JOURNAL OF APPLIED SCIENCE AND SOCIAL SCIENCE
eISSN 2229-3113 pISSN 2229-3205

Volume 15 Issue 10, October 2025
Impact factor: 2019: 4.679 2020: 5.015 2021: 5.436, 2022: 5.242, 2023: 6.995, 2024 7.75

UDC: 616.314-002-053.2-06-036.22-092:005.6

IMPROVING PATHOGENETICALLY SUBSTANTIATED METHODS FOR THE PREVENTION OF COMPLICATIONS ASSOCIATED WITH TEETHING SYNDROME IN CHILDREN

Raimjonov Rustambek Ravshanbek ugli
Department of Orthopedic Dentistry and Orthodontics,
Andijan State Medical Institute
Uzbekistan, Andijan

RELEVANCE: Teething in children is a complex physiological process often accompanied by local and systemic symptoms. Complications arising during this period, including inflammatory processes, fever, sleep disturbances, and refusal to eat, can negatively affect the child's overall health. Preventing these complications and improving the quality of life for children through a deeper pathogenetic study and the improvement of existing prevention methods is one of the urgent tasks of modern pediatrics and pediatric dentistry.
Keywords: teething syndrome, children, complications, prevention, pathogenesis, inflammation, pain management, pediatrics, dentistry.

СОВЕРШЕНСТВОВАНИЕ ПАТОГЕНЕТИЧЕСКИ ОБОСНОВАННЫХ МЕТОДОВ ПРОФИЛАКТИКИ ОСЛОЖНЕНИЙ, СВЯЗАННЫХ С СИНДРОМОМ ПРОРЕЗЫВАНИЯ ЗУБОВ У ДЕТЕЙ

АКТУАЛЬНОСТЬ: Прорезывание зубов у детей — это сложный физиологический процесс, часто сопровождающийся местными и общими симптомами. Осложнения, возникающие в этот период, включая воспалительные процессы, лихорадку, нарушения сна и отказ от еды, могут негативно сказаться на общем состоянии здоровья ребенка. Предотвращение этих осложнений и улучшение качества жизни детей путем более глубокого изучения патогенеза и совершенствования существующих методов профилактики является одной из актуальных задач современной педиатрии и детской стоматологии.
Ключевые слова: синдром прорезывания зубов, дети, осложнения, профилактика, патогенез, воспаление, обезболивание, педиатрия, стоматология.

BOLALARDA TISHLAR YORIB CHIQISH SINDROMI BILAN BOG‘LIQ ASORATLARNING PATOGENETIK ASOSLANGAN PROFILAKTIKA USULLARINI TAKOMILLASHTIRISH

DOLZARBLIGI: Bolalarda tishlarning yorib chiqishi ko'pincha mahalliy va umumiy simptomlar bilan kechadigan murakkab fiziologik jarayondir. Ushbu davrda yuzaga keladigan asoratlar, jumladan, yallig'lanish jarayonlari, isitma, uyqu buzilishi va ovqatlanishdan bosh tortish bolaning umumiy salomatligiga salbiy ta'sir ko'rsatishi mumkin. Mavjud profilaktika usullarini patogenetik jihatdan chuqurroq o'rganish va ularni takomillashtirish orqali ushbu

JOURNAL OF APPLIED SCIENCE AND SOCIAL SCIENCE
eISSN 2229-3113 pISSN 2229-3205
Volume 15 Issue 10, October 2025
Impact factor: 2019: 4.679 2020: 5.015 2021: 5.436, 2022: 5.242, 2023: 6.995, 2024 7.75

asoratlarning oldini olish va bolalarning hayot sifatini yaxshilash zamonaviy pediatriya va bolalar stomatologiyasining dolzarb vazifalaridan biridir.
Kalit so‘zlar: tish yorib chiqishi sindromi, bolalar, asoratlar, profilaktika, patogenez, yallig'lanish, og'riqni boshqarish, pediatriya, stomatologiya.

INTRODUCTION

Teething is a natural physiological process in infants, but it is often associated with a range of local and systemic symptoms collectively known as teething syndrome. These symptoms can include gum inflammation, pain, irritability, fever, and sleep disturbances, causing significant distress to both the child and parents. This article provides a comprehensive review of the pathogenesis of complications associated with teething syndrome and explores advanced, pathogenetically substantiated methods for their prevention. The discussion covers the inflammatory cascade triggered by erupting teeth, the role of local and systemic factors, and the limitations of current preventive measures. We analyze modern approaches, including pharmacological and non-pharmacological interventions, focusing on their mechanisms of action, efficacy, and safety. A comparative analysis of different methods is presented in tabular form. The results and discussion section emphasizes the need for an integrated, evidence-based approach to managing teething symptoms, minimizing complications, and improving the overall well-being of infants. The conclusion highlights the importance of developing personalized preventive strategies based on a deeper understanding of the underlying pathogenetic mechanisms.

The eruption of primary teeth is a milestone in an infant's development, typically beginning around six months of age. While it is a normal physiological event, it is frequently accompanied by a constellation of symptoms referred to as "teething syndrome" or "difficult dentition" (Tsang & Rinar, 2016). The clinical presentation of teething is highly variable, ranging from minor discomfort to severe symptoms that significantly impact the child's quality of life. Common local symptoms include gingival irritation, inflammation, drooling, and a tendency to chew on objects. Systemic symptoms such as irritability, low-grade fever, sleep disturbances, and changes in eating patterns are also frequently reported by caregivers (Ramos-Jorge et al., 2011).

The management of teething-related symptoms remains a topic of debate and concern among both healthcare professionals and parents. A wide array of remedies, from traditional folklore to modern pharmacological agents, are used, but their efficacy and safety are not always well-established. The overuse or misuse of certain treatments, such as topical anesthetics containing benzocaine, has led to safety warnings from regulatory agencies due to the risk of methemoglobinemia (U.S. Food and Drug Administration, 2018).

Understanding the underlying pathogenesis of teething complications is crucial for developing safe and effective preventive strategies. The process involves a complex interplay of mechanical pressure from the erupting tooth, enzymatic activity, and an inflammatory response in the surrounding gingival tissues (Moss, 1999). This inflammatory cascade is believed to be the primary driver of both local and systemic symptoms. Therefore, improving preventive methods requires a focus on modulating this response in a targeted and safe manner. This article aims to review the pathogenesis of teething complications and propose improved, evidence-based preventive strategies that are grounded in this scientific understanding.

JOURNAL OF APPLIED SCIENCE AND SOCIAL SCIENCE
eISSN 2229-3113 pISSN 2229-3205
Volume 15 Issue 10, October 2025
Impact factor: 2019: 4.679 2020: 5.015 2021: 5.436, 2022: 5.242, 2023: 6.995, 2024 7.75

LITERATURE REVIEW

The body of literature on teething syndrome is extensive, yet it is characterized by conflicting findings and a lack of high-quality evidence. Historically, teething was erroneously blamed for a variety of serious childhood illnesses, leading to delays in proper diagnosis and treatment (Ashley, 2001). Modern research has debunked these myths, but a clear consensus on the definitive signs and symptoms directly attributable to teething is still evolving.

Several studies have systematically investigated the symptoms associated with teething. A meta-analysis by Massignan et al. (2016) concluded that the most common manifestations were gingival irritation, irritability, and drooling. While a slight increase in body temperature was noted, high fever (>38.5°C) was not found to be directly associated with tooth eruption, a critical point for clinicians to consider in differential diagnosis.

The pathogenesis of teething pain and inflammation is linked to the release of inflammatory mediators. As the tooth crown moves towards the oral epithelium, it exerts pressure, leading to localized ischemia and subsequent reperfusion, which triggers the release of cytokines like interleukin-1 (IL-1), interleukin-6 (IL-6), and tumor necrosis factor-alpha (TNF-α) (Kupietzky, 2007). These mediators are responsible for the classic signs of inflammation: redness, swelling, heat, and pain. They can also enter the systemic circulation, potentially explaining systemic symptoms like irritability and low-grade fever.

Current management strategies can be broadly categorized as non-pharmacological and pharmacological. Non-pharmacological approaches, such as chilled teething rings or gentle gum massage, are widely recommended as a first line of defense. They are thought to provide relief through a combination of counter-pressure and cold-induced vasoconstriction, which can reduce inflammation and numb the area (Memarpour et al., 2015). Pharmacological interventions include systemic analgesics (e.g., acetaminophen, ibuprofen) and topical agents. Systemic analgesics are effective but require careful dosing to avoid toxicity. Topical anesthetic gels, particularly those with benzocaine, have come under scrutiny for safety concerns (FDA, 2018). Herbal-based gels containing ingredients like chamomile or licorice root have gained popularity as alternatives, but robust evidence of their efficacy is often lacking. This review identifies a gap in the literature regarding integrated preventive models that are based on a nuanced understanding of the pathogenetic pathways.

MATERIALS AND METHODS

This study is a comprehensive narrative review based on a systematic search of the existing literature. The search was conducted across multiple electronic databases, including PubMed, Scopus, Web of Science, and Google Scholar, for articles published between January 2000 and August 2025. The search strategy employed a combination of keywords and MeSH terms: "teething syndrome," "tooth eruption," "primary dentition," "infant," "complications," "prevention," "pathogenesis," "inflammation," "pain management," and "pediatric dentistry."

Inclusion criteria: 1) Original research articles (randomized controlled trials, cohort studies, case-control studies), systematic reviews, and meta-analyses. 2) Studies focusing on the symptoms, pathogenesis, and management of teething in children aged 0-3 years. 3) Articles published in English.

Exclusion criteria: 1) Case reports, editorials, and opinion pieces. 2) Studies focusing on permanent tooth eruption. 3) Articles published before the year 2000.

JOURNAL OF APPLIED SCIENCE AND SOCIAL SCIENCE
eISSN 2229-3113 pISSN 2229-3205
Volume 15 Issue 10, October 2025
Impact factor: 2019: 4.679 2020: 5.015 2021: 5.436, 2022: 5.242, 2023: 6.995, 2024 7.75

A total of 258 articles were initially identified. After screening titles and abstracts, 89 articles were selected for full-text review. Following the full-text assessment based on the inclusion and exclusion criteria, 42 articles were deemed relevant and included in this review. The data extracted included study design, sample size, key findings related to symptoms, pathogenetic mechanisms, and the efficacy and safety of preventive/therapeutic interventions. The information was synthesized to construct a pathogenetic model of teething complications and to evaluate and propose improved preventive strategies. A comparative analysis of existing methods was structured into tables for clarity.

RESULTS AND DISCUSSION

The synthesis of the literature reveals that complications from teething syndrome stem primarily from a localized, and sometimes systemic, inflammatory response. The results of our analysis are organized around the pathogenetic mechanisms and the corresponding preventive strategies.

Pathogenetic Mechanisms of Teething Complications:

The core of the problem is the inflammatory process. The eruption pathway is created by a combination of osteoclast and osteoblast activity, modulated by dental follicle cells. As the tooth approaches the surface, the overlying mucosa undergoes pressure, leading to the release of inflammatory mediators. This process can be conceptualized in stages: 1) Mechanical Pressure and Ischemia: The advancing tooth compresses blood vessels in the gingiva. 2) Inflammatory Cascade: Cellular stress and minor tissue damage trigger the release of prostaglandins and cytokines (IL-1, TNF-α), leading to vasodilation, increased vascular permeability, and nerve ending sensitization. This manifests as gingival swelling, erythema, and pain. 3) Systemic Response: These inflammatory mediators can enter the bloodstream, leading to systemic effects like pyrexia (low-grade fever) and general malaise or irritability. Increased salivation (drooling) is a reflex response to oral irritation.

This understanding allows for a more targeted approach to prevention and management, moving beyond simple symptomatic relief to modulating the underlying inflammatory response.

Table 1.

Comparison of preventive and management strategies for teething syndrome

Method	Mechanism of action	Advantages	Disadvantages/Risks	Evidence level
Non-pharmacological				

JOURNAL OF APPLIED SCIENCE AND SOCIAL SCIENCE
eISSN 2229-3113 pISSN 2229-3205
Volume 15 Issue 10, October 2025
Impact factor: 2019: 4.679 2020: 5.015 2021: 5.436, 2022: 5.242, 2023: 6.995, 2024 7.75

Chilled teething rings	Cryotherapy (cold application) causes vasoconstriction, reducing inflammation and providing a numbing effect. Counter-pressure provides sensory relief.	Safe, readily available, inexpensive, empowers parents.	Risk of contamination if not cleaned properly. Freezing can cause cold burns; chilling is recommended.	Moderate
Gum massage	Gentle pressure provides counter-stimulation, which can interfere with pain signals (Gate Control Theory).	No cost, promotes parent-child bonding, safe.	May be ineffective for severe pain. Requires clean hands.	Low to moderate
Pharmacological				
Systemic analgesics (Acetaminophen, Ibuprofen)	Inhibit prostaglandin synthesis via COX enzyme inhibition, reducing pain and fever. Ibuprofen has a stronger anti-inflammatory effect.	Effective for moderate-to-severe pain and fever. Well-studied.	Risk of hepatotoxicity (acetaminophen) or GI/renal issues (ibuprofen) with incorrect dosing or overuse.	High
Topical anesthetics (e.g., Lidocaine, Benzocaine)	Block sodium channels in nerve endings, preventing pain signal transmission.	Rapid onset of action.	Short duration. Risk of systemic absorption and toxicity. Benzocaine carries a risk of methemoglobinemia. Saliva washes it away quickly.	Low (Recommended against)

JOURNAL OF APPLIED SCIENCE AND SOCIAL SCIENCE
eISSN 2229-3113 pISSN 2229-3205
Volume 15 Issue 10, October 2025
Impact factor: 2019: 4.679 2020: 5.015 2021: 5.436, 2022: 5.242, 2023: 6.995, 2024 7.75

Herbal/Homeopathic Gels (e.g., Chamomile)	Proposed anti-inflammatory and mild sedative properties.	Perceived as "natural" and safer by some parents.	Lack of regulation and standardized dosing. Limited high-quality evidence of efficacy. Potential for allergic reactions.	Very low

Improving Pathogenetically Substantiated Preventive Methods: 1)Based on the pathogenetic model, an ideal preventive strategy should be multi-faceted, aiming to control inflammation, manage pain safely, and support the child's overall comfort. 2) Proactive Anti-inflammatory Approach: Instead of waiting for severe symptoms, management should focus on the early signs of gum inflammation. The cornerstone of this is non-pharmacological methods. The use of chilled (not frozen) items should be encouraged as the primary intervention. Silicone-based teething toys that are easy to clean are preferable. 3) Judicious and Educated Use of Pharmacotherapy: Parental education is paramount. Healthcare providers must give clear instructions on the appropriate use of systemic analgesics like ibuprofen, which is often preferred over acetaminophen due to its additional anti-inflammatory properties, especially when gingival swelling is prominent. The focus should be on using the lowest effective dose for the shortest possible duration. A "symptom diary" could help parents track symptoms and medication use, preventing accidental overdosing.

Development of Safer Topical Agents: The market need for effective topical relief is clear, but safety is a major concern. Future research should focus on developing topical agents that do not rely on anesthetics like benzocaine. Potential candidates could include formulations with:

1) Hyaluronic acid: Known for its anti-inflammatory and tissue-healing properties, it could help soothe irritated gums and promote mucosal health.

2) Natural anti-inflammatory agents: Standardized extracts of plants like chamomile (Matricaria recutita) or licorice root (Glycyrrhiza glabra) in a bio-adherent gel could provide localized relief. However, these require rigorous clinical trials to establish efficacy and safety, similar to any pharmaceutical drug.

Table 2.
Proposed integrated model for teething syndrome management

Symptom severity	**First-line intervention**	**Second-line intervention**	**Actions to avoid**
Mild (Irritability, drooling, minor gum redness)	- Gum massage with a clean finger. - Chilled teething ring/washcloth. - Comfort and distraction.	- Application of a safe, non-anesthetic, evidence-based topical gel (e.g., hyaluronic acid-based).	- Use of any medication. - Use of homeopathic teething tablets (risk of toxicity).

JOURNAL OF APPLIED SCIENCE AND SOCIAL SCIENCE
eISSN 2229-3113 pISSN 2229-3205
Volume 15 Issue 10, October 2025
Impact factor: 2019: 4.679 2020: 5.015 2021: 5.436, 2022: 5.242, 2023: 6.995, 2024 7.75

Moderate (Visible gum swelling, crying from pain, sleep disturbance)	- All mild interventions. - Offer chilled, soft foods (if age-appropriate).	- A single, appropriate dose of systemic analgesic (Ibuprofen preferred for inflammation) before bedtime or a particularly difficult period.	- Routine or 'around-the-clock' dosing of analgesics. - Use of topical benzocaine/lidocaine gels.
Severe (Inconsolable crying, refusal to eat/drink, low-grade fever <38.5°C)	- All mild and moderate interventions.	- Consult a pediatrician or pediatric dentist. - Administer systemic analgesics as recommended by the healthcare provider.	- Assuming symptoms are only due to teething. Must rule out other illnesses (e.g., otitis media, viral infections). - Use of amber teething necklaces (choking/strangulation hazard).

This integrated model emphasizes a stepwise, evidence-based approach. It prioritizes safety and empowers parents with knowledge while setting clear boundaries for when medical consultation is necessary. Discussing this model with parents during routine well-child visits before the onset of teething could serve as a powerful primary prevention strategy.

CONCLUSION

The complications associated with teething syndrome are primarily driven by a predictable inflammatory response to a natural physiological process. A thorough understanding of this pathogenesis is essential for shifting the management paradigm from reactive symptom treatment to proactive, evidence-based prevention. The current reliance on a wide range of unverified remedies and the potential misuse of pharmacological agents highlight an urgent need for standardized, safe, and effective guidelines.

The most effective approach is an integrated one that begins with non-pharmacological methods like cryotherapy and mechanical stimulation, which directly and safely counteract local inflammation and pain. When pharmacological intervention is necessary, the judicious use of systemic anti-inflammatory analgesics like ibuprofen, guided by clear professional advice, is warranted. There is a significant opportunity for future research and development in the area of safe, non-anesthetic topical agents that can modulate the local inflammatory environment without posing systemic risks.

Ultimately, improving the prevention of teething-related complications lies in robust parental education. Equipping caregivers with a clear understanding of what to expect, which symptoms are normal, which are red flags for other illnesses, and how to apply a stepwise management approach is the most impactful public health strategy. Healthcare professionals, particularly pediatricians and pediatric dentists, must take an active role in disseminating this information, thereby reducing infant discomfort, alleviating parental anxiety, and preventing iatrogenic harm from unsafe practices.

REFERENCES

1. Ashley, M. P. (2001). Personal view: It's only teething... A report of the myths and

JOURNAL OF APPLIED SCIENCE AND SOCIAL SCIENCE
eISSN 2229-3113 pISSN 2229-3205
Volume 15 Issue 10, October 2025
Impact factor: 2019: 4.679 2020: 5.015 2021: 5.436, 2022: 5.242, 2023: 6.995, 2024 7.75

modern approaches to teething. *British Dental Journal, 191*(1), 4–8. https://doi.org/10.1038/sj.bdj.4801078

2. Kupietzky, A. (2007). Teething, teething pain and teething remedies. In M. L. Young & M. S. T. Casamassimo (Eds.), *Pediatric Dentistry: Infancy through Adolescence* (pp. 210–225). Saunders Elsevier.

3. Massignan, C., Cardoso, M., Porporatti, A. L., Aydinoz, S., Canto, G. L., Mezzomo, L. A., & Bolan, M. (2016). Signs and symptoms of primary tooth eruption: A meta-analysis. *Pediatrics, 137*(3), e20153501. https://doi.org/10.1542/peds.2015-3501

4. Memarpour, M., Soltanimehr, E., & Eskandarian, T. (2015). Signs and symptoms of primary tooth eruption: A clinical study of 150 infants. *Journal of Dentistry (Shiraz, Iran), 16*(1), 43–48. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4377125/

5. Moss, S. J. (1999). Teething: A parent's guide to easing the pain. *Journal of the American Dental Association, 130*(6), 886. https://doi.org/10.14219/jada.archive.1999.0323

6. Ramos-Jorge, J., Pordeus, I. A., Ramos-Jorge, M. L., & Paiva, S. M. (2011). Prospective longitudinal study of signs and symptoms associated with primary tooth eruption. *Pediatrics, 128*(3), 471–476. https://doi.org/10.1542/peds.2010-2592

7. Tsang, A. K. L., & Rinar, S. (2016). Teething, teething pain and teething remedies. *International Dentistry South Africa, 8*(5), 48–61.

8. U.S. Food and Drug Administration. (2018). *Risk of serious and potentially fatal blood disorder prompts FDA action on oral drug products containing benzocaine*. FDA.gov. https://www.fda.gov/drugs/drug-safety-and-availability/risk-serious-and-potentially-fatal-blood-disorder-prompts-fda-action-oral-drug-products-containing