



RESEARCH ARTICLE

PARENTS' KNOWLEDGE AND PREVENTIVE BEHAVIORS TOWARD FLUORIDE USE FOR PREVENTING DENTAL CARIES IN PRESCHOOL CHILDREN: A SYSTEMATIC LITERATURE REVIEW

Ardianti Maartrina Dewi¹, Seno Pradopo², Davin Nurizki Ramadhana³

¹²³ Department of Pediatric Dentistry Faculty of Dental Medicine, Universitas Airlangga, Surabaya, Indonesia

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***Corresponding Author:**

davinnurizkird@gmail.com

ABSTRACT

Dental caries remains one of the most common chronic diseases affecting preschool children worldwide and continues to be a major public health concern. Although fluoride has been recognized as an effective agent for preventing dental caries, its successful application largely depends on parents' knowledge and preventive behaviors, which may also be influenced by educational level and socioeconomic status. This systematic literature review aimed to synthesize recent evidence regarding the relationship between parental knowledge and preventive behaviors toward fluoride use in preventing dental caries among preschool children. The review also examined the influence of educational attainment and socioeconomic status on children's caries risk. Relevant studies published between 2021 and 2025 were identified from major scientific databases following the PRISMA guidelines. The selected articles discussed fluoride use, parental knowledge, preventive behaviors, socioeconomic factors, educational background, and caries risk assessment in children. The findings indicate that parents with better knowledge of fluoride generally demonstrate more appropriate preventive behaviors, including supervising toothbrushing with fluoride toothpaste, utilizing professional fluoride applications, and attending regular dental visits. Higher educational attainment is associated with better oral health literacy, while socioeconomic status affects access to preventive dental care and oral health resources. However, several studies also suggest that adequate knowledge alone does not always lead to consistent preventive practices because behavioral, environmental, and accessibility factors also contribute to oral health outcomes. Overall, current evidence highlights that improving parental education and expanding access to fluoride-based preventive programs may reduce the burden of dental caries among preschool children.

INTRODUCTION

Oral health is an essential component of children's overall health because it influences their ability to eat, speak, learn, and interact with others. Healthy primary teeth contribute to proper nutrition, normal growth, and children's confidence during social activities. Conversely, poor oral health may negatively affect children's daily life, including their physical development, school attendance, and quality of life. Therefore, maintaining oral health from an early age should be considered an important part of child health promotion (Pakkhesal et al., 2021).

Dental caries remains one of the most common chronic diseases among children worldwide. It is a multifactorial disease caused by the interaction between cariogenic bacteria, fermentable carbohydrates, susceptible tooth surfaces, and time. Without appropriate prevention, the demineralization process gradually damages dental hard tissues and eventually forms irreversible cavities. Besides causing pain and discomfort, untreated dental caries may interfere with eating habits, sleeping patterns, nutritional status, and children's academic performance (Hasan et al., 2024).

The burden of dental caries continues to be a global public health challenge despite advances in preventive dentistry. The World Health Organization reported that approximately 514 million children worldwide suffer from untreated caries in their primary teeth, indicating that early childhood caries remains highly prevalent across different populations. This condition demonstrates that preventive strategies still require significant improvement, particularly during the preschool years when healthy oral habits begin to develop (Mollet et al., 2024).

Indonesia also faces a similar problem. National data have consistently shown that dental caries affects a large proportion of children. The 2018 National Basic Health Research (Kementerian Kesehatan Republik Indonesia Indonesia, 2018) reported a high prevalence of dental caries among individuals aged over three years, while the 2023 Indonesian Health Survey indicated that oral health problems among children remain common. These findings suggest that preventive efforts have not yet achieved optimal outcomes and that greater attention should be directed toward family-based oral health promotion (Kementerian Kesehatan Republik Indonesia, 2023).

One of the most effective approaches for preventing dental caries is the appropriate use of fluoride. Fluoride protects teeth by enhancing enamel remineralization, reducing demineralization, and inhibiting the activity of cariogenic bacteria. It can be delivered through fluoride toothpaste, mouth rinses, fluoride varnish, and other professionally applied topical products. Because of its proven effectiveness, fluoride has become an essential component of modern preventive dentistry, especially for children who are at greater risk of developing dental caries (Cumerlato et al., 2022).

Although fluoride has demonstrated substantial clinical benefits, its effectiveness largely depends on consistent and appropriate use. Preschool children are generally unable to maintain their oral hygiene independently; therefore, parents play a major role in establishing healthy oral care habits. Parents are responsible for supervising toothbrushing, choosing fluoride-containing products, controlling sugar consumption, and ensuring regular dental visits. These daily practices determine whether preventive strategies can be successfully implemented during early childhood (American Academy of Pediatric Dentistry, 2023).

Parental knowledge is considered one of the key factors influencing children's oral health. Parents who understand the benefits of fluoride and the causes of dental caries are generally more likely to adopt preventive behaviors that reduce their children's caries risk. However, knowledge alone is not always sufficient to produce positive behavioral changes. Several studies have shown that some parents possess adequate knowledge but still fail to apply appropriate preventive practices consistently because of limited access to dental care, lack of motivation, or misconceptions regarding fluoride use (Coello Hidalgo et al., 2025).

Educational attainment also contributes to parents' ability to understand oral health information and make appropriate decisions regarding their children's oral care. Parents with higher educational backgrounds generally have better oral health literacy and are more likely to seek preventive dental services. Better educational experiences may also improve parents' confidence in understanding professional recommendations and applying preventive measures at home (Dumitrescu et al., 2022).

Besides educational level, socioeconomic status also influences children's oral health. Family income and social conditions affect access to oral healthcare services, preventive products, and reliable health information. Families with better socioeconomic conditions usually have greater opportunities to obtain regular dental examinations and preventive fluoride treatment, whereas limited financial resources often become barriers to preventive dental care. Consequently, socioeconomic disparities continue to contribute to differences in children's oral health outcomes (Almajed et al., 2024).

Another important approach in preventing dental caries is Caries Risk Assessment (CRA), which identifies children according to their risk of developing dental caries based on biological, behavioral, and protective factors. The American Academy of Pediatric Dentistry recommends using CRA to support individualized preventive strategies rather than applying the same intervention to every child. Through risk-based assessment, preventive programs can be adjusted according to each child's oral health condition and family background (American Academy of Pediatric Dentistry, 2023).

Previous studies have investigated parental knowledge, fluoride use, educational background, and socioeconomic status separately. However, the available evidence remains scattered, making it difficult to obtain a comprehensive understanding of how these factors interact in preventing dental caries among preschool children. A systematic synthesis of recent evidence is therefore necessary to identify consistent findings, existing knowledge gaps, and future research directions.

Therefore, this systematic literature review aims to summarize and analyze recent evidence regarding parents' knowledge and preventive behaviors toward fluoride use in preventing dental caries among preschool children. In addition, this review explores the influence of parental educational level and socioeconomic status on children's caries risk, providing evidence that may support future family-based oral health promotion and preventive dental programs.

RESEARCH METHOD

This study employed a Systematic Literature Review (SLR) to identify, evaluate, and synthesize scientific evidence regarding parents' knowledge and preventive behaviors toward fluoride use in preventing dental caries among preschool children. This method was selected because the original research aimed to examine the relationship between parental knowledge of fluoride, preventive behaviors, educational level, socioeconomic status, and children's caries risk. Instead of collecting primary data, the present study synthesized findings from previous studies to provide comprehensive evidence on these variables (American Academy of Pediatric Dentistry, 2023).

The review followed the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) 2020 guideline to ensure that the literature selection process was conducted systematically and transparently. The PRISMA framework consists of four stages, including identification, screening, eligibility assessment, and inclusion of eligible studies, allowing researchers to minimize selection bias and improve the quality of evidence synthesis (Page et al., 2021).

The literature search was conducted using four electronic databases, namely PubMed, Scopus, ScienceDirect, and Google Scholar. Articles published between 2021 and 2025 were included to obtain the most recent evidence regarding fluoride use, parental oral health knowledge, preventive behaviors, educational level, socioeconomic status, and dental caries among preschool children. The search strategy used combinations of keywords, including fluoride, parents' knowledge, preventive behavior, dental caries, oral health, preschool children, early childhood caries, caries risk assessment, and socioeconomic status, combined with Boolean operators such as AND and OR to improve search accuracy (Chou et al., 2021).

The inclusion criteria consisted of: (1) original research articles or systematic reviews published in peer-reviewed journals; (2) articles published in English between 2021 and 2025; (3) studies involving preschool children or children younger than six years of age; (4) studies discussing fluoride use, parental knowledge, parental preventive behaviors, educational level, socioeconomic status, or Caries Risk Assessment (CRA); and (5) studies providing complete methodological information and relevant findings. Articles were excluded if they were conference abstracts, editorials, commentaries, case reports, duplicate publications, or studies unrelated to fluoride-based prevention of dental caries in children (Jullien, 2021).

After all records had been identified, duplicate articles were removed before the screening process. The remaining studies were screened by reviewing their titles and abstracts to determine their relevance

to the objectives of this review. Articles that met the preliminary criteria were further assessed through full-text reading to evaluate their eligibility. Only studies that specifically discussed parental knowledge, fluoride-based preventive behaviors, educational level, socioeconomic status, or dental caries prevention in preschool children were included in the final review (Kamalapriya et al., 2023).

Relevant information from each selected study was extracted using a standardized data extraction table. The extracted data included the author's name, publication year, country, study design, study population, sample size, intervention or exposure, outcome variables, and the main findings. Particular attention was given to studies discussing parental knowledge regarding fluoride, preventive behaviors, educational level, socioeconomic status, fluoride-based interventions, and Caries Risk Assessment because these variables corresponded to the conceptual framework developed in the original proposal (Pérez De Mora et al., 2025).

The findings from the selected studies were synthesized using a narrative synthesis approach because the included articles varied in study design, population characteristics, outcome measurements, and research settings. Rather than conducting a meta-analysis, the results were organized into several major themes, including parental knowledge regarding fluoride, preventive oral health behaviors, the influence of educational level, the impact of socioeconomic status, fluoride-based preventive interventions, and children's caries risk. This approach allowed similarities and differences among previous studies to be identified and discussed comprehensively (Wang et al., 2025).

Finally, the synthesized evidence was interpreted to explain how parental knowledge and preventive behaviors toward fluoride use contribute to the prevention of dental caries among preschool children. The review also examined the influence of educational level and socioeconomic status on parental oral health practices, thereby providing evidence that may support future family-based oral health promotion and preventive dental programs (Hasan et al., 2024).

RESULTS AND DISCUSSION

Parents' Knowledge of Fluoride in Preventing Dental Caries

The reviewed studies consistently indicate that parents' knowledge plays an important role in preventing dental caries during early childhood. Parents who understand the function of fluoride are generally more aware of the importance of maintaining their children's oral hygiene from an early age. They are more likely to supervise toothbrushing, choose fluoride toothpaste appropriate for the child's age, and seek preventive dental care before oral problems become severe. These preventive actions help reduce the risk of enamel demineralization and support healthier oral development in preschool children (Pérez De Mora et al., 2025).

Fluoride has been recognized as one of the most effective preventive agents against dental caries because it promotes enamel remineralization, inhibits mineral loss, and reduces the activity of cariogenic bacteria. For these reasons, many international oral health organizations recommend regular exposure to fluoride through daily toothbrushing and professional fluoride application according to children's caries risk. However, these preventive measures can only be implemented effectively when parents understand the purpose and correct use of fluoride products. This finding demonstrates that parental knowledge is a key component of successful caries prevention (American Academy of Pediatric Dentistry, 2023).

Several studies included in this review found that although many parents had heard about fluoride, their understanding was often incomplete. Misconceptions regarding fluoride safety, appropriate dosage, and the recommended age for fluoride toothpaste were still frequently reported. Some parents believed that fluoride should be avoided because of concerns about toxicity, while others were uncertain about the amount of toothpaste suitable for young children. These misunderstandings may reduce parents' confidence in using fluoride consistently during daily oral care (Jullien, 2021).

Similarly, Issrani et al. (2025) reported that parental awareness of fluoride treatment and preventive dental procedures varied considerably across different populations. While many parents acknowledged that fluoride could prevent dental caries, fewer parents understood how professional fluoride applications differed from fluoride toothpaste or when each preventive method should be introduced. This suggests that increasing awareness alone may not be sufficient unless parents also receive practical education regarding fluoride-based preventive care.

Another important finding is that parents who receive oral health information from dentists or other healthcare professionals generally demonstrate better knowledge than those relying mainly on social media or informal sources. Professional guidance allows parents to obtain evidence-based information regarding fluoride use, toothbrushing techniques, dietary habits, and routine dental visits. Consequently, parents become more confident in making appropriate decisions concerning their children's oral health (Durmaz et al., 2024).

The evidence reviewed also indicates that parental knowledge should not be viewed as an isolated factor. Instead, knowledge serves as the foundation for preventive behavior, influencing how parents establish oral hygiene routines at home and encourage healthy habits throughout childhood. Therefore, improving parental knowledge remains one of the most effective strategies for reducing the prevalence of dental caries among preschool children (Hasan et al., 2024).

Parents' Preventive Behaviors Toward Fluoride Use

Parental behavior is considered one of the strongest determinants of children's oral health because preschool children depend almost entirely on their caregivers to perform daily oral hygiene activities. The literature consistently demonstrates that children whose parents actively supervise toothbrushing, use fluoride toothpaste regularly, and schedule preventive dental visits tend to experience lower levels of dental caries than children whose parents provide limited supervision (Setiawan et al., 2024).

Regular toothbrushing with fluoride toothpaste remains the most common preventive behavior reported across the reviewed studies. Parents who establish consistent brushing routines from an early age help maintain adequate fluoride exposure while reducing dental plaque accumulation. In addition, supervision during toothbrushing is particularly important among preschool children because they often lack the motor skills needed to brush their teeth effectively without adult assistance (Cumerlato et al., 2022).

Professional fluoride application also represents an important preventive behavior discussed in several studies. Fluoride varnish applied by dental professionals has shown positive effects in reducing the progression of early carious lesions and preventing new lesions among children with moderate to high caries risk. Nevertheless, utilization of professional preventive services remains relatively low because many parents only seek dental treatment after pain or visible dental problems occur instead of attending routine preventive visits (Chou et al., 2021).

Another preventive behavior highlighted in recent studies involves parents' willingness to participate in oral health education programs. Educational interventions delivered through digital applications, online platforms, and community health programs have demonstrated encouraging results in improving parents' oral health practices. Parents who actively participated in these educational activities reported greater confidence in using fluoride products appropriately and were more likely to maintain preventive oral hygiene routines for their children (Kamalapriya et al., 2023).

Despite these positive findings, several studies emphasized that appropriate knowledge does not always result in positive behavior. Some parents understood the benefits of fluoride but still failed to supervise toothbrushing consistently because of busy work schedules, limited time, or competing family responsibilities. Other families faced financial barriers or limited access to pediatric dental services, reducing opportunities for professional fluoride application. These findings indicate that preventive behavior is influenced not only by knowledge but also by environmental and social factors (Coello Hidalgo et al., 2025).

The evidence synthesized in this review supports the conceptual framework presented in the original proposal, which suggests that parental knowledge contributes to preventive behavior, while educational level, socioeconomic status, and access to healthcare influence how consistently these behaviors are practiced. Therefore, successful prevention of dental caries requires comprehensive approaches that improve knowledge while simultaneously addressing barriers that prevent families from applying fluoride-based preventive measures in daily life.

The Influence of Parents' Educational Level on Fluoride Knowledge and Preventive Behavior

Parents' educational level has been widely recognized as one of the factors influencing oral health literacy and preventive behavior. Education enables individuals to understand health information more effectively, evaluate reliable sources of information, and apply appropriate preventive measures in daily life. In the context of childhood oral health, parents with higher educational attainment generally have better knowledge regarding fluoride use, proper toothbrushing practices, dietary habits, and the importance of regular dental examinations. These advantages contribute to more effective prevention of dental caries among preschool children (Hasan et al., 2024).

Several studies included in this review demonstrated a positive relationship between educational level and parents' understanding of fluoride. Parents with college or university education were more likely to recognize the benefits of fluoride toothpaste, understand the recommended amount of toothpaste for young children, and appreciate the importance of professional fluoride applications. In contrast, parents with lower educational backgrounds were more likely to experience uncertainty regarding fluoride safety and appropriate preventive practices, increasing the possibility of inconsistent oral hygiene routines at home (Almaged et al., 2024).

Educational attainment also influences parents' ability to interpret oral health information provided by healthcare professionals. Parents with higher education tend to seek additional information from scientific or professional sources, allowing them to distinguish evidence-based recommendations from misinformation that frequently circulates through social media or informal communication. As a result, they are generally more confident in making preventive decisions for their children's oral health (Dumitrescu et al., 2022).

However, educational level should not be interpreted as the only determinant of preventive behavior. Some studies reported that parents with adequate education still failed to establish consistent oral hygiene routines because of work demands, limited time, or insufficient family support. Conversely, several parents with lower educational backgrounds successfully maintained good preventive practices because they regularly received guidance from dentists or participated in community oral health programs. These findings suggest that education provides an important foundation for oral health literacy, but behavioral outcomes are also influenced by environmental and social conditions (Jullien, 2021).

Overall, the evidence indicates that parental educational level contributes positively to children's oral health through improved knowledge and better preventive decision-making. Nevertheless, educational interventions should remain accessible to parents from all educational backgrounds to reduce inequalities in oral health knowledge and encourage consistent fluoride-based preventive behaviors.

The Influence of Socioeconomic Status on Childhood Caries Prevention

In addition to educational level, socioeconomic status is another important factor associated with children's oral health. Families with higher socioeconomic status generally have greater access to preventive dental services, fluoride-containing oral health products, and educational resources that support healthy behaviors. Better financial conditions also make it easier for parents to schedule routine dental check-ups, purchase recommended fluoride toothpaste, and seek professional preventive treatment before dental problems become severe (Pérez De Mora et al., 2025).

Several studies reviewed in this article consistently reported that children from economically disadvantaged families were more likely to experience untreated dental caries. Financial limitations often reduce access to preventive care and encourage parents to seek dental treatment only after symptoms such as pain or infection appear. Consequently, preventive opportunities may be missed, allowing caries to progress before professional intervention is provided (Coello Hidalgo et al., 2025).

Socioeconomic conditions also affect parents' exposure to oral health information. Families with higher incomes generally have more opportunities to receive preventive education through private dental clinics, schools, or digital health platforms. In contrast, limited economic resources may reduce access to these educational opportunities, making parents more dependent on informal information sources that are not always evidence-based. As a result, disparities in oral health knowledge may contribute to differences in preventive behaviors among families (Kamalapriya et al., 2023).

Interestingly, several studies emphasized that socioeconomic status alone does not determine

children's oral health outcomes. Some families with modest economic backgrounds demonstrated excellent preventive behaviors because parents actively supervised toothbrushing, limited sugary food consumption, and regularly attended community dental programs. These findings suggest that appropriate knowledge and positive parental attitudes may partially compensate for economic limitations when preventive resources remain accessible (Idomeh et al., 2025).

The findings synthesized in this review support the conceptual framework presented in the original proposal, which considers socioeconomic status as one of the factors influencing parents' knowledge and preventive behavior toward fluoride use. Therefore, improving children's oral health requires not only individual education but also policies that expand access to affordable preventive dental services for families from different socioeconomic backgrounds.

Caries Risk Assessment and Implications for Preventive Programs

Caries Risk Assessment (CRA) has become an essential component of modern preventive dentistry because it enables healthcare professionals to identify children who are at greater risk of developing dental caries. Risk assessment considers multiple factors, including previous caries experience, oral hygiene practices, fluoride exposure, dietary habits, parental knowledge, and socioeconomic conditions. By evaluating these factors together, preventive strategies can be tailored according to each child's individual needs rather than applying the same intervention to all children (American Academy of Pediatric Dentistry, 2023).

Recent evidence indicates that parental knowledge and preventive behavior are important variables in caries risk prediction. Children whose parents understand fluoride use, supervise toothbrushing, and attend routine dental visits generally present lower caries risk than children whose parents demonstrate limited preventive involvement. Consequently, parental behavior should be considered an integral component of comprehensive caries risk assessment (Wang et al., 2025).

Several studies also emphasized that preventive programs become more effective when they combine fluoride application with oral health education for parents. Educational interventions increase parents' understanding of children's oral health needs, while fluoride-based preventive measures directly strengthen enamel resistance against cariogenic challenges. The combination of these approaches provides greater long-term benefits than relying on fluoride application alone (Chou et al., 2021).

Based on the literature reviewed, preventive strategies should focus not only on clinical treatment but also on strengthening family participation in children's oral health care. Parents remain the primary decision-makers responsible for establishing healthy habits during early childhood. Therefore, oral health promotion programs should prioritize parental education, improve access to preventive dental services, and encourage routine fluoride use as part of comprehensive childhood caries prevention.

Research Gap and Future Directions

The studies included in this review consistently demonstrated that parents' knowledge, preventive behaviors, educational level, and socioeconomic status are associated with the prevention of dental caries in preschool children. However, several research gaps remain and should be addressed in future studies. One of the most common limitations identified is that many previous studies evaluated only one or two determinants of childhood caries rather than examining these factors simultaneously. As a result, the interaction between parental knowledge, educational attainment, socioeconomic conditions, and fluoride-related behaviors has not been fully explained (Hasan et al., 2024).

Another important gap concerns the diversity of study populations and research settings. Most published studies were conducted in specific regions or healthcare systems, making it difficult to generalize the findings to different countries and communities. Differences in oral health policies, fluoride availability, cultural practices, and access to dental care may influence parental behaviors and children's oral health outcomes. Therefore, additional studies involving more diverse populations are needed to strengthen the current evidence (Pérez De Mora et al., 2025).

This review also found that although parents' knowledge has been widely investigated, fewer studies have evaluated whether improved knowledge produces long-term behavioral changes. Several intervention studies reported increases in oral health knowledge after educational programs; however, the

sustainability of these behavioral improvements remains uncertain. Longitudinal studies are therefore needed to determine whether educational interventions continue to influence fluoride use and preventive practices as children grow older (Kamalapriya et al., 2023).

Recent advances in digital health have introduced new opportunities for improving parental education regarding childhood oral health. Mobile applications, online educational platforms, and digital reminders have shown encouraging results in increasing parents' awareness and supporting daily preventive behaviors. Nevertheless, evidence regarding their long-term effectiveness and implementation in low-resource settings is still limited. Future research should evaluate whether digital interventions can complement conventional oral health education and improve fluoride-related preventive practices among families from different socioeconomic backgrounds (Kamalapriya et al., 2023).

Another issue identified in this review is the limited number of studies integrating Caries Risk Assessment (CRA) with parental behavioral factors. Many risk prediction models primarily focus on clinical variables, dietary habits, and previous caries experience, while parental knowledge and preventive behaviors are often treated as secondary factors. Considering that preschool children depend heavily on their parents for daily oral care, future risk assessment models should incorporate family-related behavioral indicators to improve the prediction of childhood caries (Wang et al., 2025).

Based on the evidence synthesized in this review, future oral health promotion programs should adopt a more comprehensive approach by combining fluoride-based preventive strategies with parental education, routine caries risk assessment, and improved access to preventive dental services. Collaboration between dental professionals, educational institutions, and public health authorities is essential to develop sustainable prevention programs that address both clinical and behavioral determinants of childhood dental caries (American Academy of Pediatric Dentistry, 2023).

Overall, the findings of this systematic literature review support the conceptual framework proposed in the original study, which emphasizes that parents' knowledge and preventive behaviors are closely associated with the successful use of fluoride for preventing dental caries in preschool children. Educational level and socioeconomic status further influence these relationships by affecting parents' ability to access information, adopt preventive practices, and utilize oral healthcare services. Therefore, strengthening family-based preventive strategies should remain a priority for future research as well as public health policy (Almajed et al., 2024).

CONCLUSION

This systematic literature review demonstrates that parents play a fundamental role in preventing dental caries among preschool children through their knowledge and preventive behaviors related to fluoride use. The evidence synthesized from recent studies consistently indicates that parents with better oral health knowledge are more likely to establish appropriate preventive practices, including supervising children's toothbrushing, using fluoride toothpaste correctly, attending regular dental check-ups, and utilizing professional fluoride applications when necessary. These preventive behaviors contribute to reducing children's risk of developing dental caries and support better oral health outcomes during early childhood (American Academy of Pediatric Dentistry, 2023).

The review also highlights that parental educational level and socioeconomic status influence fluoride-related preventive practices. Higher educational attainment generally improves parents' ability to understand oral health information and apply evidence-based preventive measures, while better socioeconomic conditions increase access to preventive dental services and fluoride-containing products. However, the findings further suggest that knowledge alone is insufficient to ensure positive behavioral changes. Environmental factors, accessibility to oral healthcare, family support, and public health education also contribute to parents' ability to maintain consistent preventive behaviors (Hasan et al., 2024).

Furthermore, recent studies emphasize that effective prevention of childhood dental caries requires a comprehensive approach combining fluoride exposure, parental education, routine caries risk assessment, and continuous oral health promotion. Educational interventions, including digital health programs and community-based oral health initiatives, have shown promising results in improving parents' awareness and preventive behaviors, although additional longitudinal research is still needed to evaluate

their long-term effectiveness (Kamalapriya et al., 2023).

Overall, this review supports the conceptual framework of the original study by demonstrating that parents' knowledge, preventive behaviors, educational level, and socioeconomic status are interconnected factors influencing fluoride utilization and the prevention of dental caries among preschool children. Strengthening family-centered oral health education and improving equitable access to fluoride-based preventive services should therefore remain priorities for healthcare professionals, policymakers, and future researchers to reduce the burden of childhood dental caries and improve children's quality of life (Wang et al., 2025).

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