

All about Teething – Myths to Evidence-Based Treatment

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ABSTRACT

Teething is one of the most important events that occur in a child's life which, thereafter, grabs its family's attention. There are innumerable myths about teething discomfort, its systemic manifestations and remedies. Notorious as it was in the medieval times for child's morbidity and mortality, the scientific research in the 21st century explains the actual mechanisms causing discomfort, the comorbid conditions deteriorating the child's health and the side effects of vehement remedies used in the past under the disguise of teething. We have tried to draw attention to the most common symptoms associated with teething as reported by studies in several regions around the globe. This review article will enhance awareness about teething symptoms and their associated anomalies among the dentists and parents of the child. This article also discusses the supportive and treatment measures that can be taken by general dental practitioners and paediatric dentists to manage this condition.

Keywords: Cytokines, Dental Diseases, Gingival Fluid, Tooth Eruption, Tooth Eruption Ectopic

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INTRODUCTION

The eruption of teeth is a physiological process which involves the migration of a tooth from the intra-osseous site of jaws into the oral cavity of a child.¹ This process begins 4-10 months after birth and by the time, the child is 30 months old, his primary dentition consists of a complete set of 20 deciduous teeth.² Tooth eruption is influenced more by genetic factors than environmental factors.³ It is a collective event of infection, inflammation, trauma, and healing. Teething is linked to variable local as well as systemic disorders,^{4,5} including irritability, hypersalivation, drooling, restlessness, loss of appetite, diarrhoea, and fever.^{6,8} In the past, Hippocrates, Celsus, Aristotle and Homer have associated the process of teething with substantial morbidity.⁹ However, the latest scientific researches prove the inefficacy of this historical association and advocate referral to a physician in case of severe systemic manifestations.^{9,10} Teething is a physiological and emotional event for both mother and child because of their communal interactions during this interim period.¹⁰ Today, effective management of the teething child by supportive measures, pharmacological remedies or holistic therapy can be accomplished under the umbrella of scientific research and medical advancements.⁹

JOURNEY FROM TEETHING MYTHS TO THE REALM OF SCIENTIFIC REASONING

Throughout history, teething was notorious for numerous childhood ailments. In Iraq (ancient city of Uruk) archaeologists excavated clay tablets of the Sumerian civilization (3000BC) where goddess Ninsutu was worshipped for tooth care.^{11,12} In 1000 BC, a revered manuscript of Hinduism, the Atharvaveda, comprised prayer for the safe eruption of a baby's teeth.^{11,12}

The Homeric Hymns (9th century BC) describe the teething worm as the 'undercutter'. The Greeks used to worship 'Demeter', the goddess of children and mothers to shield them from the havocs of this worm.^{11,12}

Around the 4th century BC, Hippocrates acknowledged in his disquisition, *De Dentitione* that teething children endure gum irritation, seizures, fevers, and diarrhoea, during the eruption of cuspid teeth. According to him, obese and constipated babies had a more problematic time while teething. Spasms and seizures were infrequent in babies with diarrhoea during the period of

teething. This idea finds its roots in Hippocrates' philosophy that bad humour leaves from the body with the stools.^{11,12}

Around 117 AD, a physician from Ephesus (Greece) and a chief representative of the methodical school of medicine, Soranus, penned that itching of the gingiva by compact food made it thick and halted the physiological eruption of the tooth. He recommended olive oil to soften the gums. He also advocated the use of the hare's brain to relieve the agony of teething symptoms. This treatment prevailed till the 17th century.^{11,12}

TEETHING MORTALITY ACROSS THE WORLD

Teething was considered a life-threatening event until the end of the 19th century. Guthrie quoted an 18th century British source stating that about one-tenth of all children, born in the same year, die during teething.¹³ The Registrar General's report of 1839 reported 5016 deaths in Wales and England due to teething. According to the 1842 report teething was defamed for 12% of all deaths in children younger than 4 years of age.¹³ In 1939 Witkin declared that a great preponderance of all new-borns' afflictions was attributed to teething with a mortality rate towering up to fifty percent.¹⁴ The disease acquired a Latin name - *dentitio difficilis*, or difficult dentition.¹⁴

TEETHING IN THE 19TH CENTURY

In 1896, Dr. S.W. Foster asserted that the teething child becomes wakeful and anxious with a loss of appetite. The gastro-intestinal tract becomes hyperactive accompanied by nausea, vomiting and diarrhoea, if not relieved, paralysis and convulsions may set off a cascade of events leading to death.¹⁵ The first dentition is an anatomical as well as the physiological dilemma of infancy.¹⁶ It is quite infrequent for a child to go through the phase of dentition short of experiencing any suffering, and more often there are significant and consequential disturbances to its health.¹⁶

Theory of reflex stimulation

French pathologist Dr. Francois Broussais believed that all disease is a chemical response to excessive chemical stimulation or excitation.¹⁷ The nervous agitation induced by the eruption of teeth intensifies the susceptibility and reduces the resistance of the child. The erupting teeth while piercing the gingival tissue stimulated the trigeminal nerve endings. A reflex

stimulation of other cranial and spinal nerves provoked inflammation, functional derangement, and disease in other organs primarily in the gastro-intestinal tract.¹⁷ This theory of medical physiology became most popular in the 19th century.¹⁷⁻¹⁹

SCIENTIFIC RESEARCH IN THE TWENTIETH CENTURY

The belief that teething deteriorates health even prevailed in the 20th century, when Schwartzman (1942) advocated that teething affects up to 13% of children.¹⁹ In the 1960s, a survey including 200 Finnish mothers was conducted where 90% of the mothers believed that teething causes gum irritation and finger sucking; 77% of the mothers believed that teething causes drooling while 50% of the mothers believed that it led to fever, sleep disorder and restlessness.²⁰

According to a study, fever, rashes, diarrhoea, bronchitis, and fits should not be attributed to teething. Identifying these signs and symptoms as teething is to delay the diagnosis and treatment of bronchopneumonia, pyogenic meningitis, urinary tract infections, gastroenteritis, and other serious disorders.²¹ Carpenter (1978)²² deduced that while the lower deciduous central incisors are erupting, 39% of the 120 subjects displayed one of the numerous symptoms (fever, gum irritation, diarrhoea, facial flushing, drooling and rhinorrhoea). A follow-up for 6 months showed that the symptoms disappeared either the day of tooth eruption or following eruption.²²

In an Australian study of parents of 92 infants in the 1990s, the majority believed that teething is associated with increased body temperature, pain, irritability, sleep disorder, increased biting, drooling and flushed cheeks. Only one parent was convinced that teething poses no problems.²³

SCIENTIFIC LITERATURE ABOUT TEETHING IN THE 21ST CENTURY

A cross-sectional study of pharmacists, nurses, dentists, general practitioners, and paediatricians from Australia reported that 32% of the pharmacists and 19% of the dentists believed teething to cause fever (>38°C) as compared to 8% of general practitioners, 7% of the nurses and 2% of the paediatricians. While 9% of the paediatricians and 30–50% of each of the other groups, believed that teething predisposes to infections such as common cold and ear infections.²⁴ A survey of 215 paediatricians in Florida studied theories related to teething and diarrhoea. The author referred to 18 studies from Asia, America, Australia and Africa. Thirty five percent of respondents advocated for an association with teething diarrhoea. The physicians who favoured teething diarrhoea were recent graduates, general practitioners and lady doctors who see a greater number of patients per week and practice in rural areas. However, teething diarrhoea was attributed to changes in the eating habits of a child, increased salivary rates and stress.²⁵ Table 1 below shows time of development, eruption and shedding of the deciduous dentition.

Table 1: Time of development, eruption and shedding of the deciduous dentition^{26,27}

Primary teeth	Initial calcification	Formation completion	Eruption		Shedding	
			Maxillary	Mandibular	Maxillary	Mandibular
Central incisors	4 th foetal mos.	18-24 mos.	8-12 mos.	6-10 mos.	6-7 yrs.	6-7 yrs.
Lateral incisors	4 th foetal mos.	18-24 mos.	9-13 mos.	10-16 mos.	7-8 yrs.	7-8 yrs.
Canine	4 th foetal mos.	30-39 mos.	16-22 mos.	17-23 mos.	10-12 yrs.	9-12 yrs.
1st molar	4 th foetal mos.	24-30 mos.	13-19 mos.	14-18 mos.	9-11 yrs.	9-11 yrs.
2nd molar	4 th foetal mos.	36 mos.	25-33 mos.	23-31 mos.	10-12 yrs.	10-12 yrs.

SCIENTIFIC ASSOCIATION BETWEEN TEETHING AND ITS SYSTEMIC MANIFESTATIONS

Pain prevalence during primary teeth eruption

A study conducted to determine the presence of pain and fever during 1st year of life concluded that the prevalence rate for teething fever and pain was 49.9 % and 35.5% respectively.⁴ This prevalence increased in parallel from 6-9 months but displayed opposite trends between months 9 to 15, when fever reduced to 0 % in the 12th month and then ascended to 22.2 % in the 15th month.⁴ However, pain prevalence escalated to 16.2 % in the 12th month and then dropped down to 11.4 % in the 15th month. Afterwards, the prevalence of both turbulences increased in a parallel manner again, crowning after 15 months of life.⁴ Tobacco smoke exposure (SHS)²⁸⁻³⁰ or active smoking during pregnancy increases bidirectional interaction between the immune system and the central nervous system. Nicotine mediated stimulation of nAChR results in unstable receptor activation and hyperalgesia.³¹ Moreover, childbirth via C-section,³² ethnicity³³ and prenatal plasma vitamin D levels^{34,35} were noteworthy early-life factors predisposing the teething child to pain and fever.

Role of inflammatory cytokines in pain and fever

Increased (Insulin-like growth factor 1) IGF-1 production leads to endogenous production of (Tumour Necrotic Factor- Alpha) TNF- α enhanced by (Interleukin-1 Beta) IL-1 β secretion. IL-1 β is an endogenous pyrogen which induces (Cyclo-oxygenase) COX-2 expression and Prostaglandin synthesis in peripheral tissues. (Prostaglandin E) PGE-2 acts on peripheral and central sites in the brain and spinal cord to induce hyperalgesia. PGE-2 also mediates a febrile response by (Prostaglandin E receptor 3) EP3 receptors which are expressed in neurons.³⁶⁻³⁹

Fever prevalence during primary teeth eruption

A body temperature above 37°C or 98.6°F is defined as fever. Different studies utilizing axillary, oral, tympanic and rectal thermometers were conducted to determine the best anatomical site for temperature measurement. In a systematic review and meta-analysis conducted by Mariana et al, an association between deciduous tooth eruption and fever was established only when rectal temperatures were evaluated. Table 2 shows association between fever and primary teeth eruption in different studies.

Table 2: Association between fever and primary teeth eruption in different studies

Authors	Sample features	Study design	Tooth eruption and fever assessment	Fever evaluation	Inferences
Macknin et al ⁴⁰	N=11 Age range=3-5.6 mos.	Prospective longitudinal paired evaluation	A trained paediatrician, nurse and parents	Tympanic temperature. Fever is documented as dichotomous variables	An association between tooth eruption and fever ($p>0.05$)
Ramos-Jorge et al ⁴¹	N=47 Age range 5-15 mos.	Prospective longitudinal paired evaluation	Trained dentists	Axillary and tympanic temperature. Fever is documented as continuous variables	During eruption days, children presented with elevated temperatures ($p<0.01$)
Jaber et al ⁴²	N=46 Age range 6-18 mos.	Prospective longitudinal paired evaluation	Mothers and health care professionals	Rectal temperature. Fever was recorded as dichotomous data	An association between fever and tooth eruption ($p<0.025$)

Galili et al ⁴³	N=43 Age range 5-23 mos.	Prospective longitudinal paired evaluation	Dentists and nurses	Rectal temperature. Fever was recorded as dichotomous data	An association between fever and tooth eruption ($p<0.05$)
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Teething diarrhoea

Recent studies advocate that inflammatory cytokines IL-1 β and IL-8 are associated with gastrointestinal disturbances and IL-1 β with appetite disturbances.⁴¹ Association between primary teeth eruption and diarrhoea was accredited to changes in eating habits, increased salivation rates, a teething child putting various things in their mouth due to irritability and stress.²⁵

Primary herpetic gingivostomatitis

Because the eruption of the deciduous teeth begins when the child is losing maternal antibodies and the newly perforated gingiva around an erupting tooth provides a niche for inoculation of the herpes virus. In an experiment including 20 infants, 23 samples of oral swabs were collected and sent to a virology laboratory.

Cultures for HSV1 were positive for 9 out of 20 subjects. The infants positive for HSV displayed signs of oral infection and symptoms constant with primary herpetic gingivostomatitis. None of the HSV negative infants demonstrated signs of oral infection. However, five of the HSV negative subjects had elevated body temperatures. All of the symptomatic, HSV negative infants were referred to physicians for evaluation. Recent elucidation of the clinical features suggests that human herpesvirus 6 (HHV-6) infection can be misdiagnosed as teething. This infection is pervasive, occurs mainly in infants of teething age and produces elevated body temperature and facial rash often accredited to teething distress.⁴⁴ Different teething anomalies and their management has been tabulated in Table 3 below.

Table 3: Various dental anomalies and their management

Teething Anomalies					
	Natal tooth	Neonatal tooth	Eruption cyst/eruption hematoma	Delayed eruption	Mesiodens
Description	Tooth present at birth ⁴⁵	Tooth erupting during the first month (30 days) after birth ⁴⁵	A pathological condition where benign cysts are formed in the oral mucosa ⁴⁷	When there is a delay of ≥ 6 months than the defined normal eruption time ⁵¹	Supernumerary tooth located in the pre-maxillary region between maxillary central incisors ⁵⁴
Clinical features	Conical or Shell-like teeth Yellowish hue Enamel or dentin hypoplasia Partial or complete root failure		Bluish-purple, translucent, reddish-brown, dome-shaped lesions, bumps, or bruises in the soft gum tissue over an erupting tooth ⁴⁸	A concurrent tooth in the opposite quadrant has erupted ⁴⁹	Small rudimentary or conical in shape to a complex form having several tubercles. It may be inverted when the crown faces the nasal cavity and the root towards the oral cavity

Cause	Trauma, infection, malnutrition, hormonal stimulation, superficially placed tooth germ, maternal exposure to environmental toxins	Degenerative changes of reduced enamel epithelium after amelogenesis Or develops from remnants of dental lamina	Local Systemic Congenital (AD)	Hereditary/genetic
Prevalence	85% of natal/neonatal teeth are mandibular central incisors 90% are part of normal deciduous dentition 10% are supernumerary	More common in deciduous mandibular central incisors	More common in permanent dentition. In deciduous dentition involves 2 nd primary molars ^{52,53}	low prevalence (1.5%) in deciduous dentition
Associated problems	Feeding problems Risk of aspiration Trauma to the tongue and soft tissues	Hinder or harm the appearance of teeth in the oral cavity ⁴⁹	Discomfort and pain Feeding problems Malocclusions The functional strain on remaining teeth	Delayed eruption of permanent incisors (34.28%) Midline diastema (28.57%) Displacement of adjacent teeth, dentigerous cyst development, resorption of roots, crowding or dilaceration.
Management	Parental counselling Grinding of incisal edges of the non-mobile tooth Extraction of the mobile tooth under topical 2% lignocaine Administer 1 mg of Vitamin K before extraction (if prophylactic dose not given immediately after birth) ⁴⁶	May resolve spontaneously or require monitoring, marsupialization or extraction of involved tooth ⁵⁰	May necessitate advanced treatment options including lancing or orthodontic treatment	Extraction, orthodontic treatment and follow-up

TEETHING AND REMEDIES

Ancient remedies

Galen, who was a Greek-Roman physician recommended, chloroform, camphor, mustard baths and local massage to relieve teething symptoms.⁵⁵ During archaic times, teething infants were encouraged to chew on solid objects for example tree roots.⁵⁵ In 1429, Von Laufenberg, a German priest, emphasized that rubbing the baby's gums with chamomile, hare's brain, honey and salt will soothe his agony.⁵⁵ Topical application of emollients, dietary changes and various

arcane medications were prescribed including calomel (a mercurial), opiates and a solution of lead- acetate. Purgatives and emetics were recommended.⁵⁵ Some remedies for teething were vehement which included bleeding,⁵⁶ blistering, placing leeches on the gums and applying cauterly to the head.⁵⁷

Surgical interventions used in the past

During the 16th century, French surgeon Ambroise Pare⁵⁸ introduced lancing of the babies' gums.⁵⁹ The concept that failure to incise the gums leads to infant mortality persisted for many centuries.⁶⁰ Joseph Hurlock in 1472,

advocated for gum lancing in every disease, whether the tooth was evident or not.⁶¹ The physician Marshall Hall (1790–1857) wrote that he would lance a baby's gums many times than omit it once⁶² and taught his students to do it before, during and after the tooth eruption, occasionally twice a day.⁶³ In due course, the practice of lancing gums started to decline and by 1896, some observers overemphasized that tooth eruption causes no

more symptoms than hair growth.⁶⁴ In 1898, the pioneer paediatrician, Abraham Jacobi, declared that gum lancing has lost its charms.⁶⁵ It is recommended that the dental surgeon should be consulted for gum lancing and his guidance should be sought to perform the procedure.⁶⁶ Table 4 below states the current recommended treatment for teething children.

Table 4: Current Recommended Treatment for Teething Children

Non-pharmacological	Pharmacological		Holistic
Reassurance ^{12,67} Cuddle therapy ⁶⁷ Teething rings (chilled) silicone teethers are more efficient than liquid-filled teethers ^{12,67} Hard and sugar-free teething rusks or bread Frozen items (sliced fruits, ice cubes or vegetables) ^{12,67} Pacifier (even frozen) ^{12,67} Cucumber (peeled) ¹² Rubbing the gums with a clean finger, chilled spoon or wet gauze ^{12,67}	Local - Lignocaine-based product - Dentinox Teething Gel - Calgel and Ringstead Teething Gel ¹² - Woodward's Teething Gel consists of 30% ethanol and is not recommended for infants ¹² - Products comprising lignocaine must be avoided in case of sensitivity. - Choline salicylate based products - Bonjela ¹² - DPF recommendation for children more than 4 months of age is 0.5 inch (7.5 mm) of gel to be massaged on the painful area every three hours, with a maximum of six applications per day. ⁶⁸	Systemic - Sugar free paracetamol elixir reduces pain and pyrexia ¹² - The DPF recommended paracetamol dosage: ⁶⁸⁻⁷¹ <ul style="list-style-type: none"> • 0-3 months: 40mg/dose • 4-11 months: 80 mg /dose • 12-23 months: 120mg/dose • 2-3 years: 160mg/dose • 4-5 years: 240 mg/dose - Doses are repeated at 4–6-hour intervals, with a maximum of 5 doses per day. ⁶⁷⁻⁷¹ - The BNF recommends paracetamol for infants less than 3 months of age only on a doctor's advice. ⁷² - Commercially available as: Paracetamol Oral Suspension, Infadrops, Calpol Infant, Disprol infant suspension, Fennings Children's Cooling Powders, Boots Infant Pain Relief. ¹² - Ibuprofen suspension is not recommended for teething. ¹²	Acupressure (pressure applied to certain skin points to provide temporary relief) ¹² Aromatherapy (essential oils like oil of clove, tea tree oil or chamomile oil) ¹² Massage (oil, gel, finger) ¹² Homeopathy (Ashton and Parsons Infant Powders 4mg, Teetha, Boots Homeopathic Teething Granules) ¹²

TAKE HOME MESSAGE

The cultural emboss of medical practice tangled with the evolution of science. In this realm of scientific revolution where drones are being used for scrutiny, satellites are means of communication with other worlds, rockets are transporting the man to mars, it has become nearly impossible to blindly believe in the myths of teething. A critical approach should opt while discussing mystic rituals under the label of the medicine. Moreover, the management of teething children and their parents should be practised at both undergraduate and postgraduate level.

Nowadays, numeral supportive measures, topical and systemic pharmacological preparations, as well as holistic therapies are used to relieve the discomfort of primary teeth eruption. The most frequent symptoms found to be associated with teething are irritability, drooling, pain, fever and to lesser extent diarrhoea. Teething is a period rather than a disease and the dentist must pay heed to other causes of the child's health deterioration such as infections, malnourishment or side-effect of any medication/remedy in case of severe systemic manifestations. Thus, in the 21st century teething is bequeathed to the shelf in consort with other archival idiosyncrasies. Don't we agree that the myths get weaker during the 2nd or 3rd baby's teething period?

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CONFLICT OF INTEREST

None to declare.

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