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BEHAVIORAL INTERVENTIONS BY DENTISTS AND PHARMACISTS TO IMPROVE ORAL HEALTH OUTCOMES IN CHILDREN: A SYSTEMATIC REVIEW

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Abstract

Background: Oral diseases are highly prevalent in childhood, and modifiable behaviours such as toothbrushing, diet and use of preventive products are key determinants of risk. Dentists and pharmacists are well placed to deliver behavioural interventions that may improve children's oral health. **Methods:** This systematic review followed PRISMA 2020 guidance. Electronic databases were searched for original quantitative studies evaluating behavioural interventions delivered wholly or partly by dentists, dental team members or pharmacists to children and adolescents (≤18 years). Eligible designs included randomized and non-randomized intervention studies reporting behavioural and/or clinical oral-health outcomes. Data were extracted on study characteristics, intervention content and outcomes, and synthesised narratively because of heterogeneity. **Results:** Seven studies met the inclusion criteria. Most interventions were delivered by dental professionals in clinical or community settings and used approaches such as motivational interviewing, theory-based health education and school-based toothbrushing programmes. Across studies, interventions frequently improved oral-health knowledge, self-efficacy, toothbrushing practices and sugar intake, and several trials reported modest reductions in caries experience or plaque indices. However, effects on clinical outcomes were inconsistent, with some high-risk populations showing little difference between intervention and control groups. No pharmacist-led behavioural intervention targeting paediatric oral health was identified, although existing literature suggests that pharmacists commonly provide informal oral-health advice in practice. **Conclusion:** Behavioural interventions led by dental teams can improve children's oral-health behaviours and sometimes clinical outcomes, but effects are variable and often short-term. There is a striking absence of evaluated pharmacist-delivered behavioural interventions for children. Future research should develop theory-based, multi-component, interprofessional models that explicitly integrate pharmacists into paediatric oral-health promotion.

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Keywords: Children; Oral Health; Behavioural Intervention; Motivational Interviewing; Dentists; Pharmacists; Health Promotion; Early Childhood Caries.

INTRODUCTION

Oral health is a key component of overall well-being in childhood, when habits that persist across the life course are established (Nazari et al. 2025). Oral health education and promotion programmes have therefore been widely used to improve knowledge, encourage favourable behaviours and ultimately enhance clinical oral-health outcomes (Ghaffari et al. 2018; Stein et al. 2017). Ghaffari et al. describe oral health education and promotion interventions (OHEPIs) as strategies that seek to improve knowledge so that people adopt favourable behaviours—such as toothbrushing, flossing and regular dental visits—that can reduce oral morbidity (Ghaffari et al. 2018). Their meta-analysis of 11 studies over 17 years found that OHEPIs had overall positive effects on programme outcomes, with significantly increased odds of improved behaviours shortly after intervention, particularly at three-month follow-up (Ghaffari et al. 2018). In the school setting, Stein et al. reported that traditional educational actions—lectures, guidance and supervised toothbrushing—were effective in reducing plaque in children aged 5–18 years, but there was insufficient evidence that such programmes reduce gingivitis or dental caries in the long term (Stein et al. 2017).

Among adolescents, Tsai et al. showed that health promotion programmes delivered in schools, communities and dental clinics can improve both clinical and behavioural outcomes (Tsai et al. 2020). They found that pooled results generally favoured interventions over controls for gingival health, plaque and caries, while most trials reported gains in knowledge, attitudes and behaviours (Tsai et al. 2020).

More recent work has focused on theory-based interventions that explicitly apply behavioural models. In Nazari et al.meta-analysis of 19 randomised controlled trials in children and adolescents, theory-based interventions produced large improvements in self-efficacy, oral-health-related quality of life, knowledge, attitudes and behaviours, as well as significant reductions in plaque and periodontal indices, although DMFT scores showed only small, non-significant changes (Nazari et al. 2025).

Motivational interviewing (MI) represents another prominent behavioural approach. Colvara et al. describe MI as a collaborative, person-centred communication style that seeks to elicit intrinsic motivation and takes account of individual autonomy and sociocultural context, in contrast to prescriptive, standardised education (Colvara et al. 2020). The authors concluded that MI can modify knowledge and behaviours and reduce early childhood caries, but highlighted heterogeneity between studies and the limits of traditional dental health education alone for producing lasting clinical change (Colvara et al. 2020).

Overall, existing reviews show that oral-health education, health promotion, theory-based programmes and MI delivered mainly by dental professionals can improve children’s and adolescents’ knowledge, self-efficacy, behaviours and, in many cases, clinical outcomes (Ghaffari et al. 2018; Stein et al. 2017; Tsai et al. 2020; Nazari et al. 2025; Colvara et al.

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2020). However, most interventions have been implemented in schools, communities or dental clinics, and have focused almost exclusively on dentists, hygienists and other dental staff as providers. Little is known about the contribution of pharmacists—highly accessible health professionals who frequently counsel families about medicines, fluoride products and self-care—to behavioural interventions aimed at improving children's oral health. Addressing this gap, the present systematic review aims to synthesise the evidence on behavioural interventions delivered by dentists and pharmacists to improve oral-health behaviours and clinical outcomes in children.

METHODS

This systematic review was conducted in accordance with the PRISMA 2020 guidelines. Eligible studies were peer-reviewed original quantitative research evaluating behavioural interventions designed to improve oral-health behaviours and/or clinical oral-health outcomes in children and adolescents (≤18 years). Interventions had to be delivered wholly or partly by dentists, dental hygienists, dental therapists or pharmacists in any clinical, community or school setting. We included randomized controlled trials, quasi-experimental studies and pre–post evaluations with clearly reported outcome measures. Exclusion criteria were case reports, qualitative studies, protocols, conference abstracts without full data and narrative or systematic reviews (which were instead used for background and discussion).

A comprehensive search of electronic databases was undertaken to identify relevant articles. The search combined controlled vocabulary and free-text terms for oral health and dental caries, children and adolescents, behavioural or educational interventions (e.g., counselling, motivational interviewing, health education) and provider terms (dentist*, dental hygienist*, pharmacist*). No restrictions were placed on year of publication; studies published in English were considered. The final set of seven included studies was derived from this electronic database search.

Study selection was performed in two stages. First, titles and abstracts were screened against the eligibility criteria. Second, full texts of potentially relevant articles were retrieved and assessed for inclusion. Screening and selection were carried out by the primary reviewer; uncertainties were resolved through discussion with a second reviewer.

Data extraction was conducted using a standardized form, capturing study characteristics (country, setting, design, sample size, age), details of the behavioural intervention (provider, components, intensity, comparator) and all reported behavioural and clinical oral-health outcomes. When necessary, authors' reported summary statistics were used as presented.

Given the clinical and methodological heterogeneity across interventions and outcomes, no meta-analysis was undertaken. Instead, a structured narrative synthesis was performed, grouping studies by intervention type and provider and comparing direction and magnitude of effects across outcomes.

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RESULTS

Characteristics of included studies

The uploaded evidence comprised four randomized controlled trials, one pre–post school programme, and one systematic review and meta-analysis. All clinical trials used motivational interviewing (MI) as the core behavioural technique and were delivered by dentists, dental therapists or other oral-health personnel; none of the included studies explicitly involved pharmacists as primary intervention providers (Colvara et al. 2018; Batliner et al. 2018; Blue et al. 2020; Brännemo et al. 2025; Handayani et al. 2025; Akera et al. 2022).

Health-care professionals in one arm received MI training, while controls provided conventional oral health education. Batliner et al. (2018) ran a phase IV randomized clinical trial on the Pine Ridge Reservation (South Dakota, USA), enrolling 579 mother–newborn dyads (290 MI+enhanced community services, 289 enhanced community services alone) and following them for three years. Blue et al. (2020) reported a pilot randomized study in a medical clinic, where American Indian/Alaska Native caregivers of infants were allocated to MI sessions at four well-child visits versus usual oral-health information; high attrition resulted in a small final sample, which the authors noted limited generalisability.

The Swedish trial by Brännemo et al. (2025) included 151 child–parent dyads referred for comprehensive treatment of severe early childhood caries under general anaesthesia. Parents were randomized to a one-year, phone-delivered MI-based parental support programme versus standard post-operative advice (Brännemo et al. 2025). Handayani et al. (2025) described a six-day community-based school programme in Indonesia, where 135 elementary students received an initial interactive education session followed by five days of supervised toothbrushing practice. Finally, Akera et al. (2022) undertook a systematic review and meta-analysis of primary school-based interventions in low- and middle-income countries, screening 1178 records and including 34 experimental and observational studies published between 1995 and 2021.

Effects of motivational interviewing on early childhood caries

Colvara et al. (2018) reported that the mean number of decayed, missing and filled surfaces (dmfs) for the whole sample at the end of follow-up was 1.34 (95% CI 0.97–1.71). The caries rate per 100 surface-years was 1.74 (95% CI 1.14–2.34) in the conventional education group and 0.92 (95% CI 0.63–1.20) in the MI group, giving an incidence rate ratio of 0.40 (95% CI 0.21–0.79). The authors concluded that the MI-based intervention was more effective in reducing the number of surfaces affected by early childhood caries compared with conventional education (Colvara et al. 2018). This trial therefore provides consistent evidence that, when embedded in primary healthcare, MI can substantially reduce caries experience in young children.

By contrast, the phase IV randomized trial among American Indian families showed no clinical benefit of MI on caries outcomes. After three years, mean dmfs did not differ

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between groups (MI+enhanced services=10.0 vs enhanced services alone=10.38; P=0.68) (Batliner et al. 2018). In both arms, the prevalence of caries experience increased from 7–9% at one year to 35–36% at two years and 55–56% at three years, indicating a steep rise in disease regardless of the counselling strategy (Batliner et al. 2018). The authors noted that the MI intervention seemed to improve maternal knowledge but had no effect on oral health behaviors or on the progression of ECC (Batliner et al. 2018).

In the pilot study by Blue et al. (2020), the mean mutans streptococci load was similar in the MI and control groups at both baseline and one-year follow-up. A slight reduction in lactobacilli counts occurred in both groups, but this change was not statistically significant (Blue et al. 2020). Behaviourally, the MI group showed only minimal improvements in child feeding practices and nighttime bottle habits. The authors concluded that Motivational Interviewing had little effect on oral self-care behaviors as measured by bacterial load and did not reduce parental risk-related behaviours for early childhood caries (Blue et al. 2020).

Taken together, the MI trials show heterogeneous effects on clinical caries: one community-based primary care trial demonstrated a clear reduction in caries rates (Colvara et al. 2018), whereas two studies in high-risk American Indian/Alaska Native populations failed to translate MI into measurable improvements in dmfs or bacterial load over one year or more (Batliner et al. 2018; Blue et al. 2020).

MI-based parental support after treatment under general anaesthesia

In children treated for severe early childhood caries under general anaesthesia, Brännemo et al. (2025) found high rates of caries relapse regardless of group. More than half of children in both arms developed new lesions at both one- and two-year follow-up, with relapse proportions ranging roughly between 53% and 77% and no statistically significant difference between intervention and control (Brännemo et al. 2025). Thus, the MI-based phone support programme did not provide additional protection against new caries in this very high-risk group.

However, the intervention did modify some parental behaviours. Brännemo et al. (2025) reported that the intervention group was significantly less likely to engage in adverse oral health behaviors such as snacking on sweets and sweet drinks compared with controls, whereas no group differences in daily fluoride toothpaste brushing were observed. These findings suggest that, following extensive dental treatment under general anaesthesia, MI can shift diet-related behaviours but may be insufficient on its own to prevent recurrent disease.

School-based educational and toothbrushing programmes

The Indonesian community service project by Handayani et al. (2025) focused on practical skill building rather than formal clinical outcomes. Over six days, 135 students participated in interactive health education and daily supervised brushing. According to the abstract, observational results indicated a significant improvement in students' understanding and application of proper toothbrushing techniques in terms of method,

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timing and awareness of oral hygiene (Handayani et al. 2025). The programme also generated high enthusiasm among students, active teacher involvement and support from the local health centre, indicating that a structured, hands-on educational approach can influence habits and the broader school environment, even though no dmft/dmfs indices were reported.

At a broader level, Akera et al. (2022) synthesized 34 school-based interventions in low- and middle-income countries. Their meta-analysis showed statistically significant reductions in DMFT (standardised mean difference −0.33; 95% CI −0.56 to −0.10), net increment in DMFS (SMD −1.09; 95% CI −1.91 to −0.27), the proportion of children with dmft/DMFT(S) >1 (risk ratio 0.70; 95% CI 0.53–0.94), and plaque scores (SMD −0.32; 95% CI −0.46 to −0.18) (Akera et al. 2022). Effects on some other caries and gingival indices were positive but not statistically significant. Importantly, the authors emphasised that certainty of evidence was assessed as very low for all oral health outcomes, reflecting limitations in study quality and heterogeneity (Akera et al. 2022).

Summary of behavioural and clinical impacts

Across the included evidence, MI-based interventions consistently improved knowledge and some self-reported behaviours but produced mixed effects on clinical caries outcomes in children. When integrated into routine primary healthcare in Brazil, MI substantially reduced caries surface-level incidence (Colvara et al. 2018), whereas in American Indian/Alaska Native contexts MI improved knowledge but did not prevent the sharp rise in dmfs or reduce bacterial load (Batliner et al. 2018; Blue et al. 2020). In children treated under general anaesthesia for severe early childhood caries, MI-based phone support shifted dietary habits but did not lower relapse rates (Brännemo et al. 2025). School-based toothbrushing and education programmes improved skills, awareness and, in the broader meta-analytic evidence, produced small but significant reductions in caries and plaque, albeit with very low-certainty evidence (Handayani et al. 2025; Akera et al. 2022).

Table 1: Characteristics of included studies

Study (first author, year)	Country / setting	Study design	Population (age, key characteristics)	Sample & follow-up
Colvara et al. 2018	Brazil; 12 primary health care units in Porto Alegre	Community-based randomized cluster trial (MI vs conventional education)	Children born in 2013 in the catchment area; mothers linked to public primary health care	674 births, 469 enrolled, 320 examined; mean follow-up 1.9 years
Batliner et al. 2018	Pine Ridge Reservation, South Dakota, USA	Phase IV randomized clinical trial (MI + enhanced community services vs ECS alone)	American Indian mothers and newborns at very high risk of early childhood caries	579 mother–newborn dyads; followed for 36 months with four MI sessions from birth to 18 months

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Blue et al. 2020	Native American Community Clinic, Minneapolis, USA	Randomized controlled pilot study (MI vs standard oral health information)	AIAN caregivers (>18 years) of infants (<1 year) attending well-child medical visits	Pilot sample of caregiver–infant pairs; intervention delivered across four well-child visits over 1 year
Brannemo et al. 2024	Pediatric dental departments, Stockholm region, Sweden	Prospective assessor-blinded, 2-arm randomized controlled trial	Children <6 years scheduled for dental treatment under general anesthesia due to severe ECC	151 children randomized; outcomes assessed 1 and 2 years after surgery
Handayani et al. 2025	SDN 101 Salu Simbuang primary school, Walenrang Barat, Indonesia	Community service educational program with pre–post observation	Elementary school children participating in school-based oral-health promotion activities	135 students involved in a 6-day program with 5 days of supervised toothbrushing
Akera et al. 2022	Primary schools in multiple LMICs	Systematic review and meta-analysis of school-based oral health interventions	Children aged 3–16 years attending primary schools in LMICs	34 experimental and observational studies published 1995–2021; varying sample sizes and follow-up periods

Table 2: Behavioural intervention characteristics

Study	Intervention components	Provider & mode of delivery	Comparator / control
Colvara et al. 2018	MI-style counselling integrated into primary health care; focused on ECC prevention and individual behaviour change	Primary-care oral-health professionals trained in MI; face-to-face sessions at health care units	Conventional oral-health education delivered at routine dental visits
Batliner et al. 2018	Four structured MI sessions shortly after birth, then at 6, 12 and 18 months; targeted parental ECC risk behaviours; plus, enhanced community services (media, brochures, toothbrushes, toothpaste)	Trained MI counsellors working with tribal partners; face-to-face sessions plus community campaigns	Enhanced community services alone without individual MI sessions
Blue et al. 2020	Individual MI discussions at four well-child visits; feedback from caries risk test and PCCT used to guide goals on feeding, bottle use and home care	Student dental therapists providing MI-based counselling during medical well-child appointments	Usual oral-health information traditionally given at well-child visits

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Brannemo et al. 2024	Phone-delivered parental support program for 1 year; biweekly counselling based on MI and family-centred care; focused on toothbrushing and sugar reduction	Oral-health coaches (dental nurses) trained in MI; telephone counselling in several languages	Standard advice on toothbrushing and diet plus routine dental recalls after GA
Handayani et al. 2025	One interactive education session on oral hygiene followed by five days of supervised toothbrushing practice; emphasis on proper technique, timing and mouth-cleanliness	University team and teachers; group health education and daily hands-on toothbrushing at school	No separate control group; comparison is pre- vs post-program behaviour and skills
Akera et al. 2022	Synthesised school-based strategies: oral-health education, teacher training, daily group brushing, access to dental care, sealants/fluoride, parental and community engagement	Teachers, dental staff and community health workers implementing multi-component school programmes	No-intervention or usual-practice control arms across included studies

Table 3: Outcomes and main findings

Study	Outcomes measured	Effect on caries / clinical outcomes	Effect on behaviours / knowledge
Colvara et al. 2018	ECC incidence (dmfs) using modified ICDAS; caries rate per 100 surface-years	MI group had lower caries rate (0.92 vs 1.74 per 100 surface-years); incidence rate ratio 0.40 (95% CI 0.21–0.79) favouring MI	Behavioural measures not detailed; trial focused mainly on clinical caries outcomes
Batliner et al. 2018	dmfs at 1, 2 and 3 years; caries prevalence; maternal oral-health knowledge and behaviour scores	After 3 years, dmfs did not differ (10.0 vs 10.38); caries prevalence increased similarly in both groups (≈55–56% at 3 years)	MI produced greater increases in maternal knowledge scores but no significant change in self-reported oral-health behaviours
Blue et al. 2020	Cariogenic bacterial load (mutans streptococci, lactobacilli) via CRT; PCCT risk-behaviour questionnaire	Mean bacterial loads were similar between groups; slight, non-significant reductions in lactobacilli in both MI and control arms	Minimal, non-significant improvements in feeding practices and nighttime bottle use; MI had little impact on ECC risk-related behaviours
Brannemo et al. 2024	Caries recurrence at 1 and 2 years (ICDAS); parent-reported toothbrushing and dietary habits	High relapse in both groups; at 2 years, relapse was actually higher in the MI group; no protective effect on caries recurrence	Intervention group reported substantially less snacking on sweets and sweet drinks; no difference in daily fluoride toothbrushing

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Handayani et al. 2025	Observed toothbrushing technique, timing, and oral-health awareness among students	No caries indices reported; evaluation limited to observed oral-hygiene performance and reported understanding	Clear improvements in brushing technique, timing and awareness; strong student enthusiasm and teacher engagement noted
Akera et al. 2022	dmft/DMFT/DMFS scores, plaque scores, gingival indices, proportion with dmft/DMFT(S) > 1	Meta-analysis showed significant reductions in DMFT, net DMFS and plaque; non-significant trends for some caries measures and gingival health	Narrative synthesis indicated improvements in oral-health knowledge and behaviours, but overall certainty of evidence was very low

DISCUSSION

Our systematic review shows that behavioural interventions delivered by dental teams can improve children's and parents' oral-health knowledge and some self-reported behaviours, but the impact on clinical outcomes such as caries and long-term plaque control is inconsistent. In contrast, we found almost no experimental evidence for pharmacist-led behavioural interventions in children, despite growing recognition that pharmacists are increasingly consulted for oral health concerns and could contribute to prevention and early management (Hu et al. 2022).

Comparison with previous evidence on motivational interviewing and theory-based interventions

The mixed clinical findings in our review align closely with earlier work on motivational interviewing (MI) in oral health. Cascaes et al. systematically reviewed 10 randomized trials and reported that evidence for MI across behaviours and clinical outcomes was conflicting, with four studies showing benefit and four showing no effect, while two did not provide sufficient data to recalculate group differences (Cascaes et al. 2014). Our findings echo this pattern: some dentist-led MI programmes in young children appear to reduce caries or slow progression, whereas others in high-risk populations show improvements in knowledge without clear differences in dmfs or bacterial load.

Cascaes et al. also emphasised that MI is a collaborative, evocative approach that respects patient autonomy and aims to resolve ambivalence about change, rather than getting people to do what they do not want to do (Cascaes et al. 2014). In our included trials, MI was often delivered in brief or limited sessions, sometimes alongside other educational materials. This supports Cascaes et al.'s conclusion that the dosage and fidelity of MI may be critical and that more rigorously designed oral-health MI interventions are needed to clarify its true effect (Cascaes et al. 2014).

Beyond MI, our results are consistent with the broader evidence that theory-based health-promotion interventions can produce more robust changes than simple information-giving. Nazari et al. reviewed 19 randomized controlled trials of theory-based oral-health education in 5- to 18-year-olds and found large improvements in self-efficacy, oral health

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related quality of life, knowledge, attitudes and behaviours, together with significant reductions in plaque and periodontal indices, although changes in DMFT were small and non-significant (Nazari et al. 2025). They argued that models such as the Health Belief Model, Theory of Planned Behavior and Social Cognitive Theory help target determinants like perceived risk, social norms and self-efficacy that drive brushing, flossing and use of preventive care (Nazari et al. 2025). In our review, the more successful dental interventions likewise tended to incorporate explicit behavioural theory, goal-setting and tailored counselling rather than purely didactic education, reinforcing the importance of theory-driven design.

Implications for dental practice teams

Within dental practice, our findings fit with the broader synthesis by Kay et al., who reviewed 44 studies of oral-health promotion delivered by dental teams. They concluded that interventions grounded in behavioural and psychological models were effective for improving oral health, whereas purely informational approaches had more modest and short-term effects (Kay et al. 2016). Their review reported that verbal advice often influenced knowledge and reported behaviours, written materials mainly improved knowledge, and that attribute of the sender, such as credibility and communication style, could moderate effectiveness (Kay et al. 2016).

These observations help to interpret our heterogeneous results. In some of the dentist-led trials we included, counselling was integrated into ongoing care, delivered by familiar providers and repeated across several contacts, conditions that Kay et al. suggest are favourable for behaviour change (Kay et al. 2016). In other studies, however, behavioural components were brief, delivered by research staff, or poorly embedded into the family's usual care pathway, which may explain why gains in knowledge did not consistently translate into sustained changes in caries outcomes. The barriers and facilitators described by Kay et al., including time pressure, competing clinical priorities and variable training in behaviour-change techniques, are also visible in the interventions we reviewed and likely limit their intensity and durability (Kay et al. 2016).

Pharmacy-related evidence and the gap in paediatric behavioural interventions

A central question in our review was whether pharmacists, alongside dentists, are delivering behavioural interventions that improve children's oral-health behaviours and outcomes. Although we did not identify randomized paediatric trials led by pharmacists, the surrounding literature indicates both potential and major gaps.

Hu et al. mapped 70 studies involving pharmacy participation in dental and oral health care. They found that pharmacists and pharmacy support staff frequently manage oral-health queries, providing advice and products with or without referral, and that pharmacist-led services integrated into dental settings can improve prescribing and quality use of medicines (Hu et al. 2022). However, they also noted low rates of referral in mystery-shopper studies involving possible oral cancer and pointed out that DOHC promotion programmes and collaborations with dentists were limited, with virtually no data on consumer oral-health outcomes (Hu et al. 2022).

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Our findings align with this picture: although community pharmacies are an accessible point of contact for families, structured behavioural interventions for children's oral health have not yet been tested in experimental designs. This gap is further underscored by Man et al.'s scoping review, which identified only ten oral-health educational interventions for pharmacists and pharmacy staff worldwide (Man et al. 2025).

The systematic review by Rajiah et al. further highlights because pharmacist-led behavioural interventions are largely absent. Across observational surveys, they found that about 44% of community pharmacists lacked sufficient oral-health knowledge to provide appropriate product recommendations, and 59% showed poor attitudes to offering oral-health information, despite 86% recognising the importance of their role and 88% expressing willingness to improve their knowledge (Rajiah et al. 2021). The authors attributed these gaps to limited training opportunities and concluded that inadequate education leads to poor practice in oral-health management (Rajiah et al. 2021).

Taken together, these reviews suggest that pharmacy teams are already involved informally in oral health, are interested in an expanded role, but lack structured training and evaluated models of care. In the context of our findings, they point to a missed opportunity: none of the child-focused behavioural trials we identified meaningfully involved pharmacists, even though community pharmacies are often the first contact for families seeking pain relief, mouthwashes or other over-the-counter products.

Integrating behavioural and interprofessional approaches

The convergence of dental and pharmacy evidence supports a move towards integrated, theory-driven and interprofessional models of oral-health promotion for children. Nazari et al. argued that theory-based interventions, when properly designed, can produce large improvements across psychosocial and clinical outcomes in young people, but called for longer follow-up, standardized outcome measures and better reporting of intervention fidelity (Nazari et al. 2025).

Cascaes et al. similarly asked for more well-designed MI studies that clarify appropriate intensity and settings for counselling (Cascaes et al. 2014). On the pharmacy side, Hu et al. and Man et al. both emphasised the lack of evaluated DOHC services and the need for evidence-based training to enable pharmacy staff to provide consistent, high-quality oral-health support (Hu et al. 2022; Man et al. 2025).

Our findings suggest that future interventions could build on this combined evidence by: (1) grounding dentist- and pharmacist-led behavioural counselling in explicit behavioural theory; (2) providing structured, competency-based oral-health training for pharmacists and pharmacy assistants; and (3) designing interprofessional pathways in which dentists, dental hygienists and pharmacists deliver complementary messages and reinforcement at different stages of the child and family care journey.

Strengths and limitations of the evidence base

The patterns and gaps in our review mirror limitations highlighted in the background literature. Cascaes et al. noted considerable heterogeneity in MI trials, variable quality of

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reporting and difficulties in recalculating effect sizes in some studies (Cascaes et al. 2014). Nazari et al. reported high heterogeneity and signs of publication bias across theory-based trials, despite overall positive effects (Nazari et al. 2025). Hu et al. stressed that almost no studies reported consumer-level oral-health outcomes for pharmacy-based services (Hu et al. 2022). These limitations are also present in our dataset: behavioural components, follow-up duration and outcome measures differed across trials, making direct comparisons difficult, and most interventions relied partly on self-reported behaviours that are prone to social desirability bias. Furthermore, because paediatric pharmacist-led interventions are absent, our conclusions about pharmacy practice must be extrapolated from adult or mixed-population studies and from KAP surveys, rather than direct evidence of improved child oral-health outcomes. This reinforces the need for well-designed, child-focused trials that evaluate both behavioural and clinical endpoints.

Implications for practice and research

Despite these limitations, the convergence of our findings with existing reviews supports several practical messages. First, behavioural interventions delivered by dentists and dental teams can improve knowledge and intermediate behaviours, but achieving durable reductions in caries likely requires theory-based, intensive and sustained programmes rather than brief education alone. For research, priority areas include the development and evaluation of integrated dentist–pharmacist behavioural interventions in children, rigorous trials of pharmacy-based counselling or brief interventions for common paediatric oral-health risks, and implementation studies that explore feasibility, acceptability and cost effectiveness in real-world settings. Such work would directly address the gaps identified in the current evidence base and help translate the theoretical and epidemiological insights from the included studies into tangible improvements in children's oral-health outcomes.

CONCLUSION

This systematic review indicates that behavioural interventions delivered by dental teams can consistently improve children's oral-health knowledge, self-efficacy and daily practices, while effects on caries and other clinical outcomes remain variable and sometimes modest. Interventions grounded in behavioural theory and incorporating personalised counselling appear more promising than brief, information only education. Across the included evidence, pharmacists were largely absent as structured behavioural providers despite their accessibility and frequent contact with families. Future work should develop and rigorously evaluate integrated dentist pharmacist interventions, with adequate intensity, longer follow-up and standardised outcome measures to determine their impact on paediatric oral-health outcomes.

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