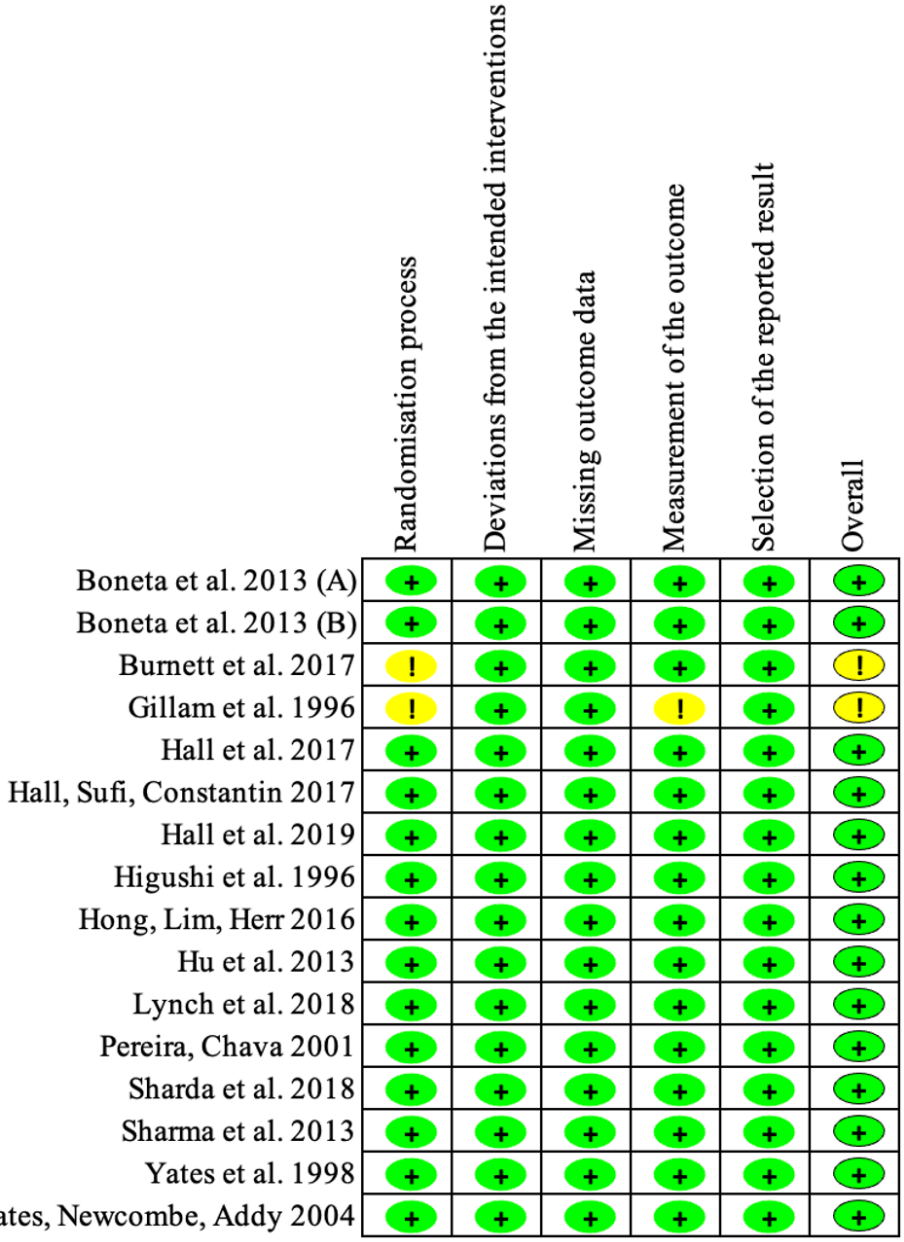

Fig. 4 Summary of risk assessment of bias according to the Cochrane tool

All studies exhibited low risk in domains related to deviations from intended interventions, missing outcome data, and selection of reported results, with each accompanied by appropriate descriptions. Randomization process and selection of reported result domains presented low risk for 87.5% of the studies, and unclear risk for 12.5%. The measurement of outcome domain presented low risk for 93.8% of studies and unclear risk for 6.2%. No domains exhibited a high risk of bias (Fig. 5).

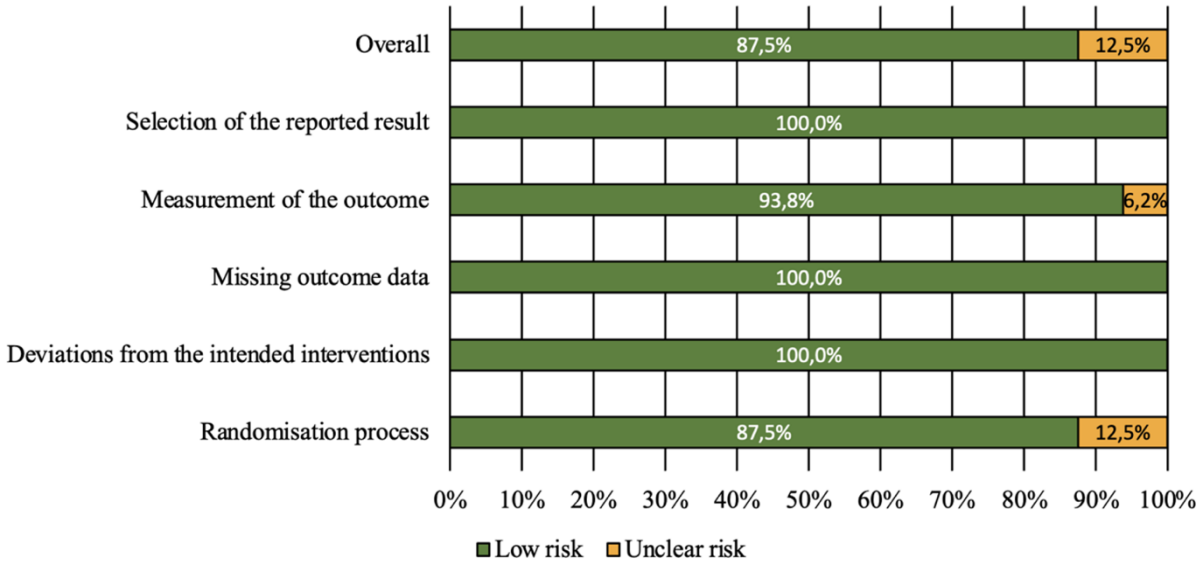

Fig. 5 Relative frequencies of studies according to the risk of bias assessment (Cochrane tool)

Discussion

The mean CONSORT score of the assessed studies was 23 points, signifying a moderate level of adherence to CONSORT recommendations (72% of the maximum CONSORT score of 32 points). Without focusing on a specific topic, similar adherence to the CONSORT Statement has been previously observed in RCT evaluations published from 2011 to 2016 in three different journals of periodontology (60–70%) (Siddiq et al. 2019). Additionally, reports in other dental specialties, such as restorative dentistry, (Elagami et al. 2024) endodontics, (Cabral et al. 2021) surgery, (Shete-Motgi et al. 2022; Kshirsagar et al. 2021) prosthetics, (Chen et al. 2018; Lempesi et al. 2014) and pediatric dentistry, (Wambier et al. 2022) have produced similar results. Some published studies have, however, shown lower adherence to the CONSORT guidelines (Loguercio et al. 2017; Menne et al. 2022; Knippschild et al. 2021; Rezende et al. 2022; Flint and Harrison 2010). These variations may be due to methodological choices made by authors when analyzing CONSORT adherence, such as the criteria used for selecting RCTs, the method of conformity assessment, or the publication period (Loguercio et al. 2017).

Despite numerous RCTs assessing the efficacy of mouthwashes for the treatment of DH, no reviews have previously examined the adherence of these studies to CONSORT guidelines. RCTs are recognized as the gold standard for evaluating a given clinical procedure, and represent the most reliable research design among

clinical studies (Cuschieri 2019). Effective translation of research data into clinical practice is the goal of evidence-based dentistry. However, the validity of research findings relies on the importance given by authors to the complete and detailed description of their methodological procedures; if a study is adequately described, it facilitates the assessment of the research quality. It is essential to note that CONSORT recommendations do not serve as a tool for the direct assessment of the quality of RCTs. Instead, they function as a protocol to be meticulously followed, mitigating systematic errors and ensuring adherence to high-quality reporting standards (Moher et al. 2001).

The RCTs included in our study were published in eight different journals. Of these, only the Journal of Periodontal & Implant Science does not include the CONSORT statement in its authors'publication guidelines (search last conducted in February 2024). Despite the recommendation being present in most journals' guidelines, none of the studies attained a maximum CONSORT score. It can therefore be concluded that, although CONSORT recommendations are encouraged by journals, neither authors nor reviewers have given full attention to the details of these recommendations. Importantly, this oversight has the potential to dissuade authors from rigorously adhering to CONSORT guidelines, ultimately having a negative influence on the reporting standards of RCTs (Moher et al. 2001).

Even so, our results indicate a trend of increasing CONSORT scores in more recent publications, with higher scores observed with later publication dates. CONSORT, established in 1996, has undergone revisions over the years to provide clearer explanations and elaborations of its principles (Moher et al. 2001). The rise in scores in recent studies is probably connected to authors'growing familiarity with the CONSORT items. This has led to an increase in the number of studies presenting reports with greater detail (Uetani et al. 2009).

We observed that, among the CONSORT items, “protocol” and “settings” were the least well-reported. Advocacy for the protocol registration of RCTs has spanned several decades, (Simes 1986) and in 2004, the International Committee of Medical Journal Editors declared that member journals would only accept publications if the trials had been registered (Dwan et al. 2011). Every study protocol must be registered in a publicly accessible database before a study commences, providing a clear outline of the study's objectives and expected results. One crucial aim of the protocol is to prevent the selective communication of results, known as results bias (Williamson and

Gamble 2005). Therefore, studies without protocol registration may present distorted data (Chan et al. 2013; Hahn et al. 2000). The item “settings” delineates the locations and environments in which the data were collected. Giving appropriately detailed information about the context and location of a study is vital for assessing applicability and generalizability, ultimately influencing the overall validity (Moher et al. 2001).

In our study, the items “randomization sequence”, “blinding”, and “losses/exclusions” were either inadequately or not reported in fewer than 50% of the studies. Authors should provide sufficient information to enable readers to assess the methods employed for generating random group allocations and the potential for bias in group assignment (Moher et al. 2001). Blinding involves concealing the intervention from participants, the healthcare professionals administering the intervention, and those collecting the clinical data and analyzing results. Given the diverse possibilities of blinding, authors should explicitly state the blinding approach early on, avoiding terms like “double-blind” without additional clarification. The lack of detailed descriptions creates significant variability in both clinical interpretations and definitions of these terms in epidemiological manuals (Devereaux 2001). Authors should also disclose information regarding losses and exclusions for each group post-randomization, including reasons for these occurrences. It is crucial to reveal the nature of deviations from the protocol and the specific reasons for excluding participants (Moher et al. 2001).

In 50% of studies, data relating to flow charts or allocation concealment were found to be absent, incomplete, or inconsistent. The purpose of a flowchart is to efficiently and directly illustrate all phases of the RCT, encompassing participant recruitment, allocation, and follow-up periods, along with any corresponding losses to follow-up. The accurate description of participant distribution at each stage of the study significantly influences the interpretation of results. The absence of a flowchart hampers the analysis of the internal and external validity of the RCT, negatively impacting the clinical research report (Egger 2001). Allocation concealment ensures the unpredictability of treatment allocation by patients and investigators, which is essential for maintaining the integrity of a study. The optimal approach to achieving this is through the implementation of an independ ent and centralized allocation protocol (Cuschieri 2019).

Assessing the risk of bias in studies is an essential step for a systematic review (Martimbianco et al. 2023). In 2008, Cochrane introduced the RoB tool, which

comprises seven domains, allowing the evaluation of risk of bias for several aspects of a study (Higgins and Green 2011). Following updates to the Cochrane Handbook in 2018, the original RoB tool was replaced by the RoB2 (Higgins et al. 2022). This new instrument has five domains and provides a global assessment of the risk of bias for a study. The subjective analysis of a researcher is associated with algorithms, resulting in the synthesis of the risk of bias not only for each domain but also for the study as a whole (Sterne et al. 2019).

In this meta-research, we combined two tools: the assessment of CONSORT compliance and the RoB2. The studies included showed moderate adherence to the CONSORT recommendations, but this had no impact on their quality according to the domains of the Cochrane RoB2. The CONSORT assessment evaluates how an RCT was reported, motivating the description of full reports, whilst the RoB2 assesses the risk of bias of the RCT to help readers understand the reliability of its results (Flemyng et al. 2020). The difference in results between the two tools can be explained by differences in factors covered between the two, such as “protocol”, “settings”, and “flowchart” in the CONSORT guidelines. On the other hand, common points between the tools also presented divergences, such as for the item “random sequence”. Several CONSORT questions specifically ask how the information is described, while the RoB2 allows the reader to interpret information provided in the text (through the answers “probably yes” and “probably no”). It should be noted that the papers published about the use of mouthwashes for treating DH were well planned and executed; however, there were flaws in the detailing of the information according to CONSORT, reducing the transparency of the studies and hindering efforts of replication.

A limitation of our study was the lack of included papers in languages other than English. Although we conducted a comprehensive search in several databases, using specific vocabulary and keywords, it is possible that some articles were not detected. This may also be related to our choice of including only peer-reviewed papers, excluding gray literature.

Adherence to the CONSORT recommendations has shown a notable increase over the years. However, despite the publication of numerous high-quality articles in this aspect, opportunities for improvement persist, particularly in aspects such as the detailed description of CONSORT items such as “protocol”, “allocation concealment”, “settings”, and “flow chart”. Our aim is to inspire authors to further refine their research

reporting methodologies, enhance the peer review process, and indirectly promote the conduct of studies characterized by clarity, transparency, and rigor.

Conclusion

In the context of RCTs investigating the effectiveness of desensitizing mouthwashes for the treatment of DH, complete adherence to the CONSORT statement has not yet been achieved. Despite this, the included trials demonstrated a low risk of bias, suggesting careful planning and execution of studies published on this topic. These findings highlight the need to promote compliance with CONSORT recommendations to enhance research methodology.

Author contribution

Lauro Taques Neto: Methodology, Investigation, Formal analysis, Writing—review & editing. Letícia Maira Wambier: Methodology, Investigation, Formal analysis. Ana Cláudia Rodrigues Chibinski: Methodology, Investigation, Formal analysis, Supervision, Writing—review & editing.

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Data availability

The authors undertake to send all detailed research data if requested.

Declarations

Ethics Not applicable.

Competing interests

The authors have no conflict of interests related to the present article.

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5 ARTIGO 2 – DESENSITIZING TOOTHPASTES FOR DENTIN HYPERSENSITIVITY: AN OVERVIEW OF SYSTEMATIC REVIEWS

STATUS: Submetido

REVISTA: Journal of Evidence-Based Dental Practice

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Abstract

Numerous systematic reviews have evaluated the efficacy of desensitizing toothpastes for managing dentin hypersensitivity (DH); however, their methodological quality may vary, affecting the reliability of the conclusions. This overview critically appraised the methodological quality of published systematic reviews on desensitizing toothpastes for DH. Searches were conducted in PubMed, Cochrane Library, Web of Science, Scopus, Embase, and LILACS, without language or date restrictions. Two reviewers independently selected studies, extracted data, and assessed methodological quality using AMSTAR 2. Eligible studies were systematic reviews of randomized clinical trials evaluating the clinical effectiveness of desensitizing dentifrices in adults with DH. From 1,256 records, 14 systematic reviews published between 2006 and 2021 were included, encompassing 114 randomized trials and 11,213 participants. The reviews evaluated toothpastes containing arginine, potassium salts, bioactive glass, strontium, stannous fluoride, nano-hydroxyapatite, oxalates, herbal agents, and polymers. Methodological quality was critically low in 10 studies and low in 4. Common weaknesses included absence of protocol registration, incomplete search strategies, and limited assessment of publication bias. Strengths involved clear PICO questions and duplicate data extraction. In general, the included reviews reported that desensitizing agents provide clinically meaningful reductions in DH. Overall, systematic reviews on desensitizing toothpastes show low methodological quality. Arginine and n-HAP appear to perform better than other agents; however, methodological limitations limit confidence in these findings, reinforcing the need for stricter adherence to methodological and reporting standards to ensure more reliable evidence (PROSPERO registration CRD42022379562).

Keywords
Dentin sensitivity, Dentifrices, Systematic review

Introduction

Dentin hypersensitivity (DH) is defined as short, sharp episodes of pain arising in the absence of other dental pathology[1], [2]. This condition typically occurs due to exposed dentin, which renders teeth sensitive to thermal stimuli (hot or cold), chemical agents (such as sweet, salty, or acidic foods), and mechanical triggers (including vigorous toothbrushing). The reported prevalence of DH varies widely, ranging from 1.3% to 92.1%, with an average of around 30%[3]. The primary factors contributing to DH are gingival recession and loss of enamel, which can result from abrasion, abfraction, or erosion[4]. The incidence of DH has increased in recent years, influenced by changes in oral health behavior, greater longevity of minimally restored teeth, periodontal procedures, tooth whitening, and orthodontic treatments [5], [6].

The most widely recognized explanation for DH is Brännström's hydrodynamic theory, which suggests that pain occurs when stimuli act on exposed dentin, inducing rapid movement of dentinal fluid that activates pulpal nerve endings[7]. Therapeutic approaches generally aim to reduce fluid flow within the dentinal tubules to decrease neural stimulation. The two main strategies for managing DH are either to inhibit neural transmission or to physically occlude the exposed dentinal tubules[8].

A wide range of products has been developed for the management of DH[2]. Among the less invasive approaches, desensitizing toothpastes are particularly noteworthy, as they are affordable, easily accessible, and suitable for home use. These formulations contain various active agents—such as fluorides, potassium salts, arginine, oxalates, stannous compounds, strontium, and bioactive materials—that function by either occluding dentinal tubules or modulating neural responses[9], [10].

Although numerous clinical trials have evaluated the effectiveness of these products, the results remain heterogeneous and, in some cases, conflicting. As a result, systematic reviews and meta-analyses have been increasingly employed to synthesize available evidence and support clinical decision-making[11], [12]. Systematic reviews occupy the top of the evidence hierarchy because, when rigorously conducted, they minimize bias through transparent methods and structured critical appraisal. However, not all systematic reviews adhere to high methodological standards. If poorly designed, the methodological quality of these reviews may vary,

potentially compromising the reliability of their conclusions[13], providing an inaccurate understanding of the true effectiveness of desensitizing dentifrices.

In this context, methodological appraisal tools play a fundamental role in safeguarding the integrity of evidence-based practice. AMSTAR, originally published in 2007, represented a major advance in assessing the quality of systematic reviews of randomized trials. Nevertheless, the complexity and diversity of contemporary evidence required a more comprehensive evaluative framework. AMSTAR-2 (A Measurement Tool to Assess Systematic Reviews) released in 2017[14], expanded the original instrument from 11 to 16-item tool, offering essential means of detecting methodological weaknesses that could compromise the validity of reviews. By identifying methodological strengths and deficiencies, AMSTAR-2 assists researchers and clinicians in determining whether a given systematic review provides trustworthy evidence to guide practice—or whether its limitations warrant cautious interpretation or further investigation.

Accordingly, the present study aims to conduct an overview of systematic reviews and to critically appraise their methodological quality using the AMSTAR-2 instrument, in order to establish the reliability of current evidence on the effectiveness of desensitizing dentifrices in the treatment of DH.

Methods

Protocol and registration

This overview of systematic reviews was conducted following the guidance provided in Chapter 22: Overviews of Reviews[15]. The study protocol was registered in the PROSPERO database under the registration number CRD42022379562.

Criteria for Selection of Reviews for Inclusion

The eligibility criteria were defined according to a PICO-based strategy, including systematic reviews of randomized clinical trials that addressed the following research question: “In patients with DH (P), are toothpastes containing desensitizing agents (I), compared to placebo toothpaste, fluoride containing toothpaste, or toothpastes containing different desensitizing agents (C), effective in relieving pain (O)?”

Types of Participants

Adult patients clinically diagnosed with DH; patients of both sexes and different age ranges within the adult population were considered eligible, regardless of the number or location of the sensitive teeth.

Types of Interventions

Interventions included the use of toothpastes formulated with desensitizing agents intended to reduce pain associated with DH. Studies evaluating any concentration, duration, or frequency of toothpaste use were included. These agents may include, but are not limited to, potassium salts (e.g., potassium nitrate, potassium citrate), stannous fluoride, strontium compounds, arginine and calcium carbonate, bioactive glass.

Types of Comparators

The comparators comprised toothpastes without desensitizing agents (placebo formulations), toothpastes containing only fluoride, or toothpastes containing alternative desensitizing agents. Comparisons could include head-to-head evaluations between different active formulations or between an active and a placebo control, provided the outcomes related to pain reduction in DH were reported.

Types of Outcomes

The primary outcome was the reduction of pain or discomfort associated with DH, as assessed by validated scales such as the Visual Analog Scale (VAS), Numeric Rating Scale (NRS), or Verbal Rating Scale (VRS), following exposure to thermal, tactile, or evaporative stimuli.

Types of Reviews

Only systematic reviews of randomized controlled trials (RCTs) were included. Meta-analyses, when available, were considered as part of the synthesis.

Search Methods for Identification of Reviews

Two reviewers (LTN and LMW) performed searches across the following electronic databases: PubMed, Cochrane Library, Web of Science, Scopus, Embase, and LILACS. The search strategy was first developed for PubMed and subsequently

adapted to each database, taking into account their specific syntax requirements, and combining controlled vocabulary (MeSH terms) with free-text terms using the Boolean operators “OR” and “AND” (Figure 6). Alerts were also set up to capture studies published up to May 2025.

Additionally, unpublished systematic reviews were identified by searching relevant registry platforms in the fields of science and Open Science Framework register sites. Gray literature was also explored in Google Scholar by screening the first 100 records. No restrictions were applied based on publication year, status, or language. Additionally, the reference lists of all included systematic reviews were also appraised to identify potential reviews to be included in this overview.

Pubmed = 25 (20/05/2025)	
#1 ("dentin sensitivity"[MeSH Terms] OR "tooth sensitivity"[MeSH Terms] OR "dentin hypersensitivity"[Title/Abstract] OR "tooth sensitivity"[Title/Abstract] OR "sensitive teeth"[Title/Abstract])	**#2** ("dentifrices"[MeSH Terms] OR "toothpaste"[Title/Abstract] OR "dentifrice"[Title/Abstract] OR "desensitizing toothpaste"[Title/Abstract] OR "desensitizing agent"[Title/Abstract])
#1 AND #2	
Scopus = 64 (20/05/2025)	
#1 (TITLE-ABS-KEY (“dentin hypersensitivity”) OR TITLE-ABS-KEY (“tooth sensitivity”) OR TITLE-ABS-KEY (“sensitive teeth”)	#2 TITLE-ABS-KEY (dentifrices) OR TITLE-ABS-KEY (toothpaste) OR TITLE-ABS-KEY (dentifrice) OR TITLE-ABS-KEY (“desensitizing toothpaste”) ORTITLE-ABS-KEY (“desensitizing agent”)) AND (LIMIT-TO (SUBJAREA , “dent”)) AND (LIMIT-TO (DOCTYPE ,”re”))
#1 AND #2	
Web of Science = 356 (20/05/2025)	
#1 "dentin sensitivity" (All Fields) or "tooth sensitivity" (All Fields) or "dentin hypersensitivity" (All Fields) or "sensitive teeth" (All Fields)	**#2** dentifrices (All Fields)or toothpaste (All Fields) or dentifrice (All Fields) or "desensitizing toothpaste" (All Fields) or "desensitizing agent" (All Fields) and Review Article (Document Types) and Dentistry Oral Surgery Medicine (Web of Science Categories) and 1.49 Dentistry & Oral Medicine (Citation Topics Meso)
#1 AND #2	
Lilacs and BBO = 45 (20/05/2025)	
#1 (mh:dentin sensitivity OR mh:tooth sensitivity OR "dentin hypersensitivity" OR "sensitive teeth" OR "hipersensibilidade dentinária" OR "dentes sensíveis" OR "hipersensibilidad dentinaria" OR "dientes sensibles")	**#2** ((mh:dentifrices OR toothpaste OR dentifrice OR "desensitizing toothpaste" OR "desensitizing agent" OR dentifrícios OR "pasta de dente" OR dentifrício OR "pasta de dente dessensibilizante" OR "agente dessensibilizante" OR "pasta de dientes" OR "pasta de dientes desensibilizante" OR "agente desensibilizante"))
#1 AND #2	
Cochrane Library = 762 (20/05/2025)	
#1 MeSH descriptor: [Dentin Sensitivity] explode all trees **#2** ("dentin hypersensitivity"):ti,ab,kw OR ("tooth sensitivity"):ti,ab,kw OR ("sensitive	**#4** MeSH descriptor: [Dentifrices] explode all trees **#5** (toothpaste):ti,ab,kw OR (dentifrice):ti,ab,kw OR ("desensitizing

teeth"):ti,ab,kw (Word variations have been searched) **#3** #1 OR #2	toothpaste"):ti,ab,kw OR ("desensitizing agent"):ti,ab,kw (Word variations have been searched) **#6** #4 OR #5
#3 AND #6	
EMBASE = 4 (20/05/2025)	
#1 'dentin sensitivity'/exp OR 'dentin sensitivity' OR 'tooth sensitivity'/exp OR 'tooth sensitivity' OR 'dentin hypersensitivity'/exp OR 'dentin hypersensitivity' OR 'sensitive teeth'/exp OR 'sensitive teeth'	**#2** 'dentifrices'/exp OR 'dentifrices' OR 'toothpaste'/exp OR 'toothpaste' OR 'dentifrice'/exp OR 'dentifrice' OR 'desensitizing toothpaste' OR 'desensitizing agent'/exp OR 'desensitizing agent'
#1 AND #2	

Fig. 6 Search strategy in the different databases (May 20, 2025)

Data Collection and Analysis

The identified studies were imported to the reference manager software EndNote™ (version 20, Clarivate Analytics, Philadelphia, USA) and duplicate records were eliminated. Two reviewers (LTN; LMW) independently screened the titles and abstracts to determine eligibility. If doubt remains, full texts were retrieved for further evaluation and any discrepancies in study inclusion were resolved by consensus, with guidance from an experienced reviewer (ACRC).

Reasons for exclusion after full-text assessment were thoroughly documented. Articles published in languages other than English were translated using Google™ Translate.

After study selection, data extraction was conducted by two reviewers independently (LTN; LMW), and disagreements were resolved through discussion with a third reviewer (ACRC). Extracted data for each included systematic review were organized in a standardized spreadsheet using Microsoft Excel™ and included, the following information was extracted: (1) general information: authors' names, year of publication, country of origin, and the journal in which the review was published; (2) methodological characteristics: protocol registration, reporting guidelines followed, eligibility criteria, search strategies; (3) characteristics of included studies: data related to the types of interventions evaluated, control groups, and clinical outcomes measured; (4) main findings: number of studies included, the risk of bias assessment; additional information such as authors' conclusions, sources of funding, and declarations of conflict of interest were also recorded.

Methodological Quality Assessment

The methodological quality of the included systematic reviews was evaluated using the AMSTAR 2 tool. Two reviewers (LTN and ACC) jointly reviewed the AMSTAR 2 criteria and discussed how to apply the instrument to the selected studies, with each assessment parameter defined in advance. After that, each one applied the tool to the included studies, and any disagreements were resolved with the involvement of a third reviewer (LMW).

AMSTAR 2 consists of 16 items, with possible responses of “Yes,” “Partial Yes,” “No,” or “No Meta-analysis Conducted.” An item was rated as “Yes” if it fully met the criterion with adequate documentation; “Partial Yes” if it met the criterion but with limited evidence; and “No” if there was insufficient information to assess it. Seven domains can critically affect the validity of a review and they are considered “critical weakness”: protocol registered before commencement of the review (item 2); adequacy of the literature search (item 4); justification for excluding individual studies (item 7); risk of bias from individual studies being included in the review (item 9); appropriateness of meta-analytical methods (item 11); consideration of risk of bias when interpreting the results of the review (item 13); assessment of presence and likely impact of publication bias (item 15).

Therefore, the overall confidence in the results of the systematic reviews was assessed based on the presence of critical and non-critical weaknesses. Reviews were rated as “high Confidence” when no or only one non-critical weakness was identified, indicating that the review provides an accurate and comprehensive summary of the available evidence. “Moderate Confidence” was assigned to reviews with more than one non-critical weakness but no critical flaws. Reviews presenting one critical flaw, with or without non-critical weaknesses, were classified as “low Confidence”, as such limitations may compromise the validity of the findings. Reviews with more than one critical flaw, regardless of non-critical weaknesses, were rated as “critically low” confidence and should not be relied upon [16].

Synthesis Methods

Data extracted from the included systematic reviews were synthesized using a narrative and descriptive approach. The synthesis focused on identifying patterns and differences across studies regarding methodological characteristics, types of

desensitizing agents investigated, comparators employed, and the main clinical outcomes reported.

When meta-analytical data were available, the findings were described and interpreted in conjunction with the qualitative evidence to provide a comprehensive overview of the effectiveness of desensitizing agents.

Results

Search Selection

Initially, 1,256 articles were identified. After removing duplicates, 391 articles were excluded based on title screening and 40 based on abstract review, leaving 19 articles for full-text assessment. Following a detailed evaluation, 5 articles were excluded for not meeting the eligibility criteria, resulting in a final selection of 14 studies[2], [10], [11], [12], [17], [18], [19], [20], [21], [22], [23], [24], [25], [26]. A flowchart of the study selection process is presented in Figure 7.

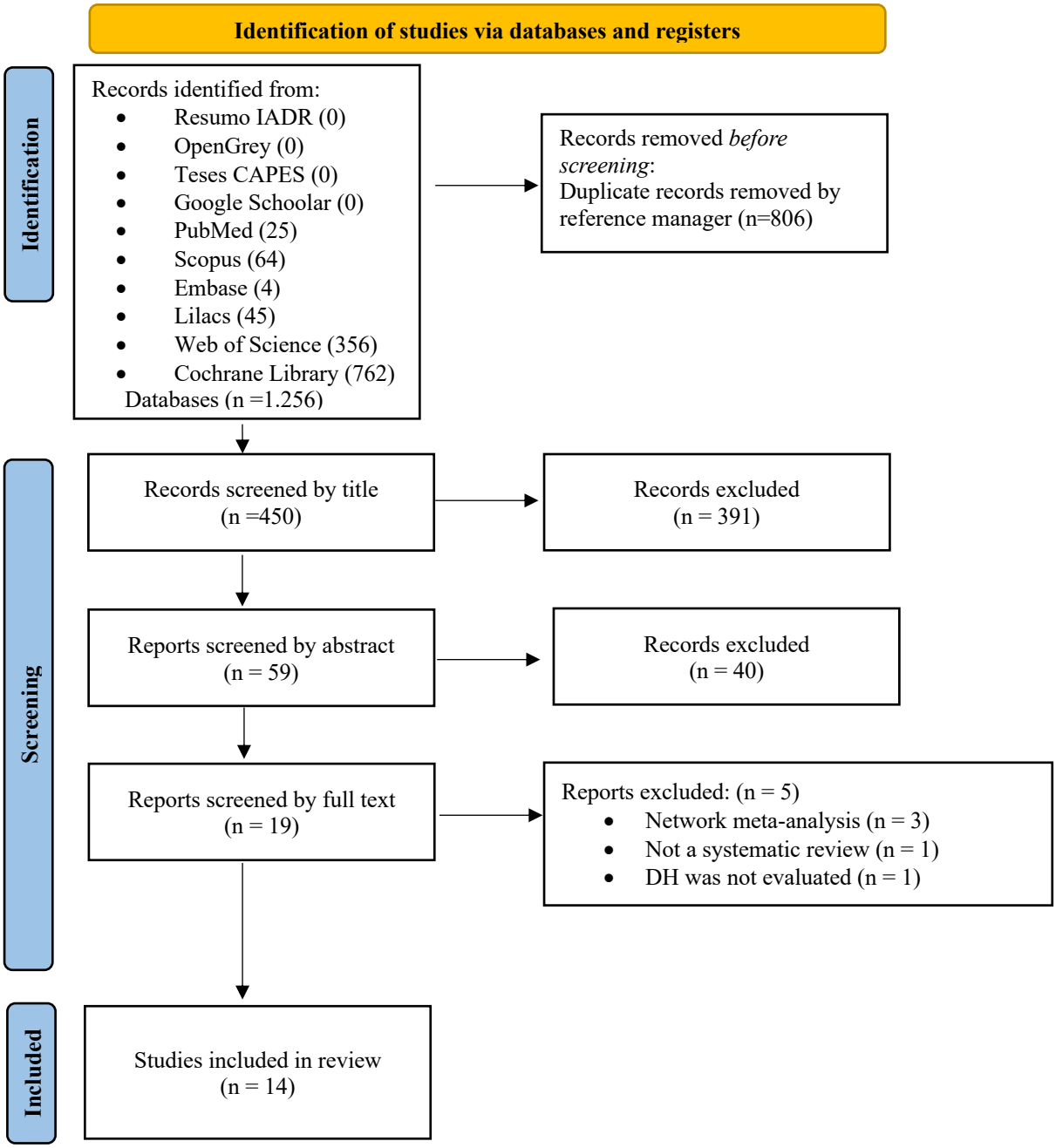

Fig. 7 PRISMA flow diagram illustrating the study selection process

Study Characteristics

The included studies were published between 2006 and 2021. The predominant language was English, with only one study published in Chinese[20]. The studies were conducted in seven countries: Brazil (n = 4)[11], [12], [17], [21], the United Kingdom (n = 3)[2], [19], [22], [23], China (n = 3)[20], [24], [26], the United States (n = 1)[25], South Korea (n = 1)[18], and Portugal (n = 1)[10] (Figure 8). The studies were published in the following journals: Cochrane Library (n = 2)[22], [23], Journal of

Clinical Periodontology (n = 2)[18], [27], Journal of Dentistry (n = 2)[11], [26], American Journal of Dentistry (n = 1)[21], International Journal of Dentistry (n = 1)[19], Journal of Oral Rehabilitation (n = 1)[10], Oral Health and Preventive Dentistry (n = 1)[17], PLOS ONE (n = 1)[25], Quintessence International (n = 1)[24], Saudi Dental Journal (n = 1)[12], and West China Journal of Stomatology (n = 1)[20].

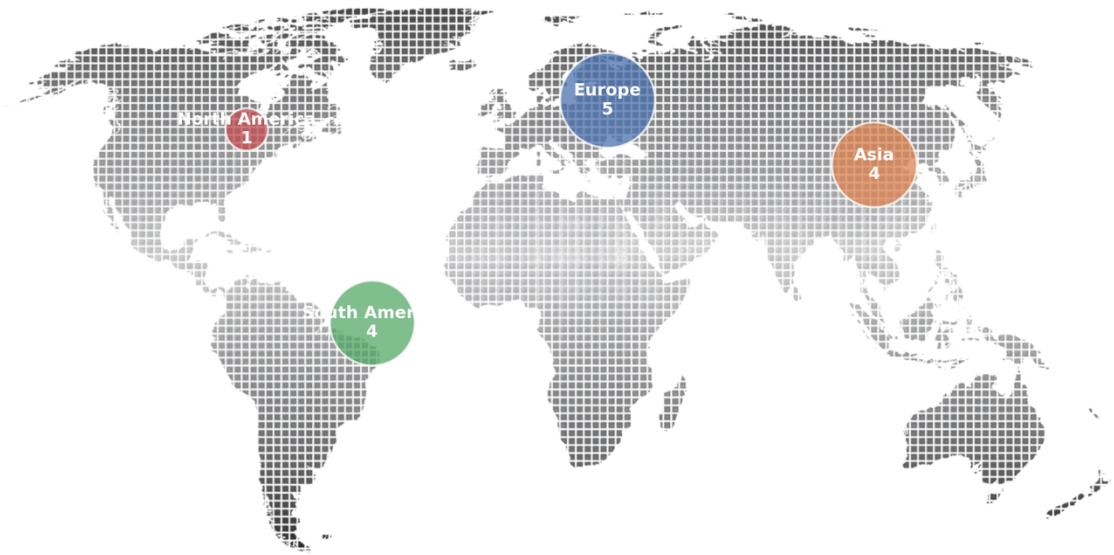

Fig. 8 Global distribution of the included systematic reviews according to continent. Bubble size is proportional to the number of publications, and colors represent different geographic regions

Seven of the 14 studies[10], [11], [12], [17], [18], [21], [26] reported protocol registration. Eleven studies adhered to reporting guidelines such as PRISMA statements and Cochrane standards for systematic reviews[10], [11], [12], [17], [18], [22], [23], [24], [25], [26], [27], while three studies[19], [20], [21] did not mention any reporting checklist. Only two studies[10], [27] did not describe a PICO framework. Regarding search strategy, three studies evaluated three or fewer databases[18], [19], [27], eleven studies searched more than three databases[10], [11], [12], [17], [20], [21], [22], [23], [24], [25], [26], and five studies included gray literature searches[11], [12], [17], [21], [25]. Eight studies did not report restrictions regarding publication date or language[11], [12], [17], [20], [21], [22], [23], [24]. Finally, eight studies[10], [12], [19], [20], [21], [22], [23], [27] did not perform a meta-analysis.

The 14 included studies encompassed 114 RCTs, totaling 11,213 patients aged 18 to 78 years (details in Table 4). Follow-up periods ranged from immediate assessments after toothpaste application up to 24 weeks. DH pain was induced using evaporative, tactile, thermal, and electrical stimuli. Pain measurements were

performed using the Visual Analogue Scale (VAS), Schiff scale, or Verbal Rating Scale (VRS). Among the 14 studies, seven evaluated toothpastes containing arginine[10], [17], [18], [21], [24], [26], [27], seven contained potassium salts[10], [18], [19], [22], [23], [26], [27], six contained bioactive glasses[12], [18], [20], [25], [26], [27], six contained strontium[10], [18], [19], [21], [26], [27], four contained stannous[10], [18], [26], [27], four contained nano-hydroxyapatite (n-HAP)[10], [11], [26], [27], two contained oxalate salts[10], [27], two contained herbal agents[10], [27], and one contained polymers[27]. The studies included either a placebo[10], [11], [12], [18], [19], [21], [22], [23], [24], [25], [27] or other active treatments [10], [11], [12], [17], [19], [20], [21], [22], [23], [24], [25], [26], [27] as comparators.

Table 4 Characteristics of the included studies.

Identification of articles (author, date)	Base de dados eletrônicas	Interventions	Controls	Age (years)	Follow-up	Conclusions
Alencar et al. 2019[11]	PubMed, Cochrane Library, Web of Science, Scopus, LILACS, Open Gray e Clinical Trials	n-HAP	Placebo and other active tretaments	18-70	4-12 weeks	The n-HAP-containing treatment showed greater DH relief when compared to other desensitizing agents, placebo or negative control.
Arantes et al. 2019[17]	Pubmed, Cochrane Library, Web of Science, Scopus, Virtual Health Library e Open Grey	Arginine	Other active tretaments	18-65	4-11 weeks	Pro-argin-containing and NovaMin-containing toothpastes showed effectiveness for DH reduction. No statistically significant difference between the two toothpastes was found. Thus, both can be prescribed to treat DH in adults with equivalent effectiveness up to four weeks.
Bae, Kim, Myung 2015[18]	Pubmed, Cochrane Library e Embase	Arginine, potassium salts, bioactive glasses, strontium and stannous	Placebo	18-77	3-12 weeks	The study reports that there is sufficient evidence to support the use of potassium, stannous fluoride, potassium and stannous fluoride, calcium sodium phosphosilicate, and arginine-containing desensitizing toothpastes for dentin hypersensitivity, but not the use of strontium-containing desensitizing toothpaste.
Freitas et al. 2021[12]	PubMed, Cochrane Library, Web of Science, LILACS e Grey Literature	Bioactive glasses	Placebo and other active tretaments	18-70	4-12 weeks	The findings appear to provide clinical success in managing DH with concentrations from 2.5% to 7.5% of toothpaste containing 45S5.

Identification of articles (author, date)	Base de dados eletrônicas	Interventions	Controls	Age (years)	Follow-up	Conclusions
Hu et al. 2018[26]	PubMed, Cochrane Library, Web of Science, EMBASE and the Chinese Biomedical Literature Database	Arginine, potassium salts, bioactive glasses, strontium, stannous and n-HAP	Other active tretaments	18-70	3-12 weeks	Results support the premise that toothpastes containing potassium, stannous uoride, potassium and strontium, potassium and stannous fluoride, calcium sodium phosphosilicate, arginine, and nano-hydroxyapatite relieve the symptoms of DH, but does not advise the use of toothpastes that contain strontium and amorphous calcium phosphate. Furthermore, high-quality studies are needed to confirm our results.
Karim et al. 2013[19]	The search strategy included using hand searching or electronic databases (cita epans o exemplo do PUBMED)	Potassium salts and strontium	Placebo and other active tretaments	18 or older	8-12 weeks	The results of the present study appear to corroborate the conclusions of previous researchers that there is only minimal evidence of the effectiveness of strontium and potassium-based toothpastes in relieving the symptoms of dentin hypersensitivity.
Liu et al. 2018[20]	PubMed, Cochrane Library, Embase, WanFang Data, CBM (Chinese Biomedical Literature Database) e CNKI (China National Knowledge Infrastructure)	Bioactive glasses	Other active tretaments	18-75	1-12 weeks	Current evidence indicated that calcium sodium phosphosilicatewas more effective than potassium nitrate at reducing DH. The evidence generated by this review was based on a small number of individuals. High-quality and large sample size as well as ideally designed clinical trials are required in the future before definitive recommendations can be made.

Identification of articles (author, date)	Base de dados eletrônicas	Interventions	Controls	Age (years)	Follow-up	Conclusions
Magno et al. 2015[21]	PubMed, Cochrane Library, Scopus, EMBASE, LILACS, Web of Science e Open Grey	Arginine and strontium	Placebo and other active tretaments	18-75	Immediate application within 112 days.	This systematic review demonstrated that arginine-based toothpaste provided an effective level of DH relief in a shorter time period of use than the strontium-based toothpaste. However, well-designed clinical trials are required due the relatively limited amount of evidence to support this conclusion.
Marto et al. 2019[10]	PubMed, Cochrane Library, EMBASE and Clinical Trials	Arginine, potassium salts, strontium, stannous, n-HAP, oxalate salts and herbal agents	Placebo and other active tretaments	18-75	1 day to more than 6 months	All active ingredients show efficacy in DH reduction in different fol- low-up times. Only in-office treatments are effective in immediate DH reduction, maintaining its efficacy over time. For long-time effects, at-home treatments can also be used. More standardised evaluation protocols should be implemented to increase the robustly of the results.
Poulsen et al. 2006[22]	Cochrane Library	Potassium salts	Placebo and other active tretaments	33-49	8-12 weeks	The evidence generated by this review is based on a small number of individuals. Furthermore, the effect varies with the methods applied for assessing the sensitivity. Thus no clear evidence is available for the support of potassium containing toothpastes for dentine hypersensitivity.
Poulsen et al. 2012[23]	Cochrane Library.	Potassium salts.	Placebo and other active tretaments	29-63	8-12 weeks	The evidence generated by this review is based on a small number of individuals. Furthermore, the effect varies with the methods applied for assessing the sensitivity.
West, Seong, Davies, 2015[27]	PubMed, Cochrane Library e Medline.	Arginine, potassium salts, bioactive glasses, strontium, stannous, n-HAP, oxalate salts, herbal agents and polymers.	Placebo and other active tretaments	18 or older		Treatments including stannous fluoride, arginine, calcium sodium phosphosilicate and strontium toothpaste appear to be clinically effective for the treatment of dentine hypersensitivity compared to comparators and controls. There is limited evidence to confirm the relative effectiveness of individual professionally applied agents.

Identification of articles (author, date)	Base de dados eletrônicas	Interventions	Controls	Age (years)	Follow-up	Conclusions
Yan et al. 2013[24]	Pubmed, Cochrane Library, Embase e China National Knowledge Infrastructure.	Arginine.	Placebo and other active tretaments	18-78	3-16 weeks	Current available clinical evidence suggests that arginine-containing toothpastes are associated with the reduction of DH compared to both placebo and positive control toothpastes. However, there are limitations to the current studies, and more well-designed trials are needed to confirm the efficacy.
Zhu et al. 2015[25]	Cochrane Library, EMBASE, Web of Science Medline , Chinese Biomedical Literature Database e Grey Literature.	Bioactive glasses.	Other active tretaments	20-60	15 days to 8 weeks	The majority of studies found that calcium sodium phosphosilicate was more effective than the negative control at alleviating DH. Because strong evidence is scarce, high-quality, well-designed clinical trials are required in the future before definitive recommendations can be made

Assessment of Methodological Quality

The methodological quality of the included systematic reviews, assessed using the AMSTAR 2 tool, revealed substantial weaknesses across most domains. None of the reviews achieved a high or moderate level of confidence.

The overall confidence in the results was rated as low [11], [12], [21], [26] or critically low [10], [17], [18], [19], [20], [22], [23], [24], [25], [27] for all included reviews, with the majority classified as critically low. Individually, the main methodological issues were identified were related with items 2, 3, 4, 10, 12, 13, 14, and 15. None of the studies provided a complete statement of all review methods prior to conducting the review. Although all authors reported including RCTs, none explained the rationale for this inclusion. Only three studies[12], [21], [25] comprehensively applied the search strategy. Five studies[11], [18], [24], [25], [26] reported the funding sources of the studies included in their reviews. Three studies[11], [17], [25] assessed the potential impact of risk of bias (RoB) in individual studies on meta-analysis results or other evidence syntheses. Four studies[11], [17], [20], [26] considered RoB in individual studies when interpreting or discussing review findings. Three studies[11], [20], [24] provided an adequate explanation and discussion of any observed heterogeneity in the review results. Only two studies[24], [26] conducted graphical or statistical tests for publication bias and discussed the likelihood and magnitude of its potential impact (Figure 9).

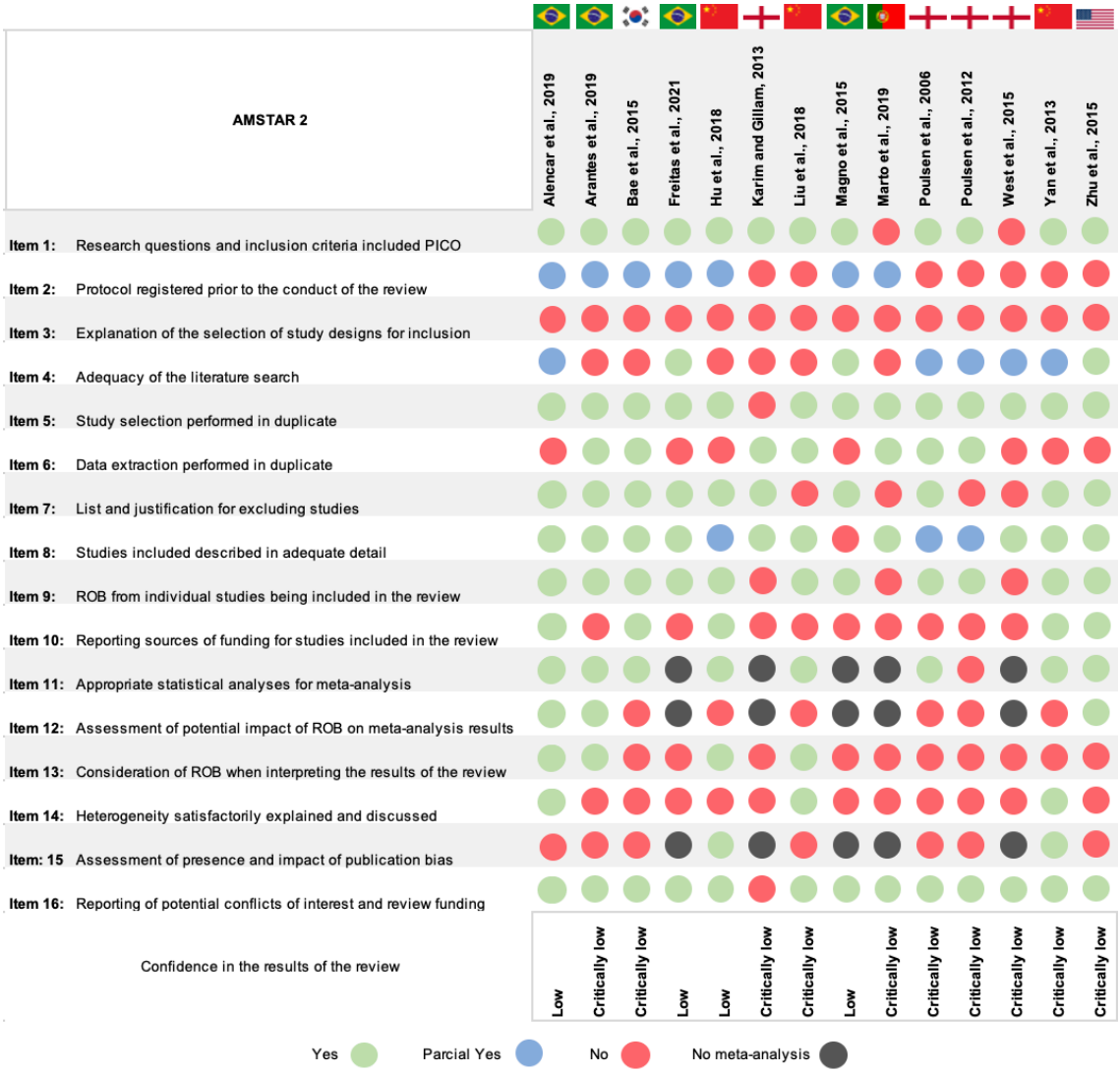

Fig. 9 AMSTAR 2 methodological quality assessment of the included systematic reviews

Considering the critical AMSTAR-2 items, which directly determine the overall confidence rating of the included systematic reviews, substantial methodological weaknesses were observed (Figure 10). None of the critical domains demonstrated consistent full compliance across the reviews. In particular, protocol registration with clear a priori specification of methods (item 2) was frequently rated as “Partial Yes” or “No”. Similarly, the adequacy of the literature search (item 4) showed low adherence, with a large proportion of reviews failing to meet the criteria for a comprehensive search strategy. Although the reporting of excluded studies with justification (item 7), the assessment of risk of bias in individual studies (item 9), and the use of appropriate meta-analytical methods when applicable (item 11) were frequently rated as ‘Yes’, these strengths were not accompanied by appropriate consideration of risk of bias when interpreting the review findings (item 13), which was predominantly rated as ‘No.

For item 15 (investigation of publication bias) was also partially described or no described at all. Collectively, the evidence shows that key methodological requirements were addressed incompletely in most reviews.

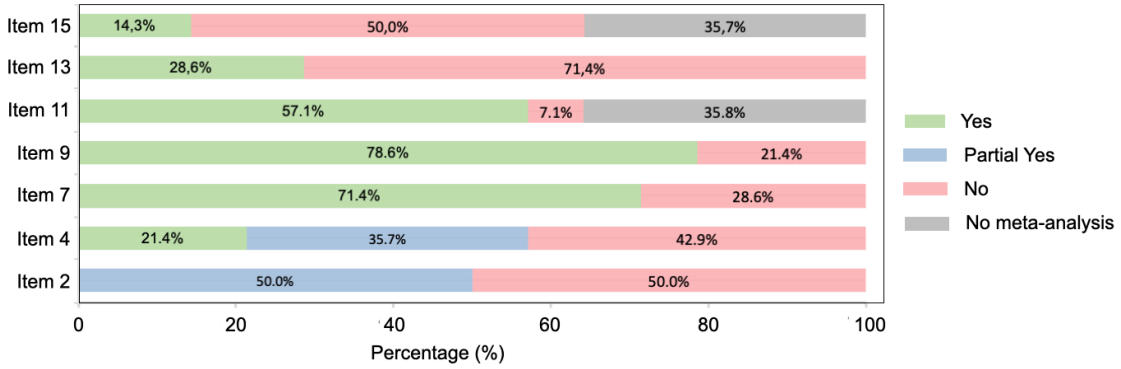

Fig. 10 Relative frequencies of critical items of included systematic reviews– AMSTAR 2 tool

The evaluation of non-critical AMSTAR-2 items revealed a heterogeneous pattern of methodological compliance among the included systematic reviews (Figure 11). High proportions of “Yes” ratings were observed for the formulation of structured research questions using the PICO framework (item 1), study selection performed in duplicate (item 5), adequate description of included studies (item 8), and disclosure of conflicts of interest and funding sources of the reviews (item 16). In contrast, all reviews failed to justify the selection of study designs (Item 3), and most did not adequately address heterogeneity in their results (item 14). Limited compliance was also observed for the assessment of the potential impact of risk of bias in individual studies on the results of meta-analyses (item 12), with a substantial proportion of reviews classified as “No meta-analysis”. Items related to duplicate data extraction and reporting of funding sources of the included primary studies (items 6 and 10) showed mixed levels of adherence, with both “Yes” and “No” ratings observed.

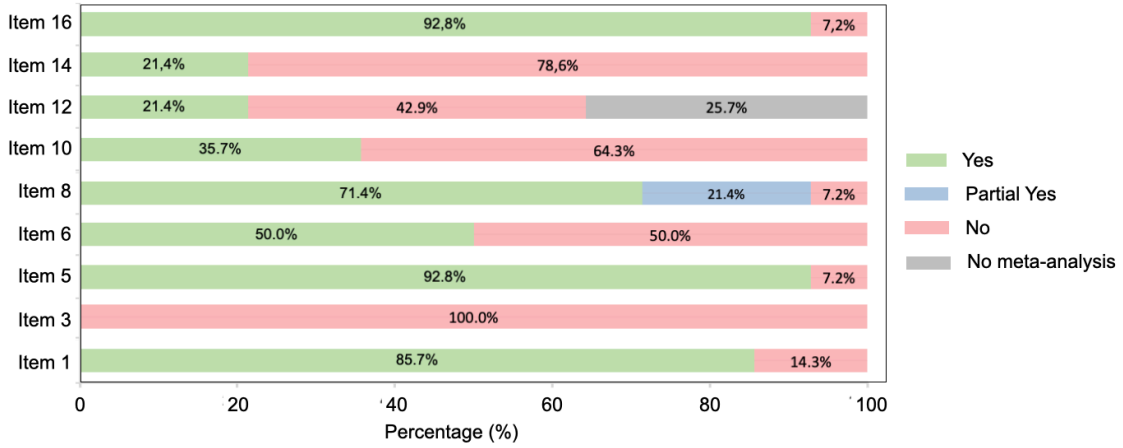

Fig. 11 Relative frequencies of non-critical items of included systematic reviews– AMSTAR 2 tool

Meta-analysis results

Results from the evaluated systematic reviews and meta-analyses were grouped according to the comparisons presented, encompassing two main categories: (1) active interventions versus placebo, and (2) active interventions versus active comparators.

Active intervention vs. placebo

Toothpastes containing bioactive glasses vs. placebo[18], [25], [26]

Statistical analyses demonstrated a significant association between bioactive glass-containing toothpastes and DH reduction in two reviews[18], [25]. One study reported a favorable effect for bioactive glass dentifrices (SMD = –2.36; 95% CI: –3.72 to –1.00; $p < 0.0007$; $I^2 = 92\%$, $p < 0.00001$)[18]. Another study identified significant DH reduction with bioactive glass toothpastes at two weeks (MD = –0.68; 95% CI: –1.15 to –0.20; $p = 0.005$; $I^2 = 59\%$, $p = 0.06$) and six weeks (MD = –1.69; 95% CI: –1.86 to –1.52; $p < 0.00001$; $I^2 = 42\%$, $p = 0.18$) using the evaporative test, and similarly at six weeks using the thermal test (MD = –1.70; 95% CI: –2.17 to –1.23; $p < 0.00001$; $I^2 = 72\%$, $p = 0.03$)[25]. However, the same study found no effect at two weeks using the thermal test (MD = –0.59; 95% CI: –1.33 to 0.14; $I^2 = 84\%$)[25]. Additionally, another review reported no significant association between bioactive glass dentifrices and DH reduction (SMD = –0.56; 95% CI: –1.40 to 0.33; $p = 0.23$; $I^2 = 98\%$, $p < 0.002$)[26].

Toothpastes containing arginine vs. placebo[18], [24], [26]

Two studies identified a significant association between arginine-containing dentifrices and DH reduction (SMD = –3.25; 95% CI: –3.87 to –2.63; $p < 0.00001$; $I^2 = 86\%$, $p < 0.00001$) [18], and (SMD = –2.52; 95% CI: –3.20 to –1.84; $p < 0.00001$; $I^2 = 94\%$, $p < 0.00001$) [26]. Another analysis also reported significant effects immediately after application—tactile test (MD = 18.98; 95% CI: 15.48 to 22.48; $p < 0.05$; $I^2 = 71.5\%$, $p = 0.007$) and evaporative test (MD = –1.05; 95% CI: –1.23 to –0.88; $p < 0.05$; $I^2 = 59.1\%$, $p = 0.044$). Significant improvements were also observed at three days (tactile: MD = 20.84; 95% CI: 15.67 to 26.00; evaporative: MD = –1.29; 95% CI: –1.52 to –1.07; $p < 0.05$) and at eight days (tactile: MD = 23.23; 95% CI: 18.64 to 27.82; evaporative: MD = –1.54; 95% CI: –1.68 to –1.34; $p < 0.05$)[24].

Toothpastes containing potassium vs. placebo[18], [26]

Both meta-analyses demonstrated effectiveness of potassium-containing toothpastes in reducing DH (SMD = –1.28; 95% CI: –2.05 to –0.51; $p = 0.001$; $I^2 = 93\%$, $p < 0.00001$) [18], [26], and (SMD = –1.27; 95% CI: –1.77 to –0.43; $p < 0.0001$; $I^2 = 93\%$, $p < 0.00001$)[18], [26].

Toothpastes containing potassium + stannous vs. placebo[18], [26]

The combination of potassium and stannous showed significant DH reduction (SMD = –2.50; 95% CI: –4.10 to –0.91; $p = 0.002$; $I^2 = 95\%$, $p < 0.00001$) in both meta-analyses[18], [26].

Toothpastes containing stannous vs. placebo[18], [26]

Stannous-containing toothpastes demonstrated superior outcomes compared to placebo (SMD = –1.37; 95% CI: –2.30 to –0.44; $p = 0.004$; $I^2 = 95\%$, $p < 0.00001$) [18], and (SMD = –2.31; 95% CI: –3.39 to –1.23; $p = 0.00001$; $I^2 = 97\%$, $p < 0.00001$)[26].

Toothpastes containing strontium vs. placebo[18], [26]

Evidence regarding strontium-containing toothpastes showed no measurable benefit over placebo. One review found no significant reduction in DH (SMD = 0.05; 95% CI: –0.34 to 0.44; $p = 0.81$; $I^2 = 64\%$, $p = 0.04$)[18]. Consistent with this, another meta-analysis also failed to identify meaningful effects associated with strontium

formulations (SMD = –0.34; 95% CI: –1.04 to –0.77; p = 0.93; I^2 = 94%, p < 0.00001)[26].

Toothpastes containing n-HAP vs. placebo[11], [26]

A significant association was observed for n-HAP dentifrices (SMD = –2.19; 95% CI: –2.61 to –1.76; p < 0.00001; I^2 = 0%, p = 0.72) [26]. The evaporative (SMD = –1.09; 95% CI: –1.24 to –0.94; p < 0.00001; I^2 = 0%, p = 0.98) and tactile tests (SMD = –1.33; 95% CI: –1.50 to –1.14; p < 0.00001; I^2 = 84%, p = 0.01) also showed significant reductions[11]. However, no statistical differences were reported using the 0–10 scale (SMD = –0.02; 95% CI: –3.01 to 3.05; p = 0.99; I^2 = 0%, p = 0.69) or the cold stimulus test (SMD = –0.17; 95% CI: –0.81 to 0.48; p = 0.61; I^2 = 0%, p = 0.87)[11].

Active intervention vs. active comparator

Arginine vs. bioactive glass[17]

No statistically significant differences were detected immediately after application (SMD = –1.05; 95% CI: –3.52 to 1.41; p = 0.40; I^2 = 98%, p < 0.00001), at two weeks (SMD = –0.55; 95% CI: –2.59 to 1.48), or at four weeks (SMD = –0.49; 95% CI: –2.78 to 1.81; p = 0.68; I^2 = 98%, p < 0.00001)[17].

Arginine vs. potassium[24]

Arginine demonstrated superior effects at three days (tactile: MD = 21.46; 95% CI: 17.09 to 25.83; evaporative: MD = –1.21; 95% CI: –1.63 to –0.78; both p < 0.05) and at eight days (tactile: MD = 7.09; 95% CI: 4.64 to 9.54; evaporative: MD = –0.38; 95% CI: –0.56 to –0.20; both p < 0.05)[17].

Arginine vs. strontium[24]

Better outcomes were observed for arginine-containing dentifrice after eight days (tactile: MD = 7.75; 95% CI: 2.61 to 12.90; evaporative: MD = –0.45; 95% CI: –0.71 to –0.19; both p < 0.05)[24].

n-HAP vs. other desensitizing agents[17]

n-HAP toothpastes were statistically superior when evaluated by tactile (SMD = –0.57; 95% CI: –0.79 to –0.35; p < 0.00001; I^2 = 0%, p = 0.35) and evaporative tests (SMD = –1.02; 95% CI: –1.49 to –0.56; p < 0.0001; I^2 = 0%, p = 0.43) [17].

Discussion

The present study critically evaluated the methodological quality of systematic reviews on the efficacy of desensitizing toothpastes for the treatment of DH. According to the AMSTAR 2 tool, the methodological quality of the reviews was classified as low or critically low, indicating that the available conclusions in the literature should be interpreted with caution. Despite these methodological shortcomings, the evidence synthesized across reviews suggests that desensitizing agents have generally demonstrated effectiveness in reducing DH.

Among the critical AMSTAR 2 items, deficiencies were notable in several domains. For instance, half of the included reviews didn't report protocol registration [19], [20], [22], [23], [24], [25], [27] and the ones that reported [10], [11], [12], [17], [18], [21], [26] didn't provide an explicit statement that review methods were established prior to conducting the review, including a plan for meta-analysis/synthesis and a strategy to investigate sources of heterogeneity. This lack of pre-specification compromises transparency and increases the risk of bias related to changes in methods or objectives during the review process[28], [29]. Registration in platforms such as PROSPERO is a key practice, as it ensures traceability and reduces the risk of duplication of scientific efforts[30].

Another important methodological topic is that many reviews presented incomplete search strategies (item 4), with a limited number of databases searched, no inclusion of gray literature, search on the reference lists from primary studies, or failure to report conducting the search within 24 months of completing the review. This has the potential to introduce selection bias[31], since it may result in the omission of relevant studies, as well as the lack of reporting on the funding sources of the primary studies (item 10). Industry sponsorship does not necessarily imply undue influence on study outcomes; however, transparent reporting of funding sources is essential to allow readers to judge the potential role of financial interests in the design, conduct, analysis, or interpretation of the results. The lack of such information limits the evaluation of possible conflicts of interest and contributes to concerns related to publication bias, as industry-funded research may be more likely to report favorable findings or selectively publish results. Therefore, clear disclosure of funding sources is a key component of methodological transparency and critical appraisal in systematic reviews [32].

The evaluation of critical AMSTAR-2 domains also revealed methodological shortcomings among regarding incomplete reporting of excluded studies (item 7),

which indicates limited transparency and increases the risk of selective reporting and incomplete evidence identification.

The evaluation of the risk of bias of the included studies in the systematic reviews (items 12 and 13) usually were accomplished with adequate tools. However, the results of these evaluations not always were incorporated into the interpretation of results by the authors. Similarly, the analysis of heterogeneity (item 14) was frequently overlooked. Simply reporting the presence of risk of bias or statistical heterogeneity is insufficient under AMSTAR 2 standards. Reviews are expected to interpret how these issues may affect the magnitude, direction, and reliability of the findings. Failure to explore and discuss the implications of bias or heterogeneity limits the interpretability of the results and weakens the validity of the conclusions. These methodological gaps reduce the reliability of the syntheses available in the literature[33]may lead to overestimated conclusions regarding the efficacy of desensitizing agents[16].

Conversely, some domains demonstrated better methodological quality, reflecting established good practices among the reviewed studies, which includes the formulation of a structured research question according to the PICO model (item 1) [34], [35]; study selection and duplicate data extraction (item 5) [31]declaration of conflicts of interest (item 16), which adequately addressed in most reviews, reflecting transparency and adherence to international editorial standards[36].

Adherence to PRISMA guidelines and Cochrane standards was reported in some of the included reviews. Although most authors stated that these guidelines were followed, many reviews did not fully implement their recommendations, particularly regarding detailed reporting of the study selection process and justification for exclusions. Mere declarative adherence, without effective application, highlights a gap between recognition of best practices and their practical implementation. Additionally, several reviews-imposed language restrictions, a practice that may reduce the representativeness of the available evidence, especially in a field with substantial scientific output from multiple countries[37].

Taking all together, it was observed that there was lack of compliance in both critical and non-critical items and the cumulative presence of these limitations may further reduce confidence in the methodological robustness of the reviews and contribute to the overall low confidence ratings observed.

The results of the meta-analyses indicate that several desensitizing agents, such as arginine, n-HAP, potassium, stannous compounds, and bioactive glass

demonstrate clinical benefits when compared with placebo. However, the magnitude of these effects and the substantial heterogeneity observed across reviews suggest that some estimates may be influenced by methodological variations, including differences in primary study designs, pain-induction protocols, and outcome measurement scales[38]. Arginine exhibited the largest effect sizes[18], [24], [26], including immediate and short-term improvements, whereas n-HAP showed consistent benefits, particularly in evaporative and tactile assessments[11], [26]. In contrast, strontium did not demonstrate statistically significant efficacy in any review, indicating limited evidence to support its clinical use[18], [26].

In head-to-head comparisons between active agents, arginine showed superior performance relative to potassium and strontium[24], and effects comparable to bioactive glass[17]. n-HAP also demonstrated superiority over other desensitizing agents, reinforcing its promising clinical potential[17]. Nonetheless, interpretation of these findings must take into account the generally low methodological quality of the included reviews and primary trials, which reduces the overall certainty of the evidence[38]. Therefore, although the results suggest that several desensitizing agents may provide clinically meaningful reductions in DH, confidence in the magnitude and consistency of these effects remains limited.

This overview has some limitations that should be acknowledged. First, the assessment relied exclusively on the information reported in the included systematic reviews; therefore, unclear or missing methodological details may have led to conservative judgments when applying the AMSTAR 2 criteria. Second, although AMSTAR 2 provides a structured and validated framework for appraising methodological quality, its application involves a degree of subjective interpretation, which may introduce variability in item classification. In addition, no quantitative synthesis of methodological quality was performed, and the overview did not reassess the primary studies included in each review, potentially overlooking improvements or inconsistencies at the individual study level. Finally, as the overview focused on published reviews, the possibility of publication bias at the review level cannot be excluded. These limitations should be considered when interpreting the overall appraisal of methodological quality.

Although the basic structure of the reviews was conducted with rigor, including clear PICO questions, independent assessment, and declared transparency, there are significant deficiencies in critical domains that underpin the reliability of the

conclusions. The absence of registered protocols, comprehensive search strategies, and formal analyses of heterogeneity and publication bias are limitations that weaken the available inferences regarding the magnitude of the effect of desensitizing toothpastes[14]. While the included reviews indicate promising results for various desensitizing agents, the predominance of low methodological quality limits the strength of the conclusions. Strengthening methodological and reporting practices is essential for future evidence syntheses to provide reliable support for clinical decision-making in the management of DH.

Conclusion

In the context of systematic reviews assessing the efficacy of desensitizing toothpastes for the management of DH, the overall methodological quality is generally low according to the AMSTAR 2 assessment. Although several reviews demonstrated strengths related to planning and transparency, important methodological shortcomings persist. Regarding effectiveness, arginine showed superior performance compared with potassium- and strontium-based formulations, and results comparable to those of bioactive glass, while n-HAP also demonstrated superiority over other desensitizing agents. Nevertheless, these findings should be interpreted with caution, as the identified methodological limitations highlight the need for stronger adherence to established methodological standards and reporting guidelines to improve the robustness, credibility, and reliability of the available evidence in this field.

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Data availability

The authors undertake to send all detailed research data if requested.

Declarations

Ethics Not applicable.

Competing interests

The authors have no conflict of interests related to the present article.

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6 DISCUSSÃO

O presente trabalho propôs uma análise crítica e integrada da evidência científica disponível sobre o tratamento da HD, abordando tanto a qualidade do relato dos ECRs, de acordo com a declaração CONSORT, quanto a qualidade metodológica das revisões sistemáticas, por meio da ferramenta AMSTAR 2. Essa abordagem dupla permite compreender a estrutura metodológica e a transparência da produção científica que sustentam a confiabilidade dessas conclusões e sua aplicabilidade clínica. A HD constitui um campo particularmente sensível do ponto de vista metodológico, uma vez que envolve desfechos subjetivos, múltiplos estímulos de provocação da dor, diferentes escalas de mensuração e, frequentemente, períodos curtos de acompanhamento. Essas características tornam o rigor metodológico e o relato transparente ainda mais essenciais, pois pequenas falhas no delineamento ou na descrição dos estudos podem resultar em vieses relevantes e em estimativas de efeito instáveis. Nesse contexto, a avaliação integrada da qualidade dos estudos torna-se fundamental para uma interpretação crítica da evidência disponível.

Os ECRs incluídos nesta tese, que avaliaram o uso de enxaguatórios bucais no tratamento da HD, apresentaram adesão moderada às recomendações da Declaração CONSORT, com pontuação média de 23 pontos, correspondente a aproximadamente 72% da pontuação máxima. Resultados semelhantes de adesão à Declaração CONSORT já foram observados em avaliações de ECRs publicados entre 2011 e 2016 em três diferentes periódicos da área de Periodontia (60–70%).[23] Além disso, estudos em outras especialidades odontológicas, como Dentística Restauradora[24], Endodontia[25], Cirurgia[26,27], Prótese Dentária[28,29] e Odontopediatria[30], também relataram resultados semelhantes. No entanto, alguns estudos publicados demonstraram níveis mais baixos de adesão às diretrizes CONSORT.[31–35] Essas variações podem estar relacionadas às escolhas metodológicas adotadas pelos autores ao analisar a adesão ao CONSORT, como os critérios utilizados para a seleção dos ECRs, o método de avaliação da conformidade ou o período de publicação considerado.[36] A persistência desse padrão ao longo de diferentes áreas sugere que as limitações no relato dos ECRs não são específicas do tema da HD, mas refletem desafios estruturais mais amplos na condução e publicação de pesquisas em odontologia.

Apesar da existência de numerosos ECRs que avaliam a eficácia de enxaguatórios bucais para o tratamento da HD, até o momento não foram identificadas revisões que tenham analisado a adesão desses estudos às diretrizes CONSORT. Os ECRs são reconhecidos como o padrão-ouro para a avaliação de procedimentos clínicos e representam o delineamento de pesquisa mais confiável entre os estudos clínicos.[37] A tradução efetiva dos dados de pesquisa para a prática clínica constitui o principal objetivo da odontologia baseada em evidências. Entretanto, a validade dos achados científicos depende da importância atribuída pelos autores à descrição completa e detalhada de seus procedimentos metodológicos, uma vez que a adequada apresentação do estudo facilita a avaliação de sua qualidade. É importante ressaltar que as recomendações CONSORT não têm como finalidade a avaliação direta da qualidade dos ECRs; ao contrário, funcionam como um protocolo a ser seguido de forma criteriosa, com o objetivo de minimizar erros sistemáticos e garantir a adesão a padrões elevados de qualidade no relato científico.[38]

Embora a maioria dos periódicos nos quais os estudos foram publicados recomende explicitamente o uso da Declaração CONSORT, nenhum ECR atingiu a pontuação máxima, indicando que a simples recomendação editorial não é suficiente para garantir a adesão integral às diretrizes. Esse achado reforça a necessidade de maior engajamento não apenas dos autores, mas também dos revisores e editores, na verificação sistemática do cumprimento dos itens do CONSORT. Observou-se, contudo, uma tendência de aumento das pontuações CONSORT ao longo do tempo, com estudos mais recentes apresentando relatos mais completos. O CONSORT, estabelecido em 1996, passou por revisões ao longo dos anos com o objetivo de fornecer explicações e detalhamentos mais claros de seus princípios. [38] O aumento das pontuações nos estudos mais recentes provavelmente está relacionado à maior familiaridade dos autores com os itens do CONSORT, o que tem resultado em um número crescente de estudos que apresentam relatos mais detalhados e completos.[39]

Entre os itens menos adequadamente relatados destacaram-se o registro de protocolo (*protocol*) e a descrição dos cenários (*settings*). A defesa do registro de protocolos de ECRs remonta a várias décadas[40] e, em 2004, o *International Committee of Medical Journal Editors* declarou que os periódicos membros somente aceitariam publicações de estudos cujos ensaios tivessem sido previamente registrados.[41] Todo protocolo de estudo deve ser registrado em uma base de dados de acesso público antes do início da pesquisa, fornecendo uma descrição clara dos

objetivos do estudo e dos resultados esperados. Um dos principais objetivos do registro do protocolo é prevenir a comunicação seletiva de resultados, conhecida como viés de relato de desfechos.[42] Dessa forma, estudos sem registro de protocolo podem apresentar dados distorcidos.[43,44] O item "*settings*" descreve os locais e ambientes nos quais os dados foram coletados. O fornecimento de informações adequadamente detalhadas sobre o contexto e o local de realização do estudo é essencial para a avaliação da aplicabilidade e da generalização dos resultados, influenciando, consequentemente, a validade global do estudo.[38]

No presente estudo, os itens sequência de randomização (*randomization sequence*), cegamento (*blinding*) e perdas e exclusões (*losses/exclusions*) foram relatados de forma inadequada ou não foram relatados em mais de 50% dos estudos incluídos. Os autores devem fornecer informações suficientes para permitir que os leitores avaliem os métodos utilizados para a geração da alocação aleatória dos grupos e o potencial de viés na atribuição dos participantes.[38] O cegamento refere-se ao mascaramento da intervenção para os participantes, para os profissionais de saúde responsáveis pela sua aplicação e para aqueles envolvidos na coleta dos dados clínicos e na análise dos resultados. Diante das diversas possibilidades de cegamento, os autores devem explicitar claramente a estratégia adotada, preferencialmente logo na descrição metodológica, evitando o uso de termos genéricos como "duplo-cego" sem esclarecimentos adicionais. A ausência de descrições detalhadas gera variabilidade significativa tanto nas interpretações clínicas quanto nas definições desses termos em manuais epidemiológicos.[45] Os autores também devem relatar informações referentes às perdas e exclusões em cada grupo após a randomização, incluindo as razões para sua ocorrência. É fundamental explicitar a natureza dos desvios em relação ao protocolo e os motivos específicos para a exclusão de participantes, conforme recomendado pelo CONSORT. [38]

Em 50% dos estudos, os dados referentes ao fluxograma (*flow charts*) ou a ocultação de alocação (*allocation concealment*) estavam ausentes, incompletos ou inconsistentes. O objetivo do fluxograma é ilustrar de forma clara e objetiva todas as fases do ECR, incluindo o recrutamento dos participantes, a alocação e o acompanhamento, bem como as respectivas perdas durante o seguimento. A descrição precisa da distribuição dos participantes em cada etapa do estudo exerce influência significativa sobre a interpretação dos resultados. A ausência de um fluxograma dificulta a análise da validade interna e externa do ECR, comprometendo

a qualidade do relato da pesquisa clínica.[46] O ocultamento da alocação garante a imprevisibilidade da designação dos tratamentos por parte dos participantes e dos investigadores, sendo um aspecto essencial para a manutenção da integridade do estudo. A abordagem mais adequada para alcançar esse objetivo é a implementação de um protocolo de alocação independente e centralizado.[37]

A avaliação do risco de viés nos estudos é uma etapa essencial de uma revisão sistemática.[47] Em 2008, a Cochrane introduziu a ferramenta RoB, composta por sete domínios, permitindo a avaliação do risco de viés em diferentes aspectos de um estudo.[48] Com as atualizações do Cochrane Handbook em 2018, a ferramenta RoB original foi substituída pela RoB 2.[49] Esse novo instrumento é composto por cinco domínios e fornece uma avaliação global do risco de viés de um estudo. A análise subjetiva do pesquisador é associada a algoritmos padronizados, resultando na síntese do risco de viés não apenas para cada domínio individual, mas também para o estudo como um todo.[50]

Nesta metapesquisa, foram combinadas duas ferramentas: a avaliação da conformidade com o CONSORT e a aplicação da ferramenta RoB 2. Os estudos incluídos apresentaram adesão moderada às recomendações do CONSORT, entretanto, esse achado não teve impacto na avaliação da qualidade metodológica segundo os domínios da ferramenta Cochrane RoB 2. Enquanto a avaliação pelo CONSORT analisa a forma como um ECR é relatado, incentivando a descrição completa dos estudos, a RoB 2 avalia o risco de viés dos ECRs, auxiliando os leitores na compreensão da confiabilidade de seus resultados.[51] As diferenças observadas entre os resultados obtidos pelas duas ferramentas podem ser explicadas pelas divergências nos aspectos avaliados por cada uma delas, como os itens "*protocol*", "*setting*" e "*flowchart*", contemplados nas diretrizes CONSORT. Por outro lado, mesmo nos pontos em comum entre as ferramentas, também foram observadas discrepâncias, como no item "*randomization sequence*". Diversas questões do CONSORT solicitam especificamente a descrição detalhada das informações, enquanto a RoB 2 permite ao leitor interpretar os dados apresentados no texto por meio das respostas "provavelmente sim" e "provavelmente não". Destaca-se que os estudos publicados sobre o uso de enxaguatórios bucais para o HD foram, em geral, bem planejados e executados, contudo, apresentaram falhas no detalhamento das informações de acordo com o CONSORT, o que reduz a transparência dos estudos e dificulta sua reprodutibilidade.

De acordo com a ferramenta AMSTAR 2, a qualidade metodológica das revisões foi classificada como baixa ou criticamente baixa, indicando que as conclusões disponíveis na literatura devem ser interpretadas com cautela. Apesar dessas limitações metodológicas, as evidências sintetizadas entre as revisões sugerem que os agentes dessensibilizantes, de modo geral, demonstraram eficácia na redução da HD.

Entre os itens críticos do AMSTAR 2, foram observadas deficiências relevantes em diversos domínios. Por exemplo, metade das revisões incluídas não relatou o registro prévio do protocolo,[52–58] e aquelas que o relataram[10,12,13,59–62] não apresentaram uma declaração explícita de que os métodos da revisão foram estabelecidos previamente à sua condução, incluindo um plano para metanálise/síntese e uma estratégia para investigar fontes de heterogeneidade. Essa ausência de pré-especificação compromete a transparência do processo de revisão e aumenta o risco de viés relacionado a modificações nos métodos ou nos objetivos ao longo da condução do estudo.[43,44] O registro em plataformas como o PROSPERO constitui uma prática fundamental, pois assegura a rastreabilidade do protocolo e reduz o risco de duplicação de esforços científicos.[42]

Outro aspecto metodológico relevante refere-se ao fato de que muitas revisões apresentaram estratégias de busca incompletas (item 4), caracterizadas pela consulta a um número limitado de bases de dados, pela ausência de inclusão da literatura cinzenta, pela não realização de busca nas listas de referências dos estudos primários ou pela falha em relatar a condução da busca dentro do período de até 24 meses anteriores à conclusão da revisão. Essas limitações podem introduzir viés de seleção, uma vez que podem resultar na omissão de estudos relevantes.[48] Além disso, observou-se a ausência de relato das fontes de financiamento dos estudos primários (item 10). O patrocínio não implica necessariamente influência indevida sobre os desfechos dos estudos; contudo, o relato transparente das fontes de financiamento é essencial para que os leitores possam julgar o possível papel de interesses financeiros no delineamento, condução, análise ou interpretação dos resultados. A ausência dessas informações limita a avaliação de potenciais conflitos de interesse e contribui para preocupações relacionadas ao viés de publicação, uma vez que pesquisas financiadas pela indústria podem apresentar maior probabilidade de relatar resultados favoráveis ou de publicar seletivamente seus achados. Dessa forma, a divulgação

clara das fontes de financiamento constitui um componente fundamental da transparência metodológica e da avaliação crítica em revisões sistemáticas.[63]

A avaliação dos domínios do AMSTAR 2 também revelou fragilidades metodológicas relacionadas ao relato incompleto dos estudos excluídos (item 7), o que indica transparência limitada e aumenta o risco de relato seletivo e de identificação incompleta das evidências. A avaliação do risco de viés dos estudos incluídos nas revisões sistemáticas (itens 12 e 13) foi, em geral, realizada com o uso de ferramentas adequadas. No entanto, os resultados dessas avaliações nem sempre foram incorporados à interpretação dos achados pelos autores. De modo semelhante, a análise da heterogeneidade (item 14) foi frequentemente negligenciada. De acordo com os padrões do AMSTAR 2, a simples descrição da presença de risco de viés ou de heterogeneidade estatística é insuficiente. Espera-se que as revisões interpretem de que maneira esses fatores podem influenciar a magnitude, a direção e a confiabilidade dos resultados. A ausência de exploração e discussão das implicações do viés ou da heterogeneidade limita a interpretabilidade dos achados e enfraquece a validade das conclusões. Essas lacunas metodológicas reduzem a confiabilidade das sínteses disponíveis na literatura[64] e podem levar à superestimação das conclusões sobre a eficácia dos agentes dessensibilizantes.[65]

Por outro lado, alguns domínios apresentaram melhor qualidade metodológica, refletindo a adoção de boas práticas consolidadas entre os estudos revisados. Destacam-se a formulação de uma pergunta de pesquisa estruturada de acordo com o modelo PICO (item 1) ,(LEITE e colab., 2024; LI e colab., 2022) a seleção dos estudos e a extração de dados realizadas em duplicata (item 5),[48] e a declaração de conflitos de interesse (item 16), adequadamente relatada na maioria das revisões, o que reflete transparência e adesão aos padrões editoriais internacionais.[67]

A adesão às diretrizes PRISMA e aos padrões da Cochrane foi relatada em parte das revisões incluídas. Embora a maioria dos autores tenha declarado seguir essas diretrizes, muitas revisões não implementaram integralmente suas recomendações, especialmente no que se refere ao relato detalhado do processo de seleção dos estudos e à justificativa para as exclusões. A adesão meramente declaratória, sem aplicação efetiva, evidencia uma lacuna entre o reconhecimento das boas práticas metodológicas e sua implementação prática. Além disso, diversas revisões impuseram restrições quanto ao idioma de publicação, uma prática que pode

reduzir a representatividade das evidências disponíveis, especialmente em uma área com expressiva produção científica proveniente de diferentes países.[68]

De modo geral, observou-se a falta de conformidade tanto em itens críticos quanto não críticos, e a presença cumulativa dessas limitações pode reduzir ainda mais a confiança na robustez metodológica das revisões, contribuindo para as classificações globais de baixa confiança observadas.

Os resultados das metanálises indicam que diversos agentes dessensibilizantes, como arginina, n-HAP, potássio, compostos estanhosos e biovidro, demonstram benefícios clínicos quando comparados ao placebo. Entretanto, a magnitude desses efeitos e a heterogeneidade substancial observada entre as revisões sugerem que algumas estimativas podem ser influenciadas por variações metodológicas, incluindo diferenças nos delineamentos dos estudos primários, nos protocolos de indução da dor e nas escalas de mensuração dos desfechos.[69] A arginina apresentou os maiores tamanhos de efeito, [57,60,61] incluindo benefícios imediatos e de curto prazo, enquanto a n-HAP demonstrou efeitos consistentes, especialmente nas avaliações evaporativas e táteis.[12,61] Em contraste, o estrôncio não demonstrou eficácia estatisticamente significativa em nenhuma das revisões analisadas, indicando evidência limitada para sustentar seu uso clínico.[60,61]

Nas comparações diretas entre agentes ativos, a arginina apresentou desempenho superior em relação ao potássio e ao estrôncio,[57] além de efeitos comparáveis aos do biovidro.[59] A n-HAP também demonstrou superioridade em relação a outros agentes dessensibilizantes, reforçando seu potencial clínico promissor.[59] Contudo, a interpretação desses achados deve considerar a qualidade metodológica geralmente baixa das revisões e dos estudos primários incluídos, o que reduz a certeza global das evidências.[69] Assim, embora os resultados sugiram que diversos agentes dessensibilizantes possam proporcionar reduções clinicamente relevantes da HD, a confiança na magnitude e na consistência desses efeitos ainda é limitada.

A presente tese apresenta algumas limitações que devem ser consideradas na interpretação de seus achados. O estudo 1 não incluiu artigos em idiomas diferentes do inglês. Embora tenha sido realizada uma busca abrangente em diversas bases de dados, utilizando vocabulário e palavras-chave específicas, é possível que alguns estudos não tenham sido identificados. Essa limitação também pode estar relacionada à opção por incluir apenas artigos revisados por pares, com a exclusão

da literatura cinzenta. O estudo 2 baseou-se exclusivamente nas informações relatadas nas revisões sistemáticas incluídas; assim, a ausência ou falta de clareza em detalhes metodológicos pode ter levado a julgamentos mais conservadores na aplicação dos critérios do AMSTAR 2. Embora o AMSTAR 2 forneça uma estrutura validada e sistematizada para a avaliação da qualidade metodológica, sua aplicação envolve certo grau de interpretação subjetiva, o que pode introduzir variabilidade na classificação dos itens. Além disso, não foi realizada uma síntese quantitativa da qualidade metodológica, e o overview não reavaliou os estudos primários incluídos em cada revisão, o que pode ter resultado na não identificação de melhorias ou inconsistências em nível individual dos estudos. Por fim, como o overview se concentrou em revisões publicadas, não se pode excluir a possibilidade de viés de publicação em nível de revisão. Essas limitações devem ser consideradas na interpretação da avaliação global da qualidade metodológica.

Em conjunto, os achados desta tese evidenciam avanços importantes na produção científica relacionada ao tratamento da HD, especialmente no que se refere ao aumento gradual da adesão às recomendações da Declaração CONSORT ao longo dos anos. Entretanto, persistem lacunas relevantes no relato de itens metodológicos fundamentais, como registro de protocolos, ocultamento da alocação, descrição dos cenários e fluxogramas, as quais comprometem a transparência e a plena interpretação dos ECRs. Essas limitações repercutem diretamente na qualidade das revisões sistemáticas que sintetizam tais evidências, nas quais, apesar de resultados clinicamente promissores para diferentes agentes dessensibilizantes, observa-se a predominância de baixa qualidade metodológica, restringindo a força e a confiabilidade das conclusões. Diante desse cenário, o fortalecimento das práticas de condução e relato da pesquisa, aliado a processos de revisão por pares mais rigorosos, mostra-se essencial para o avanço do conhecimento e para a produção de evidências mais robustas, transparentes e reprodutíveis, capazes de oferecer suporte confiável à tomada de decisão clínica no manejo da HD.

7 CONCLUSÃO

De acordo com a metodologia aplicada e os resultados obtidos, as conclusões dos trabalhos realizados são as seguintes:

1. No contexto de ECRs que investigam a eficácia de enxaguantes bucais dessensibilizantes para o tratamento da HD, a adesão completa às recomendações do CONSORT ainda não foi alcançada. Apesar disso, os ensaios incluídos demonstraram baixo risco de viés, sugerindo planejamento e execução cuidadosos dos estudos publicados sobre o tema. Esses achados ressaltam a necessidade de promover a adesão às recomendações do CONSORT para aprimorar a metodologia de pesquisa.

2. No contexto de revisões sistemáticas que avaliam a eficácia de dentifrícios dessensibilizantes para o tratamento da HD, a qualidade metodológica geral é considerada baixa, de acordo com a avaliação AMSTAR 2. Embora diversas revisões tenham demonstrado pontos fortes relacionados ao planejamento e à transparência, persistem importantes deficiências metodológicas. Em relação à eficácia, a arginina apresentou desempenho superior em comparação com formulações à base de potássio e estrôncio, e resultados comparáveis ao biovidro, enquanto a n-HAP também demonstrou superioridade em relação a outros agentes dessensibilizantes. Contudo, esses achados devem ser interpretados com cautela, visto que as limitações metodológicas identificadas ressaltam a necessidade de maior adesão aos padrões metodológicos e diretrizes de relato estabelecidos para aprimorar a robustez, a credibilidade e a confiabilidade das evidências disponíveis nessa área.

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