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IZVORNI ZNANSTVENI RAD

Arlet Guusje Reinhard[1], Caio Sampaio[2], Igor Renan Zen[3], Iasmim da Fonseca Barros[4], Juliano Pelim Pessan[2], Clarissa Calil Bonifacio[1], Tamara Kerber Tedesco[4]*

Acceptance of Non-Aesthetic Caries Treatment Approaches in Children: a Systematic Review

Prihvaćanje neestetskih pristupa u liječenju karijesa kod djece: sistematizirani pregled

[1] Department of Pediatric Dentistry, Academic Centre for Dentistry Amsterdam (ACTA), Amsterdam, the Netherlands.
Akademski centar za stomatologiju Amsterdam (ACTA), Odjel za dječju stomatologiju, Amsterdam, Nizozemska
[2] Department of Preventive and Restorative Dentistry, School of Dentistry, São Paulo State University (UNESP), Araçatuba, Brazil.
Državno sveučilište u São Paulu (UNESP), Stomatološki fakultet, Odjel za preventivnu i restaurativnu stomatologiju, Araçatuba, Brazil
[3] School of Dentistry, Positivo University (UP), Curitiba, Brazil.
Sveučilište Positivo (UP), Stomatološki fakultet, Curitiba, Brazil
[4] Department of Orthodontics and Pediatric Dentistry, School of Dentistry, University of São Paulo (USP), São Paulo, Brazil.
Sveučilište u São Paulu (USP), Stomatološki fakultet, Odjel za ortodonciju i dječju stomatologiju, São Paulo, Brazil

Abstract
Objective: To evaluate the acceptance of non-aesthetic treatment approaches for dental caries in children as perceived by parents, children, and dental professionals. Materials and Methods: A systematic search was conducted across four databases: PubMed, Scopus, Web of Science, and Embase. The included studies comprised cross-sectional or cohort studies, and randomized controlled trials assessing the acceptance of non-aesthetic treatments for dental caries in children, as reported by parents, children, and dental professionals. The risk of bias was assessed using the ROB-2, ROBINS-I, and JBI tools, depending on the study design. Results: A total of 126 studies were included in this systematic review. The acceptance rate of Silver Diamine Fluoride (SDF) treatment for posterior primary molars in children ranged from 71.4% to 100% (median 93.2%). Among parents, it ranged from 3.2% to 91% (median 69.9%), and for dental professionals it ranged from 13.2% to 95% (median 61.6%). The acceptance rate for Stainless-Steel crowns (SSC) or Hall technique (HT) treatment in posterior primary molars for children, ranged from 32% to 100% (median 90%), for parents, it ranged from 14.5% to 100% (median 81.9%), and for dental professionals it ranged from 1% to 96% (median 44%). Parents had higher acceptance of SDF treatment for posterior teeth compared to anterior teeth. Conclusion: Non-aesthetic treatment options are generally accepted by children, parents, and, to a lesser extent, dental professionals, particularly for posterior teeth. However, most of the included studies presented a high risk of bias. The systematic review protocol was registered in OSF platform (doi: 10.17605/OSF.IO/P7CNY).

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Address for correspondence
Tamara Kerber Tedesco
School of Dentistry, University of São Paulo (USP)
Av. Professor Lineu Prestes, 2227
05508-000, São Paulo, Brazil.
tamarakt@usp.br

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Arlet Guusje Reinhard 0009-0001-6157-8071
Caio Sampaio 0000-0002-6861-7205
Igor Renan Zen 0000-0002-2524-4365
Iasmim da Fonseca Barros 0009-0007-4169-8782
Juliano Pelim Pessan 0000-0002-1550-3933
Tamara Kerber Tedesco 0000-0003-0794-1578
Clarissa Calil Bonifacio 0000-0001-6515-2927

Introduction

Dental caries is one of the most prevalent diseases in the general population, particularly among children (1, 2). In industrialized countries, 60 to 90% of school-aged children are affected by dental caries (3). If left untreated, this disease can lead to dental pain, and even to tooth loss. Furthermore, caries has social, physical, and psychological consequences for both children and adults, significantly impacting on individual's quality of life (4, 5).

For children, several treatment options are available for teeth affected by dental caries in the dentine. These options range from conventional compomer or composite restora-

Uvod

Zubni karijes jedna je od najčešćih bolesti u općoj populaciji, posebno među djecom (1, 2). U industrijaliziranim zemljama od 60 do 90 % djece školske dobi pati od te bolesti (3). Ako se ne liječi, karijes može potaknuti zubobolju, a može se dogoditi i gubitak zuba. Nadalje, karijes ima socijalne, tjelesne i psihološke posljedice i za djecu i za odrasle zato što značajno utječe na kvalitetu života pojedinca (4, 5).

Za djecu je dostupno nekoliko mogućnosti u liječenju zuba zahvaćenih karijesom detina. To su konvencionalni kompomerni ili kompozitni ispuni, staklenoionomerni ispuni (GIC), atraumatski restaurativni tretmani (ART), Hallova

tions, Glass-Ionomer restorations (GIC), atraumatic restorative treatments (ART), Hall-technique (HT), stainless steel crowns (SSC), to non-restorative cavity control (NRCC), with or without Silver Diamine Fluoride (SDF) therapy (6,7,8). Although NRCC and HT appear to be the most recommended treatments for cavitated dentine lesions in primary molars due to their functional properties (6, 9), these treatment modalities are considered non-aesthetic approaches. Moreover, the application of SDF is known to stain tooth structures black upon contact (10), and SSCs are known for their metallic appearance (11).

Despite the lack of esthetic appeal, SDF offers numerous advantages as a caries treatment option. Unlike traditional methods, SDF does not require tooth preparation or restorative procedures. Its ease of application, coupled with the absence of the need for anesthesia, contributes to a more comfortable experience for the child (12). Furthermore, recent systematic reviews have demonstrated the effectiveness of SDF in arresting caries progression in children. This minimally invasive approach is both cost-effective and highly suitable for use in resource-constrained environments (13, 14).

Regarding the HT, previous data have shown that children exhibit more negative behavior when treated with conventional restorations compared to the HT (15). Additionally, the application of HT has shown to positively impact a child's oral health-related quality of life. In addition, it reduces dental anxiety in children (16). Among dental professionals, more than 77% of them have classified HT as easy or very easy to perform, while for conventional restorations, this percentage was 50% (15).

The acceptance of these treatments remains inconclusive in the literature. For instance, SDF therapy seems to be more easily accepted by parents for posterior regions than for anterior regions (12, 17). While available literature, including systematic reviews, investigates the acceptance of individual non-aesthetic treatment options such as SDF (17) or HT (18), combined information on different non-esthetic treatment modalities remains unavailable.

Additionally, most studies focus on the acceptance of the child, the parent, or the dental professional, rather than combining all perspectives within a single study. It has been reported that 43% of pediatric dentists follow parental preferences, even when these contradict their own clinical judgment (19). This highlights the importance of involving children, parents, and dental professionals in the decision-making process. Integrating data on different non-aesthetic materials, as well as perspectives from children, parents, and dental professionals, could provide a broader and more comprehensive understanding, as each group plays a key role in treatment decisions.

Therefore, the aim of the present systematic review was to assess the acceptance of non-aesthetic approaches to caries treatment in children by parents, children, and dental professionals.

tehnika (HT), krunica od nehrđajućeg čelika (SSC), nerestaurativna kontrola kaviteta (NRCC), terapija srebro-diaminfluoridom (SDF) ili bez te terapije (6, 7, 8). Iako se NRCC i HT čine najpogodnijim tretmanima za kavitirane dentinske lezije u mliječnim kutnjacima zbog svojih funkcionalnih svojstava, a zato se i preporučuju (6, 9), ti modaliteti liječenja smatraju se neestetskim pristupima. Štoviše, poznato je da se primjenom SDF-a zubno tkivo pri kontaktu oboji u crno (10), a SSC je poznat po metalnom izgledu (11).

Unatoč lošim estetskim svojstvima, SDF ima mnogobrojne prednosti kao opcija u liječenju karijesa. Za razliku od tradicionalnih metoda, ne zahtijeva pripremu zuba ili restaurativne postupke. Njegova jednostavnost pri primjeni, a i to što nije potrebna anestezija, pridonosi ugodnijem iskustvu djeteta (12). Nadalje, u nedavnim sistematiziranim pregledima istaknuta je učinkovitost SDF-a u zaustavljanju napredovanja karijesa kod djece. Taj minimalno invazivni pristup isplativ je i vrlo prikladan za upotrebu u okruženjima s ograničenim resursima (13, 14).

Kad je riječ o HT-u, prema dosadašnjim podatcima djeca pokazuju negativnije ponašanje kada ih se liječi konvencionalnim restauracijama u usporedbi s HT-om (15). Osim toga, pokazalo se da primjena HT-a pozitivno utječe na kvalitetu života djeteta povezanu s oralnim zdravljem. Uz to, smanjuje se stomatološka anksioznost kod djece (16). Među stomatolozima njih više od 77 % ocijenilo je HT kao jednostavan ili vrlo jednostavan za izvedbu, a za konvencionalne restauracije taj postotak je bio 50 % (15).

Prihvaćanje tih tretmana ostaje u literaturi nejasno. Primjerice, čini se da roditelji lakše prihvaćaju SDF terapiju za stražnje regije nego za prednje (12, 17). Iako se u dostupnoj literaturi, uključujući sistematizirane preglede, istražuje prihvaćanje pojedinačnih neestetskih opcija liječenja poput SDF-a (17) ili HT-a (18), kombinirane informacije o različitim neestetskim modalitetima liječenja ostaju nedostupne.

Uz to, autori većine studija usredotočuju se na prihvaćanje djeteta, roditelja ili stomatologa, umjesto da se unutar jedne studije kombiniraju sve perspektive. Istaknuto je da 43 % dječjih stomatologa slijedi roditeljske preferencije, čak i kada su u suprotnosti s njihovom kliničkom prosudbom (19). To pokazuje koliko je važno uključivanje djece, roditelja i stomatologa u proces donošenja odluka. Integriranje podataka o različitim neestetskim materijalima te perspektiva djece, roditelja i stomatologa mogli bi pridonijeti širem i sveobuhvatnijem razumijevanju, s obzirom na to da je svaka skupina ključna u odlukama o liječenju.

Zato je cilj ovoga sistematiziranoga pregleda bio procijeniti prihvaćanje roditelja, djece i stomatologa kad je riječ o neestetskim pristupima u liječenju karijesa kod djece.

Materials and Methods

Study design

The present systematic review was reported according to the PRISMA guideline for systematic reviews (20) and was registered on the OSF platform (available at https://osf.io/p7cny). This study was approved by the Research Ethics Committee of the ACTA (protocol number 2021-30882).

The selection of studies, data extraction, and the risk of bias assessment were performed independently and in duplicate by two reviewers. Any questions that arose were discussed during a session with both reviewers and two senior researchers (CCB and TKT).

Study Sources, search strategy and eligibility criteria

A systematic search was conducted across four databases: PubMed/Medline, Scopus, Web of Science, and Embase, with no restriction on language or date of publication. The last search was conducted on 28 April 2025.

A PICO question was formulated as follows: 'Are non-aesthetic approaches for dental caries management in children accepted by parents, children, and dental professionals?' (*Participants*: children, parents, and dental professionals; *Intervention*: non-aesthetic materials for dental caries management in children; *Comparison*: not applicable; *Outcome*: acceptance; *Study-design*: cross-sectional, cohort studies, or randomized controlled trials.) SDF, SSC, HT, and NRCC were considered as non-aesthetic approaches, while all types of whitish materials were considered aesthetic approaches (*e.g.*, GIC, resin composites, dental sealants, and compomers).

The search was developed based on the PICO question and initially designed for PubMed/Medline, then adapted for the other databases (Table 1).

Study selection and data collection

The studies were reviewed independently and in duplicate by three reviewers (AR, CS and IRZ) based on their title and abstract to determine whether they met the following inclusion criteria: (1) focused on restorative or non-operative treatment; (2) conducted in children; and (3) related to acceptance. Any disagreements between the reviewers were resolved in a session with both reviewers and two senior researchers (CCB and TKT).

The articles that met the inclusion criteria were assessed independently and in duplicate by two reviewers (AR and

Materijali i metode

Studijski dizajn

Ovaj sustavni pregled objavljen je u skladu sa smjernicama PRISMA-e za sustavne preglede (20) i registriran je na platformi OSF (dostupno na https://osf.io/p7cny). Ovu studiju odobrio je Odbor za istraživačku etiku ACTA-e (broj protokola 2021-30882).

Odabir studija, izdvajanje podataka i procjenu rizika od pristranosti obavila su neovisno (i u duplikatu) dva recenzenta. Sva pitanja koja su se pojavila raspravljena su tijekom sesije s oba recenzenta i dvama višim istraživačima (CCB i TKT).

Studijski izvori, strategija pretraživanja i kriteriji prihvatljivosti

Sistematizirano pretraživanje obavljeno je u četirima bazama podataka: PubMed/Medline, Scopus, Web of Science i Embase, bez ograničenja jezika ili datuma objave. Posljednje je bilo 28. travnja 2025.

PICO pitanje formulirano je na sljedeći način: *Prihvaćaju li roditelji, djeca i stomatolozi neestetske pristupe u liječenju karijesa kod djece?* (sudionici: djeca, roditelji i stomatolozi; intervencija: neestetski materijali za liječenje karijesa kod djece; usporedba: nije primjenjivo; ishod: prihvaćanje; studijski dizajn: presječne, kohortne studije ili randomizirana kontrolirana ispitivanja). SDF, SSC, HT i NRCC smatraju se neestetskim pristupima, a sve vrste bjelkastih materijala ubrajaju se u estetske pristupe (npr., GIC, kompozitni materijali, od smole, zubni sealanti i kompomeri).

Pretraživanje je razvijeno na temelju PICO pitanja i na početku je dizajnirano za PubMed/Medline, a zatim prilagođeno za ostale baze podataka (tablica 1.).

Ovaj sistematizirani pregled objavljen je u skladu sa smjernicama PRISMA-e za sistematizirane preglede (20) i registriran je na platformi OSF (dostupno na https://osf.io/p7cny). Ovu studiju odobrio je Odbor za istraživačku etiku ACTA-e (broj protokola 2021-30882).

Odabir studija, izdvajanje podataka i procjenu rizika od pristranosti obavila su neovisno (i u duplikatu) dva recenzenta. Sva pitanja koja su se pojavila raspravljena su tijekom sesije s oba recenzenta i dvama višim istraživačima (CCB i TKT).

Sistematizirano pretraživanje provedeno je u četirima bazama podataka: PubMed/Medline, Scopus, Web of Science i Embase, bez ograničenja jezika ili datuma objave. Posljednje je bilo 28. travnja 2025.

Odabir studija i prikupljanje podataka

Studije su neovisno (i u duplikatu) pregledala tri recenzenta (AR, CS i IRZ) na temelju njihova naslova i sažetka kako bi se ustanovilo ispunjavaju li sljedeće kriterije za uključivanje: (1) jesu li usmjerene na restaurativno ili neoperativno liječenje; (2) jesu li provedene na djeci i (3) jesu li povezane s prihvaćanjem. Sva neslaganja između recenzenata riješena su u sesiji s oba recenzenta i dva viša istraživača (CCB i TKT).

Članke koji su ispunjavali kriterije za uključivanje neovisno su (i u duplikatu) procijenila dva recenzenta (AR i CS) na temelju pregleda cjelovitoga teksta. Studije su smatrane

Table 1 Search strategies for all databases
Tablica 1. Strategije pretraživanja za sve baze podataka

Database	Search terms
PubMed/MEDLINE	((Children OR Child OR infant OR toddler OR Baby OR Parents OR Parenteral OR Caregiver OR Dentists OR "Dental Practitioners" OR "Pediatric Dentists" OR "Pediatric Dentists" OR Pedodontists OR "Dental Professionals") AND ("Stainless Steel Crown" OR SSC OR "Preformed Metal Crown" OR PMC OR SDF OR "Silver Diamine Fluoride" OR "Silver Diammine Fluoride" OR "Hall technique" OR "Caries management" OR "Nonoperative caries management" OR "nonrestorative treatment" OR "non-restorative cavity control") AND (Acceptation OR attitude OR view OR satisfaction OR perception OR acceptance OR acceptability OR appreciation OR opinion))
Scopus	TITLE-ABS-KEY (((children OR child OR infant OR toddler OR baby OR parents OR parenteral OR caregiver OR dentists OR „Dental Practitioners" OR „Pediatric Dentists" OR „Pediatric Dentists" OR pedodontists OR „Dental Professionals") AND („Stainless Steel Crown" OR ssc OR „Preformed Metal Crown" OR pmc OR sdf OR „Silver Diamine Fluoride" OR „Silver Diammine Fluoride" OR „Hall technique" OR „Caries management" OR „Nonoperative caries management" OR „nonrestorative treatment" OR „non-restorative cavity control") AND (acceptation OR attitude OR view OR satisfaction OR perception OR acceptance OR acceptability OR appreciation OR opinion)))
Web of Science	TS=((Children OR Child OR infant OR toddler OR Baby OR Parents OR Parenteral OR Caregiver OR Dentists OR "Dental Practitioners" OR "Pediatric Dentists" OR "Pediatric Dentists" OR paedodontists OR "Dental Professionals") AND ("Stainless Steel Crown" OR SSC OR "Preformed Metal Crown" OR PMC OR SDF OR "Silver Diamine Fluoride" OR "Silver Diammine Fluoride" OR "Hall technique" OR "Caries management" OR "Nonoperative caries management" OR "nonrestorative treatment" OR "non-restorative cavity control") AND (Acceptation OR attitude OR view OR satisfaction OR perception OR acceptance OR acceptability OR appreciation OR opinion))
Embase	('children'/exp OR children OR 'child'/exp OR child OR 'infant'/exp OR infant OR 'toddler'/exp OR toddler OR 'baby'/exp OR baby OR 'parents'/exp OR parents OR parenteral OR 'caregiver'/exp OR caregiver OR 'dentists'/exp OR dentists OR 'dental practitioners' OR 'pediatric dentists' OR 'pediatric dentists' OR 'paedodontists'/exp OR paedodontists OR 'dental professionals') AND ('stainless steel crown'/exp OR 'stainless steel crown' OR ssc OR 'preformed metal crown' OR pmc OR sdf OR 'silver diamine fluoride'/exp OR 'silver diamine fluoride' OR 'silver diamine fluoride' OR 'hall technique' OR 'caries management' OR 'nonoperative caries management' OR 'nonrestorative treatment' OR 'non-restorative cavity control') AND (acceptation OR 'attitude'/exp OR attitude OR view OR 'satisfaction'/exp OR satisfaction OR 'perception'/exp OR perception OR 'acceptance'/exp OR acceptance OR 'acceptability'/exp OR acceptability OR 'appreciation'/exp OR appreciation OR opinion)

CS) based on full-text review. Studies were considered ineligible if they met any of the following exclusion criteria: (1) data only from permanent teeth; (2) data only from aesthetic approaches; (3) patients with special needs; or (4) not an observational study or a randomized controlled trial.

Data from eligible studies were independently collected by two reviewers (AR and CS). The following items were extracted: publication details (title, author, and year), study characteristics (country and study design), study methodology (sample size, participants, and assessment tool), and outcome (outcome and main results). Data were charted, and the acceptance rates were recorded, ranged, and analyzed. The Cohen's Kappa index between the two reviewers was 0.75.

Risk of bias within individual studies

Cross-sectional studies were assessed for the risk of bias using the 'Checklist for Analytical Cross-Sectional Studies' (21). The domains considered in this tool included: (1) bias due to participation selection; (2) bias due to describing of study subjects; (3) bias due to exposure validity; (4) bias due to confounding factors; (5) bias due to outcome measurements; and (6) bias due to statistical analysis. Each study was assigned a label: 'high risk of bias', 'moderate risk of bias, or 'low risk of bias'.

Randomized clinical trials (RCTs) were assessed using the 'Revised Cochrane Risk-of-Bias Tool for Randomized Trials (RoB 2)' (22). The domains considered in this tool included: (1) bias arising from the randomization process; (2) bias due to deviations from intended interventions; (3) bias

neprihvatljivima ako su sadržavale bilo koji od sljedećih kriterija za isključivanje: (1) podatke samo za trajne zube (2) podatke samo za estetske pristupe; (3) pacijente s posebnim potrebama ili (4) nisu bile opservacijske studije ili randomizirana kontrolirana ispitivanja.

Podatke iz prikladnih studija neovisno su prikupila dva recenzenta (AR i CS). Izdvojene su sljedeće stavke: detalji publikacije (naslov, autor i godina), obilježja studije (zemlja i studijski dizajn), metodologija studije (veličina uzorka, sudionici i alat za procjenu) i ishod (ishod i glavni rezultati). Podatci su uneseni u grafikone, a stope prihvaćanja zabilježene su, rangirane i analizirane. Cohenov Kappa indeks između dva recenzenta bio je 0,75.

Rizik od pristranosti unutar pojedinačnih studija

Presječne studije procijenjene su na rizik od pristranosti s pomoću *Kontrolne liste za analitičke presječne studije* (21). Domene razmatrane u ovom alatu uključivale su: (1) pristranost zbog odabira sudionika; (2) pristranost zbog opisa ispitanika; (3) pristranost zbog valjanosti izloženosti; (4) pristranost zbog zbunjujućih čimbenika; (5) pristranost zbog mjerenja ishoda i (6) pristranost zbog statističke analize. Svakoj studiji dodijeljena je oznaka: *visok rizik od pristranosti*, *umjeren rizik od pristranosti* ili *nizak rizik od pristranosti*.

Randomizirana klinička ispitivanja (RCT) procijenjena su s pomoću *Revidiranoga Cochraneova alata za procjenu rizika od pristranosti za randomizirana ispitivanja* (RoB 2) (22). Domene razmatrane u ovom alatu uključivale su: (1) pristranost koja proizlazi iz procesa randomizacije; (2) pristranost

due to missing outcome data; (4) bias in outcome measurement; and (5) bias in selection of the reported result. The studies were assigned a label: 'high risk of bias', 'moderate risk of bias', or 'low risk of bias'.

Non-randomized clinical studies were assessed using the 'ROBINS-I Tool' (23), evaluating: (1) bias due to confounding factors; (2) bias due to participant selection; (3) bias due to lack of clarity in intervention groups; (4) bias due to deviation in intervention; (5) bias due to missing data; (6) bias due to deviation in outcome measurements; and (7) bias due to deviation in reported results. The studies were assigned a label: 'high risk of bias', 'moderate risk of bias', or 'low risk of bias'.

The list of studies was divided in half and reviewed by one reviewer (AR, CS or IFB). Afterwards, the list was reviewed by the other reviewer. If any doubts arose, they were addressed in a session with all reviewers and two senior researchers (CCB and TKT).

Data synthesis

Data synthesis was conducted using descriptive statistics. For outcomes related to the acceptance of non-aesthetic techniques, median, minimum, and maximum values were reported. A meta-analysis was considered inappropriate due to substantial clinical heterogeneity across studies, mainly due to variability in outcome measurement instruments and differences in participants' characteristics.

Results

Study selection

The systematic search identified a total of 2,259 studies. After removing duplicates, 1210 articles remained. These articles were screened based on their titles and abstracts, and 232 studies were deemed eligible for full-text analysis. Ultimately, 126 articles were included in the systematic review, as shown in Figure 1.

Studies characteristics

The extracted data items are presented in Supplementary Tables 1-7. The included publications were grouped according to the different non-aesthetic treatment options (SDF, SSC/HT and NRCC) and further sub-grouped by patient (parent/child) or operator (dental professional). The studies were conducted worldwide: 55 studies in Asia, 23 in North America, 29 in Europe, 10 in South America, 4 in Africa, 1 in Oceania, and 2 studies had a global approach.

Of the 126 included studies, only 58 (46%) used a certified assessment tool, such as the 'Likert scale', 'Visual Analogue Scale of Faces', or the 'Wong-Baker Faces Pain Rating Scale'. Outcome measurements used for parents and children varied, including acceptance, views, and opinion. Outcome measurements for dental professionals ranged from acceptance and preferred treatment options to knowledge about treatment options.

zbog odstupanja od planiranih intervencija; (3) pristranost zbog nedostajućih/nedovoljno podataka o ishodima; (4) pristranost u mjerenju ishoda i (5) pristranost u odabiru prijavljenog rezultata. Studijama je dodijeljena oznaka: *visok rizik od pristranosti, umjeren rizik od pristranosti* ili *nizak rizik od pristranosti*.

Nerandomizirane kliničke studije procijenjene su s pomoću alata ROBINS-I (23), a procjenjivala se (1) pristranost zbog zbunjujućih čimbenika; (2) pristranost zbog odabira sudionika; (3) pristranost zbog nedostatka jasnoće u intervencijskim skupinama; (4) pristranost zbog odstupanja u intervenciji; (5) pristranost zbog nedostajućih/nedovoljno podataka; (6) pristranost zbog odstupanja u mjerenjima ishoda i (7) pristranost zbog odstupanja u prijavljenim rezultatima. Studijama je dodijeljena oznaka: *visok rizik od pristranosti, umjeren rizik od pristranosti* ili *nizak rizik od pristranosti*.

Popis studija podijeljen je na pola i pregledao ga je jedan recenzent (AR, CS ili IFB). Nakon toga, popis je pregledao drugi recenzent. Ako su se pojavile bilo kakve sumnje, riješene su na sastanku sa svim recenzentima i dvama višim istraživačima (CCB i TKT).

Sinteza podataka

Sinteza podataka provedena je korištenjem deskriptivne statistike. Za ishode povezane s prihvaćanjem neestetskih tehnika prikazane su srednje, minimalne i maksimalne vrijednosti. Metaanaliza smatrala se neprikladnom zbog značajne kliničke heterogenosti među studijama, uglavnom zbog varijabilnosti instrumenata za mjerenje ishoda i razlika u karakteristikama sudionika.

Rezultati

Odabir studija

Sistematiziranim pretraživanjem identificirano je ukupno 2259 studija. Nakon uklanjanja duplikata, preostalo je 1210 radova. Svi su pregledani na temelju naslova i sažetaka, a 232 studije smatrane su prikladnima za analizu cjelovitoga teksta. U konačnici je u sistematizirani pregled uključeno 126 radova, kao što je prikazano na slici 1.

Obilježja studija

Izdvojeni podatci nalaze se u dodatnim tablicama od 1. do 7. Uključene publikacije grupirane su prema različitim neestetskim mogućnostima liječenja (SDF, SSC/HT i NRCC) i dalje podgrupirane prema pacijentu (roditelj/dijete) ili operateru (stomatolog). Studije su provedene diljem svijeta: 55 u Aziji, 23 u Sjevernoj Americi, 29 u Europi, 10 u Južnoj Americi, 4 u Africi i 1 u Oceaniji, a 2 studije imale su globalni pristup.

Od 126 uključenih studija, autori samo njih 58 (46 %) koristili su se certificiranim alatom za procjenu, kao što su Likertova ljestvica, vizualna analogna ljestvica lica ili Wong-Bakerova ljestvica za ocjenjivanje boli prema izrazu lica. Mjerenja ishoda korištena za roditelje i djecu varirala su, uključujući prihvaćanje, stajališta i mišljenja. Mjerenja ishoda za stomatologe kretala su se od prihvaćanja i preferiranih mogućnosti liječenja do znanja o mogućnostima liječenja.

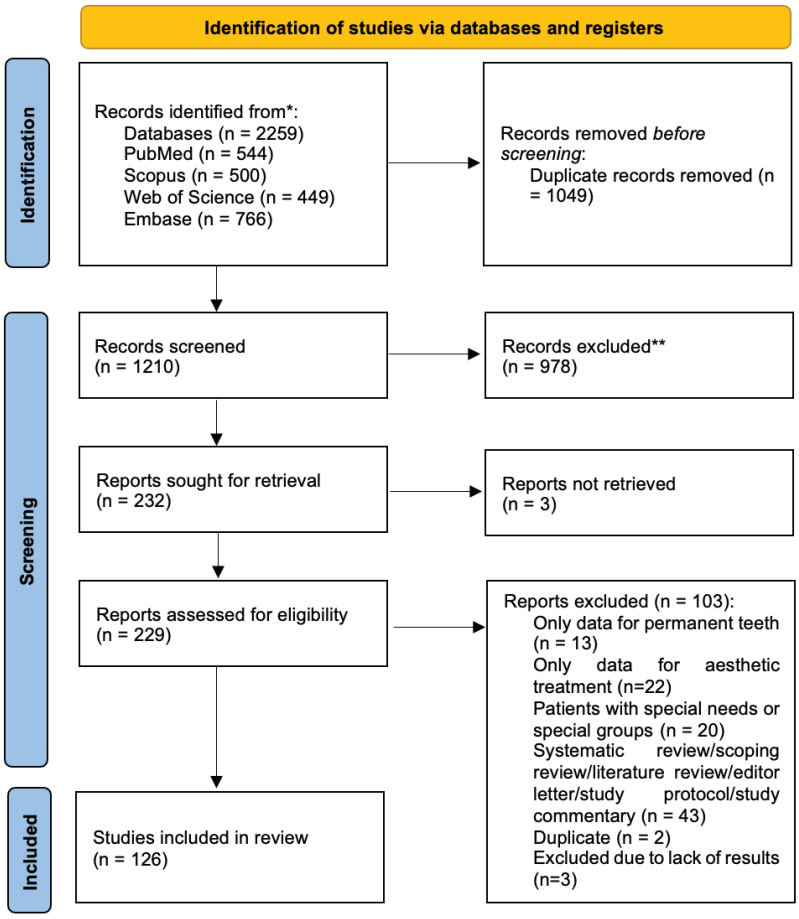

Figure 1 Flowchart of study screening and eligibility.
Slika 1. Dijagram toka probira i prikladnosti studije

Risk of bias assessment

In total, 88 cross-sectional studies, 32 RCTs, and 6 non-randomized controlled trials were included in this systematic review. The risk of bias assessments is presented in figures 2, 3 and 4. Of the 88 cross-sectional studies, 36.4% were rated as 'low risk of bias', 43.2% as 'moderate risk of bias', and 20.4% as 'high risk of bias'. Among 32 RCTs, 3.1% was rated as 'low risk of bias', 34.4% were rated as 'moderate risk of bias', while 62.5% were rated as 'high risk of bias'. Of the 6 non-randomized clinical studies, 16.6% were rated as 'low risk of bias', 16.6% as 'moderate risk of bias', and 66.7% as 'high risk of bias'.

Due to the trial context, some items on the Risk of Bias assessment sheet were not applicable to most cross-sectional studies, such as exposure validity, measurement of exposure, and confounding factors. In RCTs, it was found that, in all cases except for (24) and (25), neither participant nor operators were blinded. This can be justified by the trial context.

Data from qualitative assessment

Out of the 126 included articles, 36 articles contained only qualitative data. Most parents and children showed the acceptance of treatment with SDF, SSC and NRCC with recorded benefits including short procedure time and minimal cooperation required from the child. However, some con-

Procjena rizika od pristranosti

Ukupno je u ovaj sistematizirani pregled uključeno 88 presječnih studija, 32 randomizirana kontrolirana istraživanja i 6 nerandomiziranih kontroliranih istraživanja. Procjene rizika od pristranosti prikazane su na slikama 2., 3. i 4. Od 88 presječnih studija, 36,4 % dobilo je ocjenu nizak rizik od pristranosti, 43,2 % umjeren rizik od pristranosti i 20,4 % visok rizik od pristranosti. Među 32 randomizirana kontrolirana istraživanja, za 3,1% zaključeno je da imaju nizak rizik od pristranosti, za 34,4 % smatralo se da im je rizik od pristranosti umjeren, a za 62,5 % istaknut je visok rizik od pristranosti. Od 6 nerandomiziranih kliničkih studija, njih 16,6 % dobilo je ocjenu nizak rizik od pristranosti, 16,6 % umjeren rizik od pristranosti, a za 66,7 % ocjena je bila visok rizik od pristranosti. Zbog konteksta istraživanja neke stavke na popisu za procjenu rizika od pristranosti nisu bile primjenjive na većinu presječnih studija, kao što su valjanost izloženosti, mjerenje izloženosti i zbunjujući čimbenici. U randomiziranim kontroliranim istraživanjima utvrđeno je da u svim slučajevima, osim u (24) i (25), ni sudionici, ni operateri nisu bili zaslijepljeni. To se može opravdati kontekstom istraživanja.

Podatci iz kvalitativne procjene

Od 126 uključenih radova, 36 je sadržavalo samo kvalitativne podatke. Većina roditelja i djece pokazala je prihvaćanje liječenja SDF-om, SSC-om i NRCC-om, uz zabilježene koristi, uključujući kratko vrijeme postupka i minimalnu suradnju djeteta. No istaknuta je određena zabrinutost u vezi

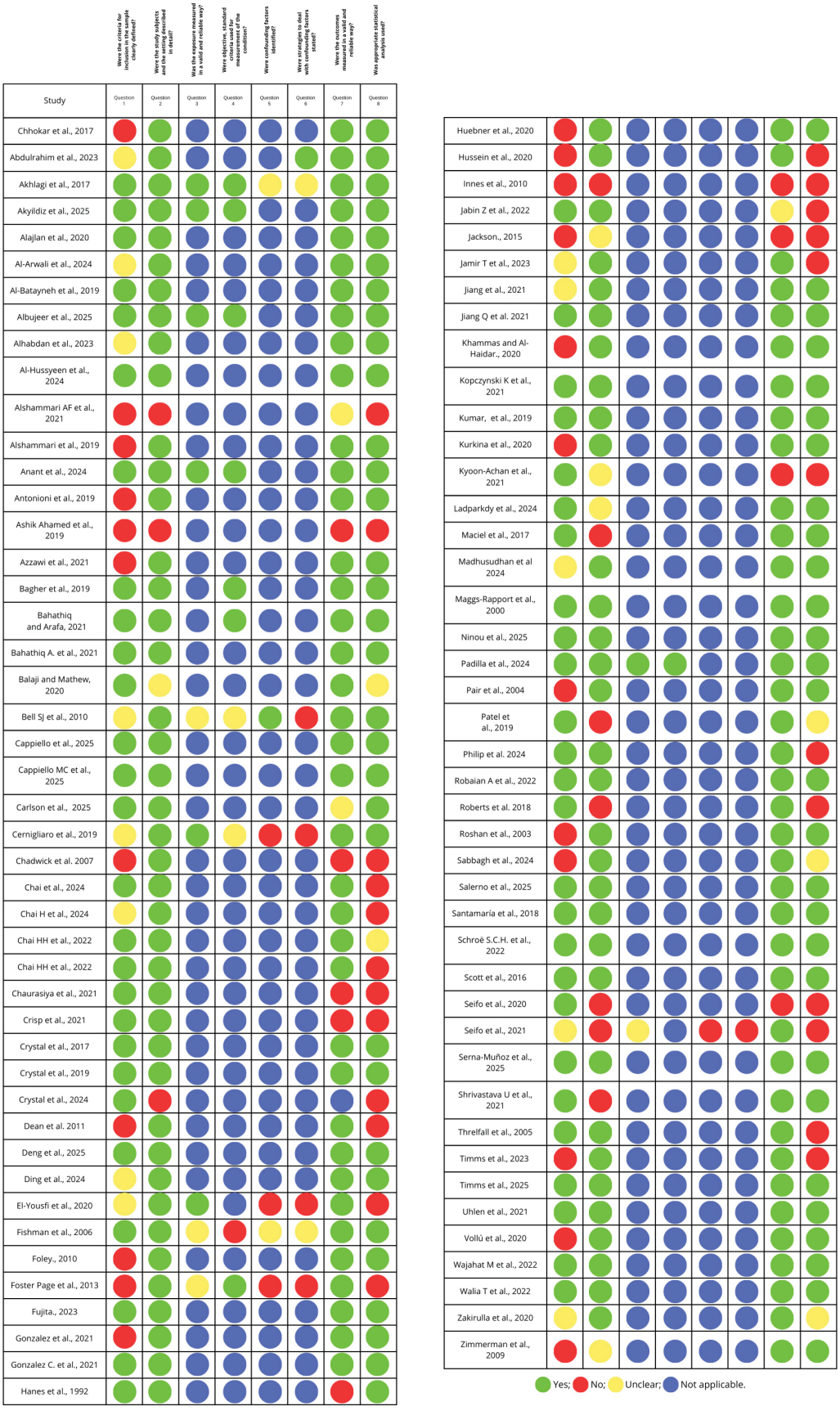

Figure 2 Risk of bias for cross-sectional studies.
Slika 2. Rizik od pristranosti za presječne studije

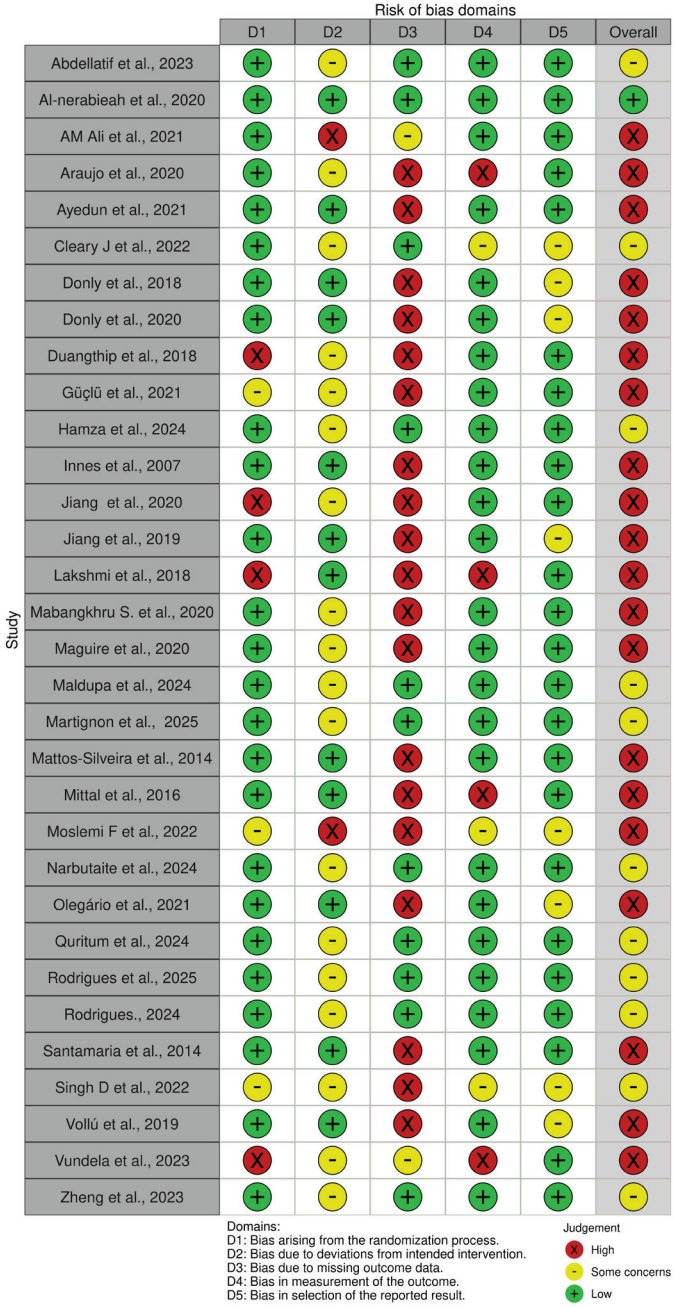

Figure 3 Risk of bias for randomized controlled trials.
Slika 3. Rizik od pristranosti za randomizirana kontrolirana istraživanja

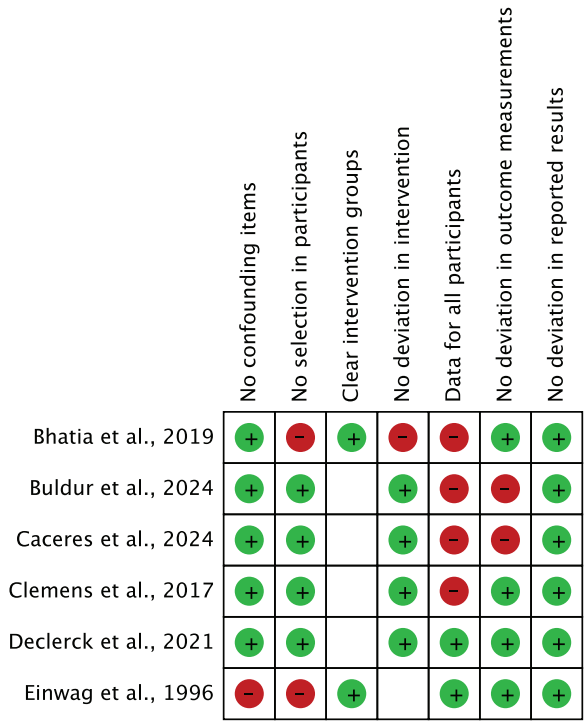

Figure 4 Risk of bias of non-randomized controlled trials.
Slika 4. Rizik od pristranosti za nerandomizirana kontrolirana istraživanja

cerns were raised regarding the discoloration of teeth when treated with SDF. Seifo et al. (12) stated that "SDF-induced black staining on anterior teeth was perceived as potentially leading to negative judgments of children and parents regarding their care, as well as bullying of children. Consequently, SDF treatment was more acceptable on posterior teeth."

Dental professionals are aware of the benefits of treatment with SDF. Most general practitioners have mentioned that the minimal cooperation required could be beneficial for treating children with disabilities or behavioral problems (26, 27). According to Santamaria et al. (15), most dentists

s promjenom boje zuba tijekom liječenja SDF-om. Seifo i suradnici (12) izjavili su da se *crno obojenje prednjih zuba prouzročeno SDF-om doživljava kao da može potaknuti negativne procjene druge djece i roditelja, te završiti maltretiranjem djece. Posljedično, liječenje SDF-om bilo je prihvatljivije na stražnjim zubima.*

Stomatolozi su svjesni prednosti liječenja SDF-om. Većina općih stomatologa navela je da bi minimalna potrebna suradnja mogla biti korisna za liječenje djece s invaliditetom ili one s problemima u ponašanju (26, 27). Prema Santamariji i suradnicima (15), većina stomatologa smatrala je NRCC *vrlo kratkim* ili *kratkim* tretmanom.

regarded the NRCC as a 'very short' or 'short' treatment to undertake.

General dentists mentioned the ease of the procedure as a beneficial aspect of the SSC or the HT treatment. Chadwick et al. (28) reported that SSC is not a part of the training program at some universities. As a result, dentists are hesitant to use the SSC in their daily practice due to a lack experience with this particular treatment.

Data from quantitative assessment

In total, 89 included studies provided quantitative data on the acceptance of SDF, SSC or NRCC by children, parents, and dental professionals. For the acceptance of SDF treatment, 9 studies were included for children, 36 for parents, and 12 for dental professionals. For the acceptance of SSC or HT treatment, 18 studies were included for children, 16 for parents, and 18 for dental professionals. 2 studies included contained data for multiple treatment options. Some articles combined data from children and parents, or from children, parents, and dentists; these data were extracted separately. The extracted quantitative data are shown in Tables 2, 3, 4 and 5.

The acceptance rate of SDF in posterior primary molars for children ranged from 71.4% to 100% (median 93.2%). For parents, the acceptance rate ranged from 3.2% to 100% (median 69.9%) and for dental professionals, the acceptance rate ranged from 13.2% to 95% (median 61.6%).

The acceptance rate of SSC or HT treatment in posterior primary molars for children ranged from 32% to 100% (median 90%) For parents, the acceptance rate ranged from 14.5% to 100% (median 81.9%) and for dental professionals, the acceptance rate ranged from 1% to 96% (median 44%). Some acceptance rates are extremely low compared to others, such as Alshammari et al. (29) with an acceptance rate of only 3.2% for SDF by parents and Pair and al. (30) with a rate of 1% for SSC by dental professionals.

The acceptance rate for NRCC treatment ranged from 71.4 % to 79.2% for children, more than 80% for parents, and ranged from 89% to 93.5% for dental professionals. For the SDF treatment, eight articles described the quantitative differences in acceptance between the anterior and posterior region by parents. In these studies, acceptance of SDF in posterior regions ranged from 53.6% to 100% (median 72,4%) while acceptance in the anterior region ranges from 18.3% to 72.5% (median 38.4%).

Discussion

The present study combined data on non-aesthetic approaches for managing carious lesions in children through a systematic review and evaluated the outcomes from the perspective of children, parents, and dental professionals. The most frequently performed non-aesthetic treatments in children were SDF and SSC. It was found that the acceptance rate by children was higher than for parents, and, in turn, higher than by dental professionals, for both SDF and SSC/HT treatments.

The acceptance rate of SDF in posterior primary molars for children had a median of 93.2%, while for parents it was 69.9%, and for dental professionals, it was 61.6%. The dif-

Opći stomatolozi spomenuli su jednostavnost postupka kao koristan aspekt SSC-a ili HT tretmana. Chadwick i suradnici (28) izvijestili su da SSC nije dio edukacijskoga programa na nekim sveučilištima. Kao rezultat toga, stomatolozi oklijevaju služiti se SSC-om u svakodnevnoj praksi zbog nedostatka iskustva s ovim konkretnim tretmanom.

Podatci iz kvantitativne procjene

Ukupno su autori 89 uključenih studija pružili kvantitativne podatke o prihvaćanju SDF-a, SSC-a ili NRCC-a kad je riječ o djeci, roditeljima i stomatolozima. Za prihvaćanje SDF liječenja uključeno je devet studija za djecu, 36 za roditelje i 12 za stomatologe. Za prihvaćanje SSC ili HT liječenja uključeno je 18 studija za djecu, 16 za roditelje i 18 za stomatologe. Dvije uključene studije sadržavale su podatke za više mogućnosti liječenja. U nekim radovima kombinirani su podatci dobiveni od djece i roditelja ili od djece, roditelja i stomatologa; ti su podatci izdvojeni zasebno. Izdvojeni kvantitativni podatci prikazani su u tablicama 2., 3., 4. i 5.

Stopa prihvaćanja SDF-a na stražnjim mliječnim kutnjacima kod djece iznosila je od 71,4 % do 100 % (medijan 93,2 %). Za roditelje se stopa prihvaćanja kretala od 3,2 % do 100 % (medijan 69,9 %), a za stomatologe od 13,2 % do 95 % (medijan 61,6 %).

Stopa prihvaćanja SSC-a ili HT-a za stražnje mliječne kutnjake kod djece kretala se od 32 % do 100 % (medijan 90 %). Za roditelje jee stopa prihvaćanja bila od 14,5 % do 100 % (medijan 81,9 %), a za stomatologe od 1 % do 96 % (medijan 44 %). Neke stope prihvaćanja iznimno su niske u usporedbi s drugima, kao što su Alshammarijeve i suradnika (29) sa stopom prihvaćanja od samo 3,2 % za SDF kad je riječ o roditeljima, te Pairja i suradnika (30) sa stopom od 1 % za SSC kad je riječ o stomatolozima.

Stopa prihvaćanja NRCC-a kretala se od 71,4 % do 79,2 % za djecu, više od 80 % za roditelje i od 89 % do 93,5 % za stomatologe. Za liječenje SDF-om, u osam radova opisane su kvantitativne razlike u prihvaćanju između prednje i stražnje regije kad je riječ o roditeljima. U tim se studijama prihvaćanje SDF-a u stražnjim regijama kretalo od 53,6 % do 100 % (medijan 72,4 %), a prihvaćanje u prednjoj regiji bilo je od 18,3 % do 72,5 % (medijan 38,4 %).

Rasprava

U ovoj studiji kombinirani su podatci o neestetskim pristupima liječenju karijesnih lezija kod djece na temelju sistematiziranih pregleda te su procijenjeni ishodi iz perspektive djece, roditelja i stomatologa. Najčešće primijenjeni neestetski tretmani kod djece bili su SDF i SSC. Utvrđeno je da je stopa prihvaćanja kod djece, i za SDF i za SSC/HT tretmane, bila veća nego kod roditelja, a time i veća nego kod stomatologa.

Stopa prihvaćanja SDF-a za stražnje mliječne kutnjake kod djece imala je medijan od 93,2 %, kod roditelja iznosila je 69,9 %, a kod stomatologa 61,6 %. Razlika u stopama prihvaćanja može se pripisati činjenici da su djeca manje zabri-

Table 2 Quantitative acceptance of silver diamine fluoride by parents and/or children.
Tablica 2. Kvantitativno prihvaćanje srebro-diamin-fluorida kad je riječ o roditeljima i/ili djeci

Title	Author + Year	Quantitative results
A multi-site service evaluation of silver diamine fluoride use for children	Timms et al., 2023 (47)	Children: 78.8% Parents: 100%
A randomized clinical trial to arrest dentin caries in young children using silver diamine fluoride	Mabangkhru et al., 2020 (48)	Parents: 55.6%
A survey of caregiver acculturation and acceptance of silver diamine fluoride treatment for childhood caries	Kumar et al., 2019 (49)	Parents: 79.5%
Adverse Effects of Silver Diamine Fluoride Treatment among Preschool Children	Duangthip et al., 2018 (25)	Parents: 62.3%
Association between dental conditions, sliver diamine fluoride application, parental satisfaction, and oral health-related quality of life of preschool children	Jiang et al., 2020 (50)	Parents: 60%
Assessing the Effects and Acceptance of Silver Diamine Fluoride Treatment in Early Childhood Caries	Anant et al., 2024 (51)	Parents: 90.6%
Caregiver satisfaction with interim silver diamine fluoride applications for their children with caries prior to operating room treatment or sedation	Cernigliaro et al., 2019 (52)	Children: 91.7% Parents: 81.3%
Caries arrest using silver diamine fluoride: Knowledge, attitude, and perception of parents in Saudi Arabia	Abdellatif et al., 2023 (53)	Parents: 78.3%
Caries Prevention Using Silver Diamine Fluoride: A 12-Month Clinical Trial	Zheng et al., 2023 (54)	Parents: 99%
Cariostatic efficacy and children acceptance of nano-silver fluoride versus silver diamine fluoride: A randomized controlled clinical trial	Al-Nerabieah et al., 2020 (24)	Children: 91.5%
Cavity-management effectiveness and feasibility of SDF solution and NaF varnish in children: One-year follow-up non-inferiority RCT.	Martignon et al., 2025 (55)	Children: 95.6% Parents: 99.3%
Child discomfort and parental acceptability of silver diamine fluoride and alternative restorative treatment: A randomized controlled clinical trial	Mahmoud et al., 2021 (56)	Children: 97.5% Parents: 91%
Children's discomfort may vary among different treatments for initial approximal caries lesions: preliminary findings of a randomized controlled clinical trial	Mattos-Silveira et al., 2014 (57)	Children: 93.2%
Clinical effectiveness/child-patient and parent satisfaction of two topical fluoride treatments for caries: a randomized clinical trial	Maldupa et al., 2024 (58)	Children: 95% Parents: 92.5%
Comparison of aesthetic perception and acceptability of silver diamine fluoride staining between Spanish and Italian parents.	Cappiello et al., 2025 (41)	Parents: 30.6%
Effect and acceptance of silver diamine fluoride treatment on dental caries in primary teeth	Clemens et al., 2017 (59)	Children: 100% Parents: 90%
Effectiveness and Parental Perception of Silver Diamine Fluoride toward Treatment of Dental Caries in Primary Teeth.	Shrivastava et al., 2021 (60)	Parents: 100%
Effectiveness of nanosilver fluoride and silver diamine fluoride in arresting early childhood caries: a randomized controlled clinical trial.	Quritum et al., 2024 (61)	Parents: 76.1%
Effects of restoring SDF-treated and untreated dentine caries lesions on parental satisfaction and oral health related quality of life of preschool children	Jiang et al., 2019 (62)	Parents: 64%
Efficacy of 30% silver diamine fluoride compared to atraumatic restorative treatment on dentine caries arrestment in primary molars of preschool children: A 12-months parallel randomized controlled clinical trial	Vollú et al., 2019 (63)	Children: 71.4%
Evaluation of the clinical efficacy of 38% silver diamine fluoride in arresting dental caries in primary teeth and its parental acceptance	Chaurasiya et al., 2021 (64)	Parents: 100%
Factors modulating parental acceptance of SDF treatment	Bahathiq; Arafa, 2021 (65)	Parents: 59.4%
Parental acceptability of silver diamine fluoride: The UK and US experiences	Timms et al., 2025 (45)	Parents: 79.3%
Parental acceptance of Silver Diamine Fluoride in two lower-middle-income countries: Iran and Tajikistan.	Sabbagh et al., 2024 (66)	Parents: 76.1%
Parental acceptance of the utilization of silver diamine fluoride on their child's primary and permanent teeth	Bagher et al., 2019 (40)	Parents: 73.1%
Parental knowledge, awareness and acceptance of silver diamine treatment among patients from Modinagar, Uttar Pradesh, India	Jabin et al., 2022 (67)	Parents: 63.7%
Parental perception of silver diamine fluoride for the management of dental caries	Wajahat et al., 2022 (68)	Parents: 87.8%
Parental perception of the application of silver diamine fluoride (SDF) for dental caries treatment among Iraqi school children: a cross-sectional study	Albujeer et al., 2025 (69)	Parents: 72.6%
Parental perceptions and acceptance of silver diamine fluoride staining	Crystal et al., 2017 (43)	Parents: 67.5%
Parental perceptions and acceptance of silver diamine fluoride staining in Italy	Cappiello et al., 2025 (42)	Parents: 42.4%
Parental perceptions and acceptance of silver diamine fluoride treatment in Kingdom of Saudi Arabia	Alshammari et al., 2019 (29)	Parents: 3.2%
Parental Perceptions of Silver Diamine Fluoride Discoloration in Baghdad/Iraq	Khammas; Al-Haidar, 2020 (44)	Parents: 71.5%
Parents' and Children's Acceptance of Silver Diamine Fluoride Application on Primary Teeth in the United Arab Emirates.	Walia et al., 2022 (70)	Parents: 36.7%
Parents' Compliance with Silver Diamine Fluoride Use for Treatment of Caries Lesions in Children	Kurkina et al., 2020 (71)	Parents: 66.2%
Parents' Satisfaction with Silver Diamine Fluoride Treatment of Carious Lesions in Children	Huebner et al., 2020 (72)	Parents: 83%
Silver Diamine Fluoride Renaissance in Paediatric Dentistry: A 24-Month Retrospective and Cross-Sectional Analysis	Abdulrahim et al., 2023 (38)	Parents: 68.2%
Silver diamine fluoride with sodium fluoride varnish versus silver diamine fluoride in arresting early childhood caries: a 6-months follow up of a randomized field trial.	Abdellatif et al., 2023 (73)	Parents: 78.2%
The Parental Concern and Acceptance of Silver Diamine Fluoride Treatment in Preschool Children: A Cross-Sectional Study.	Ladparkdy et al., 2024 (74)	Parents: 79.7%
Using sequential applications of a novel silver diamine fluoride gel and sodium fluoride varnish to arrest severe early childhood caries lesions: A clinical trial with single group assignment	Padilla Cáceres et al., 2024 (75)	Parents: 83.5%
		Median: Children: 93.2% Parents: 69.9%

Table 3 Quantitative acceptance of silver diamine fluoride by dental professionals.
Tablica 3. Kvantitativno prihvaćanje srebro-diamin-fluorida kad je riječ o stomatolozima

Title	Author + Year	Quantitative results
Dentists Education, Knowledge and Attitudes towards Silver Diamine Fluoride	Zakirulla et al., 2020 (73)	Dentist: 42%
General and pediatric dentists' knowledge, attitude and practices regarding the use of Silver Diammine Fluoride for the management of dental caries: a national survey in the Netherlands	Schroë et al., 2022 (77)	Dentist: 77%
Knowledge and Awareness on Silver Diamine Fluoride among Pediatric Dentists and Post Graduates in India - A Survey	Balaji; Mathew, 2020 (78)	Dentist: 95%
Knowledge, Attitudes, and Practices About the Use of Silver Diamine Fluoride Among Dentists in Riyadh, Saudi Arabia: A Cross-Sectional Study.	Al-Hussyeen et al., 2024 (79)	Dentist: 67.2%
Knowledge, attitudes, and practices of pediatric dentists towards silver diamine fluoride	Azzawi et al., 2021 (80)	Dentist: 82%
Knowledge on and Attitude toward Silver Diamine Fluoride among Saudi Dental Practitioners in Riyadh Public Hospitals	Alajlan et al., 2020 (26)	Dentist: 50.4%
Knowledge, Practices, and Attitudes Towards Silver Diamine Fluoride Therapy Among Dentists and Students in Southeastern Spain	Serna-Muñoz et al., 2025 (81)	Dentist: 55.9%
Pediatric Dentists' Silver Diamine Fluoride Education, Knowledge, Attitudes, and Professional Behavior: A National Survey	Antonioni et al., 2019 (82)	Dentist: 77%
Perceptions of Registered Dental Hygienists in Alternative Practice Regarding Silver Diamine Fluoride	Chhokar et al., 2017 (83)	Dentist: 43%
Silver Diamine Fluoride in Pediatric Dentistry Training Programs: Survey of Graduate Program Directors	Scott et al., 2016 (84)	Dentist: 78.9%
Survey of knowledge, attitudes and practices of Brazilian dentists regarding silver diamine fluoride	Vollú et al., 2020 (85)	Dentist: 13.2%
Training received, knowledge, and use of Silver Diamine Fluoride among Italian dentists: a nationwide survey	Salerno C et al., 2025 (86)	Dentist: 54.4%
		Median: 61.6%

ference in acceptance rates can be attributed to the fact that children tend to be less concerned about aesthetic aspects and prioritize treatment that are quick and less invasive. On the other hand, parents are generally more critical regarding aesthetic outcomes, especially for anterior teeth. Dental professionals might also hesitate due to concerns of claims or dissatisfaction from parents (12), as well as their limited experience with SDF, since the technique is still not widely adopted in clinical practice (27), and their uncertainty about the treatment's effectiveness compared to traditional methods.

For SSC or HT treatment in posterior primary molars, the acceptance rates were also higher for children, with a median of 90%, while for parents it was 81.9%, and for dental professionals 44%. The lower acceptance among professionals can be explained by the lack of training at some dental schools, as noted by Chadwick et al. (28). The HT technique has been introduced more recently; therefore a large number of professionals may be more familiar with traditional methods requiring local anesthesia and tooth preparation, which are more invasive and consequently less attractive. Additionally, Casamassimo et al. (31) reported that many dental graduates do not feel adequately prepared to treat children with SSC.

Not only was the median acceptance rate of these non-aesthetic procedures higher among children compared to parents or dental professionals, but the values also showed a smaller range, indicating lower dispersion and a greater consistency in the data related to children's acceptance. This suggests that children are generally more accepting of these treatments, likely due to their lower concern for aesthetnuta zbog estetskih aspekata i daju prednost brzim i manje invazivnim tretmanima. S druge strane, roditelji su općenito kritičniji u vezi s estetskim ishodima, posebno ako je riječ o prednjim zubima. Stomatolozi bi također mogli oklijevati zbog zabrinutosti o zahtjevima ili nezadovoljstvu roditelja (12) te zbog njihova ograničenog iskustva sa SDF-om, s obzirom na to da ta tehnika još nije široko prihvaćena u kliničkoj praksi (27), ali i zbog njihove nesigurnosti u učinkovitost liječenja u usporedbi s tradicionalnim metodama.

Za SSC ili HT na stražnjim mliječnim kutnjacima, stopa prihvaćanja bila je također veća kod djece, s medijanom od 90 %, kod roditelja je iznosila 81,9 %, a kod stomatologa 44 %. Niže prihvaćanje među profesionalcima može se objasniti nedostatkom edukacije na nekim stomatološkim fakultetima, kako su primijetili Chadwick i suradnici (28). HT tehnika uvedena je nedavno i zato velik broj profesionalaca može bolje poznavati tradicionalne metode koje zahtijevaju lokalnu anesteziju i preparaciju zuba, bez obzira na to što su invazivnije i posljedično manje atraktivne. Istaknimo da su Casamassimo i suradnici. (31) izvijestili da se mnogi diplomirani stomatolozi ne osjećaju dovoljno pripremljenima za liječenje djece SSC-om.

Ne samo da je medijan prihvaćanja ovih neestetskih postupaka bio veći među djecom u usporedbi s roditeljima ili stomatolozima, nego su vrijednosti također pokazale manji raspon, što upućuje na nižu disperziju i veću dosljednost u podatcima vezanima za prihvaćanje djece. To sugerira da djeca općenito bolje prihvaćaju ove tretmane, vjerojatno zbog njihove manje brige za estetske ishode, posebno u stražnjoj regiji gdje je funkcionalnost prioritet. Dostupna literatura podupire ovaj trend, te se ističe da je prihvaćanje nee-

Table 4 Quantitative acceptance of stainless-steel crown or hall technique treatment by parent and/or child
Tablica 4. Kvantitativno prihvaćanje krunica od nehrdajućeg čelika ili tretmana Hallovom tehnikom kad je riječ o roditeljima i/ili djeci

Title	Author + Year	Quantitative results
A Split Mouth Randomized Controlled Clinical Trial to Compare The Clinical Performance of Primary Posterior Esthetic And Stainless Steel Crown	Singh et al., 2022 (87)	Parents: 100%
Acceptability of different caries management methods for primary molars in a RCT	Santamaria et al., 2014 (15)	Children: 87% Parents: 98%
Acceptability of the Hall Technique to parents and children	Foster Page et al., 2013 (88)	Children: 90% Parents: 80%
Atraumatic restorative treatment compared to the Hall Technique for occluso-proximal carious lesions in primary molars; 36-month follow-up of a randomised control trial in a school setting	Araujo et al., 2020 (89)	Children: 70% Parents: 70%
Atraumatic restorative treatment vs Hall technique for occlusoproximal lesions in primary dentition-an in vivo study	Lakshmi et al., 2018 (90)	Children: 66.7%
Attitudes of Parents and Children toward Primary Molars Restoration with Stainless Steel Crown	Akhlagi et al., 2017 (91)	Children: 82.4% Parents: 61.5%
Can zirconia crowns be the first restorative choice after endodontic treatment of primary teeth?	Güçlü et al., 2021 (92)	Children: 90% Parents: 90%
Child and parental acceptance of preformed metal crowns	Bell et al., 2010 (93)	Children: 95.1% Parents: 95.2%
Clinical Performance of Indirect Composite Onlays as Esthetic Alternative to Stainless Steel Crowns for Rehabilitation of a Large Carious Primary Molar	Mittal et al., 2016 (94)	Children: 32% Parents: 44%
Comparison of the Treatment Assessments of the Conventional Stainless-Steel Crown Restorations and the Hall Technique	Ayedun et al., 2021 (95)	Children: 100%
Comparison of three management approaches for dental caries in primary molars: A two-year randomized clinical trial	Narbutaite et al. 2024 (96)	Children: 88.6 % Parents: 100%
Evaluation of Clinical Effectiveness and Patient Acceptance of Hall Technique for Managing Carious Primary Molars: An In Vivo Study	Bhatia et al., 2019 (97)	Children: 65.4%
Evaluation of parental satisfaction and child's acceptance of stainless-steel crowns and figaro crowns in primary molars - a retrospective clinical study	Subramanian et al., 2022 (98)	Children: 100% Parents: 84%
Exploring Parent's Satisfaction and the Effectiveness of Preformed Metal Crowns Fitting by Hall Technique for Carious Primary Molars in Jeddah Region, Saudi Arabia: Findings of a Prospective Cohort Study.	Almaghrabi et al., 2022 (99)	Parents: 96%
Is the Metallic Color of Stainless Steel Crown Satisfying for Cooperative Children and their Parents? a Preliminary Study	Moslemi et al., 2022 (100)	Children: 90% Parents: 82.5%
Longitudinal observational digital analysis of occlusion in Hall Technique	Akyildiz et al., 2025 (101)	Children: 93%
Non-invasive treatment approach for hypomineralized second primary molars using preformed metal crowns: results after 1-year follow-up	Declerck et al. 2021 (102)	Children: 83% Parents: 72%
Parental Knowledge and Acceptance of Different Treatment Options for Primary Teeth Provided by Dental Practitioners	Al-Batayneh et al., 2019 (103)	Parents: 14.5%
Placement of preformed metal crowns on carious primary molars by dental hygiene/therapy vocational trainees in Scotland: a service evaluation assessing patient and parent satisfaction	Jackson, 2015 (104)	Children: 93% Parents: 81%
Stainless steel crown versus bulk fill composites for the restoration of primary molars post-polypectomy: 1-year survival and acceptance results of a Randomized Clinical Trial	Olegário et al., 2021 (105)	Children: 46.8% Parents: 81.2%
The Hall Technique; a randomized controlled clinical trial of a novel method of managing carious primary molars in general dental practice: acceptability of the technique and outcomes at 23 months	Innes et al., 2007 (36)	Children: 91.3% Parents: 72.2%
The opinion of children and their parents about four different types of dental restorations in a public health service in Brazil	Maciel et al., 2017 (106)	Children: 95.3% Parents: 97.9%
		Median: Children: 90% Parents: 81.9%

Table 5 Quantitative acceptance of stainless-steel crown or hall technique treatment by dental professionals.
Tablica 5. Kvantitativno prihvaćanje krunice od nehrđajućeg čelika ili tretmana Hallovom tehnikom kad je riječ o stomatolozima

Title	Author + Year	Quantitative results
A group of general dental practitioners' views of preformed metal crowns after participation in the Hall technique clinical trial: a mixed-method evaluation	Innes et al., 2010 (107)	Dentist: 21%
A survey among dentists treating pediatric patients about management of caries and opinion on various restorative modalities	Ashik Ahamed et al., 2019 (108)	Dentist: 15%
Acceptability of different caries management methods for primary molars in a RCT	Santamaria et al., 2014 (15)	Dentist: 77%
Changes in dentists' attitudes and practice in pediatric dentistry	Roshan et al., 2003 (34)	Dentist: 26%
Choice of Material for the Treatment of Proximal Lesions in Deciduous Molars among Pediatric Post-Graduates and Pediatric Dentists of Gujarat: A Cross-Sectional Study	Patel et al., 2019 (109)	Dentist: 65%
Community dental officers' use and knowledge of restorative techniques for primary molars: An audit of two Trusts in Wales	Maggs-Rapport et al., 2000 (110)	Dentist: 61%
Comparison of three management approaches for dental caries in primary molars: A two-year randomized clinical trial	Narbutaite et al., 2024 (111)	Dentist: 88.5
Dentists' Perception and Clinical Use of Preformed Metal Crowns to Restore Primary Molar Defects in Chengdu City, China: A Cross-Sectional Study	Jiang et al., 2021 (112)	Dentist: 31.4%
General dental practitioners' views on the use of stainless-steel crowns to restore primary molars	Threlfall et al., 2005 (35)	Dentist: 18%
Hall Technique: Knowledge and Attitudes of Pediatric Dentists in the United States	Gonzalez et al., 2021 (113)	Dentist: 39%
Materials used to restore class II lesions in primary molars: A survey of California pediatric dentists	Pair et al., 2004 (30)	Dentist: 1%
Parental attitudes on restorative materials as factors influencing current use in Pediatric Dentistry	Zimmerman et al., 2009 (114)	Dentist: 93%
Stainless-steel crowns in children: Norwegian and Finnish dentists' knowledge, practice and challenges	Uhlen et al., 2021 (115)	Dentist: 12.9%
The use of Hall technique preformed metal crowns by specialist pediatric dentists in the UK	Roberts et al. 2018 (116)	Dentist: 96%
Use of stainless-steel crowns to restore primary molars in Germany: Questionnaire-based cross-sectional analysis	Santamaría et al., 2018 (117)	Dentist: 24.4%
Use of the Hall Technique by dentists in East China: A questionnaire-based cross-sectional survey	Ding et al., 2024 (118)	Dentist: 44.2%
Use of the 'Hall technique' for management of carious primary molars among Scottish general dental practitioners	Dean et al., 2011 (119)	Dentist: 48%
Use of the Hall technique by specialist pediatric dentists: a global perspective	Hussein et al., 2020 (120)	Dentist: 50.6%
		Median: 44%

ic outcomes, especially in the posterior region, where functionality is prioritized. The available literature supports this trend, indicating that the acceptance of non-aesthetic treatments is generally higher for the posterior region than for the anterior region.

It is important to consider that the treatment modalities found (SDF, SSC and NRCC) cannot be directly compared, as their clinical indications are not identical. Both treatment modalities can be used for caries in the dentine of primary molars, while SDF can also be used in primary anterior teeth. SSC or HT treatment is indicated for primary molars with extensive caries lesion, proximal lesions, or when there is enamel development disorder, such as Hypomineralised Second Primary Molars (32). SDF and NRCC are indicated for cavities that can be made cleansable (to stop the active process) or lesions that cannot be restored in either anterior or posterior areas of primary teeth (27).

Another key finding was that the acceptance level by dental professionals for both SDF and SSC treatment was much

stetskih tretmana općenito veće za stražnju regiju nego za prednju.

Važno je uzeti u obzir da se spomenuti načini liječenja (SDF, SSC i NRCC) ne mogu izravno uspoređivati jer njihove kliničke indikacije nisu identične. Svi ti načini mogu se primijeniti u liječenju karijesa dentina mliječnih kutnjaka, a SDF se može koristiti i na prednjim mliječnim zubima. SSC ili HT tretmani indicirani su za mliječne kutnjake s opsežnom karijesnom lezijom i aproksimalnim lezijama ili kada postoji poremećaj u razvoju cakline, poput hipomineraliziranih drugih mliječnih kutnjaka (32). SDF i NRCC indicirani su za kavitete koji se mogu očistiti (kako bi se zaustavio aktivni proces) ili lezije koje se ne mogu restaurirati ni u prednjem, ni u stražnjem području mliječnih zuba (27).

Drugi ključni nalaz bio je da je razina prihvaćanja SDF-a i SSC-a, kad je riječ o stomatolozima, bila znatno niža nego kod djece i roditelja, u skladu s prethodnim studijama. Lin i suradnici (33) izvijestili su o stopi prihvaćanja HT liječenja od 81,8 % za stomatologe. U ovom sistematiziranom pregle-

lower than that of children and parents, in line with previous studies. Lin et al. (33) reported an acceptance rate of 81.8% for dental professionals regarding HT treatment specifically. In this systematic review, a median acceptance for SSC and HT treatment was found to be 44% for dental professionals. This difference can be explained by the inclusion of studies such as Roshan et al. (34), Pair et al. (30), and Threlfall et al. (35), which reported lower acceptance rates (26%, 1% and 18%, respectively). These studies had been published before HT was first mentioned in the literature (36), meaning they likely refer to the use of conventional SSC, where local anesthesia and tooth preparation were required. Since the first publication, the use of HT by general practitioners has expanded (36, 32).

Another factor influencing the lower acceptance of SSC or HT by dental professionals is that not all dental schools teach these techniques, as observed by Chadwick et al. (28). The absence of education and hands-on practice with these techniques during the dental training might explain why dental professionals are hesitant to implement them in their daily practice. Learning about these techniques and practicing them during their dental education might be a reason why dental professionals are hesitant to apply these treatments in their daily practice. In line with this, Casamassimo et al. (31) reported that dental graduates do not feel adequately prepared to treat children with SSC. Crystal et al., (19) observed that 69.5% of the students in a US pediatric residency program were taught the Hall technique treatment. Ezzeldin et al., (37) stated that 55.5% of general practitioners are aware of the Hall technique, but only 18% uses the Hall technique in their day-to-day practice.

When acceptance was not clearly specified in a study, other parameters were used to gauge the views of children or parents. For example, visual analogue assessment tools were used to assess whether the child was uncomfortable or in pain during treatment. This information was then combined with post-treatment questions to infer the acceptance of the treatment. For parents, aesthetic approval was also taken into account, which also affected the overall acceptance. This was shown in eight studies (38, 39, 40, 41, 42, 43, 44, 45), where the acceptance of SDF in posterior regions ranged from 53.6% to 100% (median 72.4%) while the acceptance in the anterior region ranged from 18.3% to 72.5% (median 38.4%). This difference can be attributed to the greater concern of parents for the aesthetic appearance of anterior teeth, which directly impacts their acceptance of non-aesthetic treatments such as SDF, particularly in visible areas. This indicates that parents are more likely to accept SDF treatment in posterior areas, rather than anterior.

Mercury poses significant risks to both human health and the environment. To address this, the United Nations Environment Programme (UNEP) established the Minamata Convention on Mercury, aiming to "protect human health and the environment from anthropogenic emissions and releases of mercury and mercury compounds" (46). The Convention advocates for a phase-down of mercury use, including dental amalgam. In this context, although amalgam fillings are also considered non-aesthetic for dental restora-

du utvrđeno je da je medijan prihvaćanja liječenja SSC-om i HT-mo za stomatologe bio 44 %. Ta se razlika može objasniti uključivanjem studija kao što su one Roshana i suradnika (34), Paira i suradnika (30) i Threlfalla i suradnika (35) u kojima se izvješćuje o nižim stopama prihvaćanja (26 %, 1 % i 18 %). Te su studije objavljene prije nego što je HT prvi put spomenut u literaturi (36), što znači da se vjerojatno odnose na upotrebu konvencionalnoga SSC-a, gdje je bila potrebna lokalna anestezija i preparacija zuba. Poslije prve publikacije upotreba HT-a proširila se među općim stomatolozima (36, 32). Drugi čimbenik koji utječe na niže prihvaćanje SSC-a ili HT-a, kad je riječ o stomatolozima, jest taj što se na svim stomatološkim fakultetima ne poučavaju te tehnike, kako su primijetili Chadwick i suradnici (28). Nedostatak edukacije i praktične prakse s tim tehnikama tijekom studija mogao bi objasniti zašto ih stomatolozi oklijevaju primijeniti u svakodnevnoj praksi. U skladu s tim, Casamassimo i suradnici (31) izvijestili su da se diplomirani stomatolozi ne osjećaju zadovoljavajuće pripremljenima za liječenje djece SSC-om. Crystal i suradnici (19) naveli su da je 69,5 % studenata u američkom programu specijalizacije iz pedijatrije poučavano o liječenju Hallovom tehnikom. Ezzeldin i suradnici (37) izjavili su da je 55,5 % liječnika opće prakse upoznato s Hallovom tehnikom, ali samo se 18 % koristi njome u svakodnevnoj praksi.

Kada prihvaćanje nije bilo jasno navedeno u studiji, korišteni su drugi parametri za procjenu mišljenja djece ili roditelja. Primjerice, korišteni su vizualni analogni alati za procjenu da bi se doznalo je li dijete osjećalo nelagodu ili bol tijekom liječenja. Te su informacije zatim kombinirane s pitanjima nakon liječenja kako bi se zaključilo o prihvaćanju liječenja. Za roditelje je uzeto u obzir i estetsko odobravanje, što je također utjecalo na ukupno prihvaćanje. To je pokazano u osam studija (38, 39, 40, 41, 42, 43, 44, 45) u kojima je prihvaćanje SDF-a u stražnjim regijama iznosilo od 53,6 % do 100 % (medijan 72,4 %), a prihvaćanje u prednjoj regiji bilo je od 18,3 % do 72,5 % (medijan 38,4 %). Ta se razlika može pripisati većoj zabrinutosti roditelja za estetski izgled prednjih zuba, što izravno utječe na njihovo prihvaćanje neestetskih tretmana poput SDF-a, posebno u vidljivim područjima. To upućuje na to da su roditelji skloniji prihvaćanju tretmana SDF-om u stražnjim područjima, a ne u prednjima.

Živa je rizična za ljudsko zdravlje i za okoliš. Kako bi se riješio taj problem, u Program Ujedinjenih naroda za okoliš (UNEP) uvrštena je Minamatska konvencija o živi, sa svrhom *zaštite ljudskoga zdravlja i okoliša od antropogenih emisija i ispuštanja žive i živinih spojeva* (46). Konvencija se zauzima za postupno smanjenje upotrebe žive, uključujući dentalni amalgam. U tom kontekstu, iako se amalgamski ispuni također smatraju neestetskima za zubne restauracije, taj materijal nije bio uključen u ovaj sistematizirani pregled. Fluoridni lakovi uglavnom su indicirani kao terapijska sredstva i koriste se kao remineralizirajuće sredstvo za NRCC, ali njihova neestetska priroda traje samo nekoliko sati dok se proizvod ne ukloni žvakanjem i/ili četkicom za zube. No promjena boje dentina u smeđa ili crnu koja nastaje zbog NRCC-a nije estetska, zbog čega je NRCC svrstan u neestetske opcije liječenja u ovom sistematiziranom pregledu. Nažalost, samo

tions, this material was not included in the present systematic review.

Fluoride varnishes are primarily indicated as therapeutic agents and have been used as a remineralising agent for NRCC, but their non-aesthetic nature lasts only a few hours until the product is removed by mastication and/or toothbrushing. However, the brown or black discoloration of dentin resulting from NRCC treatment is non-aesthetic, which is why NRCC treatment is included as a non-aesthetic treatment option in this systematic review. Unfortunately, only two articles contained information about the acceptance of NRCC.

Another challenge was that almost all RCTs were not blinded for participants and/or the operators, resulting in a 'high risk' of bias classification for nearly all studies. In the case of non-aesthetic treatment options, blinding of participants and/or operators is not feasible due to the color of the materials used. Although this was an unavoidable bias, it must be considered in the data interpretation, as blinding is a relatively minor aspect in clinical trial. In cross-sectional studies, more than half of the studies lacked clear inclusion criteria. The quality of evidence in cross-sectional studies, RCTs, and non-randomized clinical studies, in general, should be improved to provide more reliable data on this issue, thus allowing for clearer conclusion.

Conclusion

Non-aesthetic treatment options for dental caries in children are well accepted by children, parents, and, to a lesser extent, by dental professionals. These treatments are advantageous because they are easy to perform and time-efficient. SDF treatment is better accepted when performed on the posterior region than on the anterior one. Despite these findings, they should be interpreted with caution due to the moderate to high risk of bias present in the included studies. Another important aspect is the context of the patients, parents, and operators. The influence of this context on treatment acceptance should be considered in future research.

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dva rada sadržavala su informacije o prihvaćanju NRCC-a. Drugi izazov bio je taj što gotovo sva randomizirana kontrolirana istraživanja nisu bila zaslijepljena za sudionike i/ili operatere, što je rezultiralo visokim rizikom od pristranosti za gotovo sve studije. U slučaju neestetskih opcija liječenja, zasljepljivanje sudionika i/ili operatera nije moguće zbog boje korištenih materijala. Iako je to bila neizbježna pristranost, mora se uzeti u obzir pri interpretaciji podataka zato što je zasljepljivanje razmjerno mali aspekt u kliničkom ispitivanju. U presječnim studijama, u više od njih 50 %, nisu bili jasni kriteriji za uključivanje. Kvaliteta dokaza u presječnim studijama, randomiziranim kontroliranim ispitivanjima i nerandomiziranim kliničkim studijama općenito bi trebala biti poboljšana kako bi se pružili pouzdaniji podatci o ovom pitanju, što bi omogućilo jasnije zaključke.

Zaključak

Neestetske terapijske opcije za liječenje karijesa kod djece dobro prihvaćaju djeca i roditelji a, u manjoj mjeri, stomatolozi. Ti tretmani imaju prednost jer su jednostavnu i vremenski učinkoviti. Tretman SDF-om bolje je prihvaćen kada se primjenjuje na stražnjim zubima nego na prednjima. Unatoč tim nalazima, treba ih tumačiti s oprezom zbog umjerenoga do visokoga rizika od pristranosti zabilježenog u uključenim studijama. Drugi važan aspekt jest kontekst pacijenata, roditelja i operatera. Utjecaj toga konteksta na prihvaćanje liječenja treba uzeti u obzir u budućim istraživanjima.

Sukob interesa: Nije naveden.

Doprinos autora: **C. C. B.,** i **T. K. T.** – ideja i dizajn studije; **A. R, C. S., I. R. Z.,** i **I. F. B** – prikupljanje podataka; **A. R.** i **C. S** – pisanje teksta; **C. C. B., T. K. T., J. P. P., I. R. Z.,** i **I. F. B.** – revidiranje i konačno odobrenje rukopisa

Sažetak

Cilj: Željelo se procijeniti prihvaćanje neestetskih pristupa u liječenju zubnog karijesa kod djece kako ih percipiraju roditelji, djeca i stomatolozi. **Materijali i metode:** Provedeno je sistematizirano pretraživanje četiriju baza podataka: PubMed, Scopus, Web of Science i Embase. Uključene studije bile su presječne ili kohortne, a kontrolirana ispitivanja randomizirana u kojima se procjenjivalo prihvaćanje neestetskih tretmana zubnog karijesa kod djece prema podatcima dobivenim od roditelja, djece i stomatologa. Rizik od pristranosti procijenjen je s pomoću alata ROB-2, ROBINS-I i JBI, ovisno o studijskome dizajnu. **Rezultati:** U ovaj sistematizirani pregled uključeno je ukupno 126 studija. Stopa prihvaćanja tretmana stražnjih mliječnih kutnjaka srebrovim diamin-fluoridom (SDF) kod djece kretala se od 71,4 % do 100 % (medijan 93,2 %). Među roditeljima iznosila je od 3,2 % do 91 % (medijan 69,9 %), a za stomatologe od 13,2% do 95 % (medijan 61,6 %). Stopa prihvaćanja liječenja krunicama od nehrđajućeg čelika (SSC) ili Hallovom tehnikom (HT) na stražnjim mliječnim kutnjacima kod djece kretala se od 32 % do 100 % (medijan 90 %), za roditelje je bila od 14,5 % do 100 % (medijan 81,9 %), a za stomatologe od 1 % do 96 % (medijan 44 %). Roditelji su bolje prihvaćali SDF tretmane za stražnje zube u usporedbi s prednjim zubima. **Zaključak:** Neestetske mogućnosti liječenja općenito prihvaćaju djeca, roditelji i, u manjoj mjeri, stomatolozi, posebno za stražnje zube. No u većini uključenih studija ističe se visok rizik od pristranosti. Protokol sistematiziranoga pregleda registriran je na platformi OSF (doi: 10.17605/OSF.IO/P7CNY).

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Adresa za dopisivanje
Tamara Kerber Tedesco
School of Dentistry, University of São Paulo (USP)
Av. Professor Lineu Prestes, 2227
05508-000, São Paulo, Brazil.
tamarakt@usp.br

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