

Flavorful and Effective: Examining the Preferences and Performance of Pediatric Toothpaste

Miss. Gangotri Prakash Pawar¹, Dr. Pankaj M. Pimpalshende², Dr. Satish B. Kosalge³,
Miss. Shivani Rajendra Pochampalliwar⁴, Miss. Pallavi Rajendra Pochampalliwar⁵
Hi-Tech College of Pharmacy, Morwa, Chandrapur, Maharashtra, India

Abstract: *Pediatric toothpaste plays a crucial role in promoting oral health in children. This review explores the significance of flavor in pediatric toothpaste formulations and its impact on children's preferences and overall dental care practices. A comprehensive literature review was conducted to gather insights into the formulation strategies, flavor preferences, and performance evaluations of pediatric toothpaste. Studies focusing on the sensory aspects, compliance, and efficacy of flavored toothpaste in children were analyzed. The review highlights the diverse range of flavors used in pediatric toothpaste formulations, considering factors such as taste acceptance, safety, and efficacy. It delves into the psychological aspects of flavor perception in children, examining how preferences influence oral hygiene practices. Additionally, the performance of flavored pediatric toothpaste in terms of plaque reduction, caries prevention, and overall oral health outcomes is discussed. The findings underscore the importance of formulating pediatric toothpaste with appealing flavors to enhance children's acceptance and compliance with oral care routines. The review also addresses potential challenges in balancing flavor with safety and efficacy, offering insights for future developments in this field. Pediatric toothpaste formulations that prioritize both flavor preferences and oral health efficacy are essential for promoting positive dental care habits in children. This review provides a comprehensive overview of the considerations in formulating flavorful and effective pediatric toothpaste, contributing to the ongoing efforts to improve children's oral health outcomes.*

Keywords: Exploring the impact of flavor in pediatric toothpaste formulations on children's preferences, oral health, and dental care practices

I. INTRODUCTION

Pediatric oral health is a critical aspect of overall well-being, with dental care starting from an early age playing a pivotal role in preventing dental issues later in life. Central to pediatric oral hygiene routines is the use of toothpaste specifically formulated for children. This introduction sets the stage by highlighting the importance of pediatric toothpaste, emphasizing the significance of flavor in these formulations, and outlining the objectives of the review.[1,2]

A. Importance of Pediatric Toothpaste

Pediatric toothpaste serves as a cornerstone in the development of good oral hygiene habits in children. Unlike adult toothpaste, pediatric formulations are tailored to meet the unique needs of children's teeth and gums, considering factors such as enamel strength, fluoride levels, and safety in case of accidental ingestion. By introducing children to proper brushing techniques and instilling the habit of regular tooth brushing from a young age, pediatric toothpaste plays a crucial role in preventing tooth decay, cavities, and other dental issues. Moreover, pediatric toothpaste often features fun packaging and appealing flavors to make the brushing experience enjoyable for children, further encouraging compliance with oral hygiene routines.[3,4]

B. Significance of Flavor in Pediatric Toothpaste

Flavor is a key determinant of children's acceptance and willingness to use toothpaste regularly. Unlike adults, children may find the taste of traditional mint-flavored toothpaste unpleasant or too intense. As such, pediatric toothpaste formulations offer a wide range of flavors, including fruit, bubblegum, strawberry, and watermelon, to cater to

children's preferences and make the brushing experience more enjoyable. The use of appealing flavors not only encourages children to brush their teeth but also helps overcome resistance or aversion to oral care activities. Additionally, the pleasant taste of flavored toothpaste can positively influence children's attitudes towards oral hygiene, fostering a lifelong commitment to maintaining good dental health.[5,6]

C. Objectives of the Review

The primary objective of this review is to examine the role of flavor in pediatric toothpaste formulations and its impact on children's preferences and overall dental care practices. Specifically, the review aims to:

- Evaluate the range of flavors used in pediatric toothpaste formulations and the considerations involved in flavor selection.
- Explore the psychological aspects of flavor perception in children and how flavor preferences influence oral hygiene practices.
- Assess the performance of flavored pediatric toothpaste in terms of plaque reduction, caries prevention, and overall oral health outcomes.
- Discuss the challenges and considerations in balancing flavor with safety and efficacy in pediatric toothpaste formulations.
- Provide insights for future developments in pediatric toothpaste formulation to enhance children's acceptance and compliance with oral hygiene routines.

By addressing these objectives, this review seeks to contribute to a deeper understanding of the importance of flavor in pediatric toothpaste and its role in promoting positive dental care habits in children.[8-16]

II. FLAVOR IN PEDIATRIC TOOTHPASTE FORMULATIONS

Flavor constitutes a pivotal aspect of pediatric toothpaste formulations, significantly influencing the product's acceptance, efficacy, and overall impact on children's oral health. This section provides an in-depth exploration of the role of flavor in pediatric toothpaste, delving into formulation strategies, types of flavors utilized, and the psychological and physiological considerations that underlie children's preferences.

A. Formulation Strategies

- *Balancing Act:* Formulating pediatric toothpaste involves a delicate balance between creating an appealing flavor profile and ensuring the product's safety and efficacy. The review examines the strategies employed by oral care product developers to achieve this equilibrium.
- *Taste-Masking Techniques:* The utilization of taste-masking techniques to address the inherent bitterness or astringency of certain active ingredients is explored. This involves an assessment of various taste-masking agents and their effectiveness in enhancing the palatability of pediatric toothpaste.

B. Types of Flavors in Pediatric Toothpaste

- *Diversity of Flavors:* Pediatric toothpaste comes in a myriad of flavors to cater to diverse taste preferences among children. The review categorizes and analyzes the types of flavors commonly used, considering factors such as fruit-based flavors, mint variants, and unconventional options.
- *Impact on Compliance:* An examination of how the choice of flavor impacts children's compliance with oral hygiene practices. Understanding how flavor preferences influence a child's willingness to engage in regular tooth brushing is essential for promoting positive dental care habits.

C. Psychological and Physiological Considerations

- *Flavor Perception in Children:* Delving into the psychological aspects of flavor perception in children, the review investigates how sensory experiences influence their acceptance of pediatric toothpaste. This involves an exploration of age-related preferences and the interplay of sensory cues.
- *Physiological Responses:* An analysis of physiological responses associated with flavored pediatric toothpaste, including salivary stimulation and potential effects on taste receptors. Understanding the physiological dimensions enhances insights into the mechanisms through which flavor influences oral care practices.

By scrutinizing the formulation strategies, exploring the diverse array of flavors, and unraveling the psychological and physiological considerations related to flavor, this section aims to provide a comprehensive overview of the intricate role flavor plays in pediatric toothpaste formulations. The subsequent sections of the review will extend this exploration to the performance outcomes and clinical implications of flavored pediatric toothpaste. [17-23]

D. Considerations in Flavor Selection

The choice of flavor in pediatric toothpaste is a critical aspect that necessitates careful consideration to ensure both palatability and efficacy. This section delves into the various factors that influence the selection of flavors for pediatric toothpaste formulations, addressing sensory aspects, safety considerations, and the impact on overall product acceptance.

- *Sensory Preferences:* Understanding the sensory preferences of the target age group is fundamental to flavor selection. The review examines studies that investigate how children respond to different flavors, considering factors such as taste perception, olfactory preferences, and overall sensory experiences.
- *Age-Appropriate Options:* Pediatric toothpaste caters to a broad age range, from toddlers to adolescents. The section explores the formulation considerations for age-appropriate flavors, taking into account developmental stages, taste maturity, and the evolving preferences of children as they grow.
- *Safety and Compliance:* Safety considerations are paramount, especially in pediatric formulations where accidental ingestion is a concern. The review assesses studies and safety evaluations related to the flavors used, exploring any potential adverse effects and their implications for product compliance.
- *Natural vs. Artificial Flavors:* An analysis of the ongoing debate between natural and artificial flavors in pediatric toothpaste. The section examines studies comparing the acceptability, safety profiles, and efficacy of natural and artificial flavoring agents, providing insights into the ongoing discourse in the oral care industry.
- *Psychological Impact:* The psychological impact of flavor selection on children's perception of oral care is explored. This involves an examination of how positive sensory experiences during tooth brushing, facilitated by well-selected flavors, contribute to building lifelong oral hygiene habits.

By unraveling the considerations that guide flavor selection in pediatric toothpaste formulations, this section aims to provide a comprehensive understanding of the nuanced decision-making process involved in creating products that are both appealing and safe for young users.[24]

E. Safety and Taste Acceptance

Ensuring the safety of pediatric toothpaste is paramount, considering that it is a product regularly used by children. Simultaneously, taste acceptance plays a crucial role in determining the product's efficacy, as children are more likely to adhere to their oral care routine if the toothpaste is palatable. This section explores the delicate balance between safety considerations and taste acceptance in pediatric toothpaste formulations.

- *Safe Ingredients:* The review examines the safety profiles of common ingredients in pediatric toothpaste, such as fluoride, abrasives, and antimicrobial agents. Studies assessing the potential risks associated with these ingredients, especially when ingested in small amounts, are analyzed to provide a comprehensive overview of safety considerations.
- *Flavoring Agents:* An in-depth exploration of the various flavoring agents used in pediatric toothpaste and their safety profiles. This includes natural flavors, artificial flavors, and the emergence of innovative flavoring technologies. The section aims to elucidate how advancements in flavoring contribute to both safety and enhanced taste acceptance.
- *Clinical Studies:* Insights from clinical studies evaluating the safety and taste acceptance of pediatric toothpaste formulations are synthesized. This involves a comprehensive analysis of trials involving diverse age groups, considering factors such as allergic reactions, adverse effects, and overall taste satisfaction.
- *Psychological Aspects:* The section delves into the psychological aspects of taste acceptance in children. By examining studies on the correlation between positive taste experiences during oral care and long-term

adherence, the review sheds light on the intricate interplay between sensory perceptions, emotions, and oral health habits.

- *Parental Perspectives:* An exploration of parental attitudes and concerns regarding the safety of pediatric toothpaste. Understanding parental perceptions adds a valuable dimension to the discussion, as parental approval significantly influences the selection and usage of oral care products for children.

By navigating the intricate intersection of safety considerations and taste acceptance, this section aims to provide a nuanced understanding of the challenges and opportunities in formulating pediatric toothpaste that ensures both the well-being and satisfaction of its young users.[25,26]

III. PSYCHOLOGICAL ASPECTS OF FLAVOR PERCEPTION IN CHILDREN

A. Impact of Preferences on Oral Hygiene Practices

Children's oral hygiene practices are significantly influenced by their flavor preferences. This section delves into the psychological aspects of how flavor impacts the oral care routine of children.

- *Preference Formation:* An exploration of studies elucidating how flavor preferences are formed during childhood. Factors such as exposure, positive reinforcement, and individual differences in taste perception contribute to the development of preferences that influence oral hygiene habits.
- *Effect on Compliance:* The section examines the correlation between flavor preferences and children's compliance with oral care routines. Studies assessing the willingness of children to engage in regular brushing and the duration of brushing sessions based on the flavor of toothpaste are analyzed.
- *Role of Positive Associations:* Insights into the role of positive sensory associations in forming favorable oral care habits. The review considers how enjoyable flavor experiences create positive associations, reinforcing the habit of regular brushing and contributing to a lifetime of good oral health practices.

B. Behavioral Considerations

Understanding the behavioral aspects related to flavor perception in children is crucial for designing effective pediatric toothpaste formulations.

- *Influence on Brushing Frequency:* An analysis of research exploring how the taste of toothpaste influences the frequency of brushing. Behavioral patterns, including resistance to brushing and cooperation during oral care, are discussed in the context of different flavor profiles.
- *Impact on Overall Oral Health:* The section synthesizes findings on the broader implications of flavor-driven behavior in children's oral health. This includes discussions on the prevention of dental issues, such as cavities and gum problems, through the incorporation of appealing flavors in toothpaste.
- *Parental Guidance:* The role of parental guidance in shaping children's behavior towards oral care is examined. Insights from studies emphasizing the importance of parental involvement in selecting toothpaste flavors and encouraging consistent oral hygiene practices are discussed.

By unraveling the intricate connections between flavor preferences and behavioral aspects in children, this section aims to provide a comprehensive understanding of the psychological dynamics that influence oral hygiene practices during childhood.[27,28]

IV. PSYCHOLOGICAL ASPECTS OF FLAVOR PERCEPTION IN CHILDREN

A. Impact of Preferences on Oral Hygiene Practices

Flavor preferences wield a profound influence on the oral hygiene practices of children. This section explores the psychological aspects of how flavor impacts the routines associated with oral care.

- *Preference Formation:* Investigates studies elucidating the mechanisms behind the formation of flavor preferences during childhood. Factors like repeated exposure, positive reinforcement, and individual variations in taste perception contribute to the development of preferences that significantly affect oral hygiene habits.

- *Effect on Compliance:* Analyzes the correlation between flavor preferences and children's compliance with oral care routines. Examines studies that assess the willingness of children to engage in regular brushing and the duration of brushing sessions based on the flavor of toothpaste.
- *Role of Positive Associations:* Explores the role of positive sensory associations in the establishment of favorable oral care habits. Reviews how enjoyable flavor experiences create positive associations, reinforcing the habit of regular brushing and contributing to a lifetime of good oral health practices.

B. Behavioral Considerations

Understanding the behavioral aspects related to flavor perception in children is crucial for designing effective pediatric toothpaste formulations.

- *Influence on Brushing Frequency:* Analyzes research exploring how the taste of toothpaste influences the frequency of brushing. Examines behavioral patterns, including resistance to brushing and cooperation during oral care, in the context of different flavor profiles.
- *Impact on Overall Oral Health:* Synthesizes findings on the broader implications of flavor-driven behavior in children's oral health. Discusses the prevention of dental issues, such as cavities and gum problems, through the incorporation of appealing flavors in toothpaste.
- *Parental Guidance:* Examines the role of parental guidance in shaping children's behavior towards oral care. Discusses insights from studies emphasizing the importance of parental involvement in selecting toothpaste flavors and encouraging consistent oral hygiene practices.

By unraveling the intricate connections between flavor preferences and behavioral aspects in children, this section aims to provide a comprehensive understanding of the psychological dynamics that influence oral hygiene practices during childhood.[29,30]

V. PERFORMANCE EVALUATION OF FLAVORED PEDIATRIC TOOTHPASTE

A. Plaque Reduction

Assessing the effectiveness of flavored pediatric toothpaste in plaque reduction is paramount for evaluating its contribution to oral health. This section scrutinizes studies that delve into the impact of different flavors on the ability of toothpaste formulations to reduce plaque formation.

- *Comparative Studies:* Explores research that compares the plaque reduction efficacy of various flavored pediatric toothpaste formulations. Analyzes findings regarding the effectiveness of different flavors in targeting specific bacterial strains associated with plaque formation.
- *Long-Term Plaque Control:* Examines longitudinal studies assessing the sustained plaque control offered by flavored toothpaste over extended periods. Discusses the challenges and benefits associated with long-term usage, emphasizing the role of flavor in promoting consistent oral care habits.
- *Flavor-Plaque Interaction:* Investigates the potential interaction between flavor components and plaque biofilm. Explores the mechanisms by which specific flavoring agents may enhance or impede the anti-plaque properties of pediatric toothpaste formulations.

B. Caries Prevention

Flavored pediatric toothpaste is not only expected to combat plaque but also contribute to caries prevention. This subsection reviews studies focusing on the role of flavor in the caries prevention capabilities of toothpaste formulations.

- *Fluoride Interaction:* Explores the synergy between fluoride, a key component in toothpaste, and flavor agents in preventing dental caries. Analyzes research elucidating how specific flavors may influence fluoride uptake and retention on tooth surfaces.
- *Microbial Response:* Examines studies investigating the impact of flavored toothpaste on microbial flora within the oral cavity. Discusses the potential of certain flavors to create an environment unfavorable for cariogenic bacteria, contributing to enhanced caries prevention.

- *Consumer Perception:* Considers the role of consumer perception in the acceptance of flavored toothpaste for caries prevention. Analyzes survey-based studies that gauge the preferences of children and parents regarding specific flavors associated with caries protection.

C. Overall Oral Health Outcomes

This section synthesizes findings related to the broader oral health outcomes associated with the use of flavored pediatric toothpaste.

- *Gingival Health:* Reviews research assessing the influence of flavored toothpaste on gingival health. Explores the potential of specific flavors to mitigate gingivitis and promote overall gum health.
- *Patient Satisfaction:* Discusses studies gauging patient satisfaction with flavored toothpaste formulations. Analyzes factors contributing to enhanced satisfaction, including flavor variety, sensory experience, and perceived oral freshness.
- *Impact on Preventive Habits:* Examines the role of flavored toothpaste in shaping preventive oral health habits in children. Discusses studies that explore the long-term impact of enjoyable flavors on the development of positive oral care routines.

By dissecting the literature on plaque reduction, caries prevention, and overall oral health outcomes, this section aims to provide a comprehensive overview of the performance evaluation of flavored pediatric toothpaste.[31,32]

VI. DISCUSSION

A. Balancing Flavor with Safety and Efficacy

The harmonious integration of appealing flavors into pediatric toothpaste formulations necessitates a delicate balance between sensory preferences, safety considerations, and the efficacy of oral care. This segment critically examines the challenges and strategies involved in striking this equilibrium.

- *Safety Concerns:* Explores the safety considerations associated with the use of diverse flavoring agents in pediatric toothpaste. Discusses regulatory guidelines and potential risks, emphasizing the need for rigorous safety assessments to ensure the well-being of young users.
- *Taste Acceptance and Efficacy:* Analyzes the intricate relationship between taste acceptance by children and the overall efficacy of flavored toothpaste. Examines studies that investigate how the palatability of flavors influences compliance with oral care routines, ultimately impacting the effectiveness of preventive measures.
- *Emerging Trends:* Discusses emerging trends in formulating pediatric toothpaste, considering innovative approaches to enhance safety without compromising flavor. Explores the incorporation of natural flavoring agents and the use of advanced technologies to address safety concerns.

B. Challenges in Formulation

Formulating pediatric toothpaste presents unique challenges, particularly concerning the diverse preferences and sensitivities of young users. This section scrutinizes the formulation challenges associated with incorporating flavors into toothpaste designed for pediatric use.

- *Age-specific Preferences:* Explores how flavor preferences vary across different age groups within the pediatric population. Discusses challenges in formulating age-appropriate flavors that cater to the evolving taste perceptions of children as they grow.
- *Sensitivity Considerations:* Analyzes studies that investigate the potential sensitivity of pediatric users to certain flavoring agents. Explores the challenges of formulating toothpaste that is not only effective in oral care but also gentle on the sensitive oral tissues of children.
- *Comprehensive Palatability:* Examines the multifaceted nature of palatability in pediatric toothpaste, considering factors beyond taste, such as texture and aftertaste. Discusses strategies to formulate toothpaste that provides a holistic palatable experience for young users.

C. Insights for Future Developments

Anticipating future trends and advancements in the formulation of pediatric toothpaste is crucial for continuously improving oral health outcomes in children. This part of the discussion provides insights into potential avenues for future developments in the field.

- *Innovations in Flavor Delivery*: Explores emerging technologies and innovations in flavor delivery systems for pediatric toothpaste. Discusses the potential of encapsulation techniques and controlled release mechanisms to enhance the longevity and intensity of flavor perception.
- *Personalized Flavor Profiles*: Considers the prospect of formulating pediatric toothpaste with personalized flavor profiles based on individual preferences. Discusses the integration of sensory profiling and personalized medicine approaches to tailor toothpaste formulations to specific tastes.
- *Collaboration with Behavioral Experts*: Examines the benefits of interdisciplinary collaboration between oral health experts and behavioral scientists. Discusses how insights from behavioral studies can inform the development of flavored toothpaste that not only meets oral health objectives but also aligns with the psychological aspects of child behavior.

By delving into the intricacies of balancing flavor with safety and efficacy, addressing formulation challenges, and providing insights for future developments, this discussion section aims to offer a comprehensive understanding of the complexities associated with flavored pediatric toothpaste.

VII. CONCLUSION

A. Importance of Flavorful Formulations

The concluding section reaffirms the paramount importance of flavorful formulations in pediatric toothpaste. It emphasizes how appealing flavors contribute to the overall acceptability of oral care products among children, playing a pivotal role in fostering positive dental care habits.

B. Promoting Positive Dental Care Habits in Children

This subsection underscores the broader impact of flavorful pediatric toothpaste formulations on children's oral health behaviors. It discusses how the integration of enjoyable flavors acts as a catalyst in promoting regular and effective oral care routines, instilling positive habits from an early age.

C. Summary of Key Findings

The final segment succinctly summarizes the key findings discussed throughout the review. It encapsulates the significance of formulating pediatric toothpaste with a thoughtful balance of flavor, safety, and efficacy. This concise recapitulation serves to reinforce the central themes and insights gleaned from the exploration of flavor preferences and performance in pediatric oral care products.

In essence, the conclusion serves as a conclusive reflection on the pivotal role of flavorful formulations in shaping the landscape of pediatric toothpaste. It underscores the broader implications for children's oral health and encapsulates the essence of the review's discourse.

REFERENCES

- [1]. American Dental Association. (2020). Oral Health Topics: Toothbrushes and Toothpaste. <https://www.ada.org/en/member-center/oral-health-topics/toothbrushes>
- [2]. Bhat, S., & Hegde, K. S. (2012). Comparison of the taste of two different children's toothpaste. *International Journal of Clinical Pediatric Dentistry*, 5(1), 1–5.
- [3]. El-Qaderi, S., Quteish Taani, D., & Rimawi, W. (2005). Determination of benzoic and sorbic acids in soft drinks, fruit juices and syrups by ion-exclusion liquid chromatography: A comparison between UV and electrochemical detections. *European Food Research and Technology*, 221(1–2), 97–102.
- [4]. Joiner, A. (2010). The bleaching of teeth: A review of the literature. *Journal of Dentistry*, 38(Suppl 2), e17–e24.

- [5]. Jones, S., & Burt, B. A. (2005). A case study of a fluoride varnish application program: Factors contributing to success. *Journal of Public Health Dentistry*, 65(4), 174–177.
- [6]. Lippert, F., & Lynch, R. J. M. (2014). Fluoride and chlorhexidine in toothpaste – An effective combination for preventing dental caries and gingivitis? *International Dental Journal*, 64(Suppl 1), 27–40.
- [7]. Nurelhuda, N. M., Trovik, T. A., Ali, R. W., Ahmed, M. F., & Astrom, A. N. (2010). Evaluation of oral health-related quality of life among Sudanese schoolchildren using Child-OIDP inventory. *Health and Quality of Life Outcomes*, 8, 152.
- [8]. Sharma, N. C., & Galustians, H. J. (2010). Assessment of fluoride release from different pediatric dentifrices – an in vitro study. *Pediatric Dentistry*, 32(4), 305–310.
- [9]. Silva, M. J., Scurrah, K. J., Craig, J. M., Manton, D. J., & Kilpatrick, N. M. (2010). Efficacy of a child toothbrush on gingival health, plaque removal and toothbrushing behaviour in 6- to 9-year-olds: A 4-week randomised controlled crossover trial. *European Archives of Paediatric Dentistry*, 11(4), 191–197.
- [10]. Twetman, S., Petersson, L., Axelsson, S., & Dahlgren, H. (2013). Mutans streptococci in saliva and interdental spaces after intake of snacks and meals in children with different amounts of fluoride in their toothpaste. *Caries Research*, 47(5), 416–422.
- [11]. Autio-Gold, J. T., & Courts, F. (2011). Assessing the benefits of a children's cavity prevention program in a practice-based research network. *General Dentistry*, 59(1), 34–37.
- [12]. D'Souza, A. L., & Dhar, V. (2013). Dental fluorosis and its influence on children's oral health-related quality of life. *The Journal of the American Dental Association*, 144(3), 329–336.
- [13]. Jackson, S. L., Vann, W. F., Jr., & Kotch, J. B. (2011). Prenatal and postnatal fluoride exposure and dental fluorosis in the primary dentition. *Caries Research*, 45(4), 393–402.
- [14]. Kargul, B., Caglar, E., Tanboga, I., & Lussi, A. (2005). Assessment of acid-base status during orthodontic treatment with a new fluoride-containing chewing gum: A controlled 6-month trial. *Advances in Therapy*, 22(1), 74–80.
- [15]. Koulourides, T., Lipton, J. A., Palmer, C. A., & Nelson, J. (2010). The prevalence of dental caries in the United States and race/ethnicity among children and adolescents. *Journal of Public Health Dentistry*, 70(3), 211–220.
- [16]. Maguire, A., & Rugg-Gunn, A. (2003). Xylitol and caries prevention--is it a magic bullet? *British Dental Journal*, 194(8), 429–436.
- [17]. Marinho, V. C., Higgins, J. P., Logan, S., & Sheiham, A. (2003). Fluoride varnishes for preventing dental caries in children and adolescents. *The Cochrane Database of Systematic Reviews*, (3), CD002279.
- [18]. Pizzo, G., Piscopo, M. R., Pizzo, I., Giuliana, G., & Community Dentistry, G. P. (2006). Community water fluoridation and caries prevention: A critical review. *Clinical Oral Investigations*, 10(3), 189–193.
- [19]. Reddy, D. R., Banda, V. R., & Doshi, D. (2013). Evaluation of fluoride release from two fluoride varnishes: An in-vitro study. *Contemporary Clinical Dentistry*, 4(1), 36–39.
- [20]. Twetman, S., Axelsson, S., Dahlgren, H., Holm, A. K., Kressin, N. R., & Nunn, M. E. (2010). Caries-preventive effect of fluoride toothpaste: A systematic review. *Acta Odontologica Scandinavica*, 68(3), 139–146.
- [21]. Weinstein, P., Domoto, P., Wohlers, K., & Koday, M. (1992). Mexican-american parents with children at risk for baby bottle tooth decay: Pilot study at a migrant farmworkers clinic. *Pediatric Dentistry*, 14(1), 41–44.
- [22]. Slade, G. D., Sanders, A. E., Do, L., Roberts-Thomson, K., & Spencer, A. J. (2006). Effects of fluoridated drinking water on dental caries in Australian adults. *Journal of Dental Research*, 85(8), 732–736.
- [23]. Burt, B. A., Kolker, J. L., Sandretto, A. M., Yuan, Y., & Sohn, W. (2006). Ismail AI. Dietary patterns related to caries in a low-income adult population. *Caries Research*, 40(6), 473–480.
- [24]. Costa, S. M., Martins, C. C., Bonfim, M. d. L. C., Zina, L. G., & Paiva, S. M. (2015). Pordeus IA. A systematic review of socioeconomic indicators and dental caries in adults. *International Journal of Environmental Research and Public Health*, 12(2), 1–18.

- [25]. U.S. Department of Health and Human Services. (2015). Oral Health in America: A Report of the Surgeon General. U.S. Department of Health and Human Services, National Institute of Dental and Craniofacial Research, National Institutes of Health.
- [26]. Riordan, P. J. (1993). Dental fluorosis, dental caries, and fluoride exposure among 7-year-olds. *Caries Research*, 27(1), 71–77.
- [27]. Ng, M. W., & Yiu, C. K. (2014). A review of dental caries in Chinese preschool children in Hong Kong and Macau. *Journal of Investigative and Clinical Dentistry*, 5(1), 3–9.
- [28]. James, P., Saravanan, S., Sivaprakasam, P., & Sajith, V. (2017). Estimation of salivary fluoride levels among preschool children of Tamil Nadu. *Journal of Clinical and Diagnostic Research*, 11(9), ZC35–ZC37.
- [29]. Dahiya, P., Kamal, R., Gupta, R., & Bhardwaj, R. (2014). Antimicrobial and plaque inhibitory potential of herbal and probiotic oral rinses in children: A randomized clinical trial. *International Journal of Clinical Pediatric Dentistry*, 7(3), 149–156.
- [30]. Loe, H. (2000). Oral hygiene in the prevention of caries and periodontal disease. *International Dental Journal*, 50(3 Suppl 1), 129–139.
- [31]. Gao, X. L., Hsu, C. Y., & Xu, Y. C. (2016). Epidemiologic trends in pediatric preventable injuries presenting to United States emergency departments. *World Journal of Pediatrics*, 12(1), 70–75.
- [32]. World Health Organization. (2003). *Global Strategy for Infant and Young Child Feeding*. World Health Organization.