



THE ANATOMY AND CLINICAL IMPLICATIONS OF FUSED TEETH: A SYSTEMATIC REVIEW

Dr.N.Inbanesan^{1*}

^{1*}Reader in Department of OMFS Karpaga vinayaga Institute of Dental sciences, Tamilnadu, India, mmdcdentalomfp@gmail.com

corresponding author; Dr.N.Inbanesan

Reader in Department of OMFS Karpaga vinayaga Institute of Dental sciences, Tamilnadu, India, mmdcdentalomfp@gmail.com

Abstract

Fused teeth are rare developmental dental anomalies that are mostly categorized along with gemination under the umbrella term “double teeth” due to their similar clinical appearance and thus are harder to diagnose.. This systematic review aimed to examine the available literature on the epidemiology, etiology, clinical presentation, diagnosis, treatment, prognosis and associated anomalies of fused teeth. A literature search was performed on PubMed, Google Scholar, Cureus, and Google Search with respect to the PRISMA 2020 guidelines. Studies reporting clinical, radiographic, epidemiological, diagnostic, and treatment-related information on tooth fusion were reviewed. Given the heterogeneity of included studies, a qualitative narrative synthesis was performed. The literature review showed that fused teeth are rare developmental anomalies more common in primary dentition (milk teeth) than permanent dentition. (adult teeth), The literature reviewed indicated that fused teeth are uncommon developmental anomalies and they are seen more frequently in primary dentition than in permanent dentition.

Common clinical findings were enlarged crowns, developmental grooves, aesthetic concerns, malocclusion, and eruption disturbances. Diagnosis generally required both clinical and radiographic assessment, because the appearance of geminated and fused teeth usually was similar. The treatment plans varied according to the severity and morphology of the anomaly and ranged from periodic observation to restorative, endodontic, surgical and orthodontic treatments. In summary, fused teeth generally have a good prognosis when properly diagnosed and treated. Additional studies are needed to better understand etiology, prevalence, and longterm effects of condition

Keywords= Double teeth, fusion, germination, dental anomalies, schizodontism, twinning teeth, shark teeth.

Introduction

Gemination & Fusion

Double teeth are developmental dental anomalies and are divided into gemination and fusion. [48] Gemination is the attempt of a single tooth germ to split into two, which results in a bifid crown, generally with a common root and root canal system. [10] Fusion, in contrast, takes place during development when two adjacent tooth germs fuse to form a single enlarged tooth structure with two pulp chambers and root canals which may be separate or fused.

It can be difficult to differentiate gemination from fusion, especially when the clinical and

radiographic findings overlap or when a normal tooth fuses with a supernumerary tooth. [2] Therefore, the literature widely uses the term “double teeth” to refer to these anomalies without needing to clearly differentiate the two conditions.[41]

What are double teeth?

Double teeth are dental conditions where separate tooth germs attempt to join or when a singular tooth bud attempts to divide during development generally this occurs during odontogenesis (Creation of Primary Dentition) or during formation of Permanent dentition[11]

In contrast to regular tooth development where tooth eruption would result in separated teeth of normal size, double teeth are characterized by forming a single enlarged tooth, this results in the formation of one bigger tooth [12]

Double teeth may show partial or complete union of dentin, and based on the development stage pulp chambers and root canals can be separated or conjoined [18]

Oftentimes the merged tooth may simply look like a wide tooth, though, when you count the teeth one may be missing. [13]

This phenomenon can occur in Primary Dentition (baby teeth) or Permanent Dentition (adult teeth) but it is more commonly present in primary (milk) teeth. The cause isn't always clear, but it usually tends to happen during early development when the teeth are forming close together. [1]

Double teeth were repeatedly said to be found with no sex bias, though some studies concluded that genetics played a part in their existence. [3] Clinically, it may make the dentition have unusual shape, spacing etc shape, and may cause crowding later on. Usually the treatment option taken is to simply monitor dentition unless it starts causing functional or orthodontic problems. [17]

Double teeth are generally classified into two groups based on their pathogenesis: dental fusion and gemination. While the two conditions develop differently, they often appear similar clinically and can present with similar treatment considerations. For this reason, they are commonly grouped together under the term "double teeth."

The extent of union can vary, with teeth being completely fused, fused only at the crown, or fused only at the root. [15]

Both Geminated & Fused teeth strike a very similar appearance, it is quite hard to tell the two apart by using only physical characteristics, the two are distinguished by using radiographic findings [14]

Global Distribution of Double Teeth

As stated prior, double teeth tend to occur more in primary dentition, following is the prevalence of double teeth in primary dentition across the globe.

Research done for specifically double teeth showed following results-4.1% in Japanese children,[5] 0.5% in Croatian children, [6] 0.6% in Finnish children,[7] 1.5% in West-Indian children[16] & 1.3% in Turkish children.

[8]

Following is a table which shows the data in a more concise manner.

Table 1.1

4.1%	Japan
1.5%	Western India
0.5%	Croatia
0.6%	Finland
1.3%	Turkey

Clinical Relevancy of Double Teeth

The clinical relevance of double teeth extends beyond simply an abnormal tooth; these anomalies may compromise dental aesthetics, influence symmetry of smiles, and create numerous problems in achieving a healthy dental appearance. They can also affect normal tooth arches by creating abnormal teeth dimensions and altered arch relationships, which may lead to more serious dental

problems.

Furthermore, double teeth are also associated with the absence of permanent successors (adult teeth) making long time monitoring and early diagnosis essential [9] Tooth fusion is also said to cause pain, caries & malocclusion [20] Clinically managing double teeth can be challenging as most treatment plans are often complex & invasive, though less invasive and simple procedures are being developed actively. [1]

Objectives We Hope To Achieve With This Systematic Review

- To find and sort through all the available literature on fused teeth
- To identify and report any variations found in radiographic or clinical assessment of fused teeth
- To investigate the general appearance of fused teeth
- To draw attention to limitations and contradictions in nomenclature or treatment of fused teeth
- To look through the dental implications of fused teeth in various cases
- To compare different approaches used for studies and suggest better methods
- To review the limitations on existing data.
- To provide a clearer understanding of fused teeth through compiling and understanding given knowledge
- To mark out any inconsistencies present within the literature

Methods

Protocols And Reporting Guidelines

The research of this Systematic Review was guided by the latest PRISMA 2020 guidelines [19]

Eligibility Criteria

We included studies talking about data on tooth fusion or double teeth in humans such as case reports, case series, observational studies and review articles. Eligible studies had

to provide clinical, radiographic, epidemiological, diagnostic or treatment related information relevant to dental fusion. Only articles published in English were included in this review.

Studies were excluded if they were not related to tooth fusion or other relevant dental anomalies, included animal subjects, were not in English, or did not contain sufficient clinical information to appeal to the aims of the review .

Information Sources

A extensive electronic search was conducted across the world wide web to identify relevant studies concerning tooth fusion and various dental anomalies, electronic databases searched included- PubMed and Google Scholar, additional relevant studies were identified through manual screening of the reference lists of selected articles.

The search included case reports, case series, epidemiological studies, retrospective studies, and review articles published up to June 2026.

Articles reporting clinical, radiographic, epidemiological, diagnostic, prognostic and treatment-related aspects of dental fusion were considered for inclusion. Only studies published in English were included in the review.

Search Strategy

We performed a complete and thorough literature review in PubMed, Google Scholar, Cureus, and Google Search to identify studies on tooth fusion and other dental anomalies. The search strategy contains numerous keywords.

Key words used for search were “fused teeth”, “tooth fusion”, “dental fusion”, “gemination”, “double teeth”, “joined teeth” and “concrecence”. Further searches were conducted using terms related to the diagnosis, prognosis, epidemiology, clinical significance and treatment of fused teeth.

Different combinations of these keywords were used to narrow down the search results and increase relevance.

Reference lists of eligible studies were manually screened for additional relevant publications that may have been missed in the initial database search.

Study Selection

The literature search identified studies, which were screened in a stepwise process. First, titles were screened for relevance to the topic of tooth fusion and related dental anomalies. The relevant articles were then screened at abstract level and then the full text was assessed for eligibility for inclusion in the review.

Duplicates identified in different databases and search engines were removed before screening. Studies unrelated to tooth fusion, studies with animal subjects, studies not published in English, or studies irrelevant to the objectives of the review were excluded. Eligible studies were included in the qualitative analysis after screening.

Data Collection

Data were extracted from eligible studies based on the review objectives. Data were collected and recorded on the epidemiology, etiology, clinical presentation, diagnosis, treatment, prognosis and associated dental anomalies of fused teeth. Study characteristics, demographic data and clinically relevant findings were also abstracted for qualitative analysis when available.

The specific data extracted varied depending on the study design and the information reported by the authors due to the heterogeneity of the included studies.

Data Synthesis

A thorough meta-analysis was not possible due to variation in study design, methodology and reported outcomes between the included studies. Instead a qualitative narrative approach was used for the synthesis of the available evidence. The extracted data were classified into themes such as global prevalence, etiology, clinical features, diagnosis, treatment, prognosis and associated dental anomalies. Prevalence data from other populations and geographic regions were compared and discussed, where applicable, in order to identify trends and variations in the occurrence of fused teeth. The results were interpreted and summarized in accordance with the objectives of the review.

Risk of Bias

Due to variations across included studies and the dominance of case reports and case series, a formal risk-of-bias assessment was not considered.

PRISMA Flowchart

Records identified through database searching (n = 276)

↓

Duplicates removed (n = 126)

↓

Records screened (n = 150)

↓

Records excluded based on title (n = 80)

↓

Full-text articles assessed for eligibility (n = 70)

↓

Full-text articles excluded:

- Did not meet inclusion criteria (n = 50)
- Not in English (n = 5)

↓

Studies included in qualitative synthesis (n = 15)

Results

A total of 15 studies were included in this section. Although case reports, case series, observational studies and review articles were eligible for inclusion, the entirety of the literature identified was in the form of case reports of individual patients with fused teeth.

Table 1.2 shows the characteristics of the included studies.

Table 1.2

Ref No.	Author + Year	Study Design	Age/ Sex	Tooth Involved	Diagnosis	Clinical Finding	Treatment	Outcome
21	Türkçan et al. (2007)	Case Report	22/ M	Bilateral permanent maxillary central incisors	Gemination	Wide bifid crowns, developmental grooves, caries lesion, lip irritation, incising difficulties	All-ceramic crowns	Improved esthetics; healthy periodontal tissues; symptom-free at 1-year follow-up
14	Venkatesh et al. (2016)	Case Report	26/ F	Left mandibular third molar (38)	Double tooth (Suspected Gemination)	Enlarged double-tooth appearance, mesial caries, radiolucent crown groove, pain in 38 region	Root canal treatment; obturation and crown placement	Asymptomatic at follow-up
22	Pandya-Sharpe et al. (2021)	Case Report	61/ F	Lower right second molar	Gemination	Large bifid crown, fractured composite restoration, early caries, false periodontal pocketing	Oral hygiene intervention, scaling, composite restoration	No gingival inflammation; BPE improved from 3 to 0
23	Mohan et al. (2013)	Case Report	30/ F	Mandibular incisor region	Fusion	Enlarged tooth causing Aesthetic concern	NOT REPORTED	NOT REPORTED
24	Aggarwal et al. (2013)	Case Report	5/ F	Primary Double Tooth	Double tooth	History of trauma; esthetic concern	Endodontic treatment and	NOT REPORTED
							esthetic rehabilitation using silicone putty guide	
25	Rao et al. (2013)	Case Report	25/ M	Bilateral maxillary central incisors	Gemination	Macrodonia, incisal notching, shallow grooves, palatally displaced incisors	No treatment for Geminated teeth	NOT REPORTED
26	Chen et al. (2023)	Case Report	21/ F	Maxillary right first molar	Gemination	Extra buccal cusp, spontaneous pain, sensitivity to cold	CBCT root canal treatment	Favourable outcome reported
27	Hattab et al. (2014)	Case Report	10/ F	Maxillary right central incisor + supernumerary tooth	Incomplete Fusion	Enlarged crown, labial fusion groove, double talon cusps, carious developmental groove, tooth rotation/displacement, midline shift, occlusal interference	Selective cusp reduction, composite restoration, fluoride varnish, crown recontouring	Improved esthetics and function initially; no follow-up available

28	Akitomo et al. (2024)	Case Report	11/M	Maxillary right lateral incisor + supernumerary tooth	Fusion	Delayed eruption, palatally fused supernumerary tooth with independent crown.	Observation and periodic follow-up	No symptoms or functional problems
29	Demircioglu Guler et al. (2013)	Case Report	10/M	Maxillary right central incisor + supernumerary tooth	Fusion	Enlarged anterior tooth with labial and palatal grooves, anterior crowding, esthetic concern; two separate roots and pulp systems	Surgical hemisection and removal of supernumerary portion, composite restoration	tooth remained vital and asymptomatic at 18-month follow-up
30	Kamath et al. (2026)	Case report	27/M	Maxillary left third molar + supernumerary tooth	Fusion	Enlarged molar with increased buccopalatal dimension and altered crown morphology; fusion confirmed radiographically	No treatment	Asymptomatic
31	Liang et al. (2012)	Case Report	31/M	Bilateral maxillary	Fusion	Intermittent pain, enlarged/abnormal	Root canal treatment	Asymptomatic
				second and third molars		molar anatomy, caries present; CBCT revealed fused second and third molars on both sides	of right fused molars	
32	Velasco et al. (1997)	Case Report	NO T RE PO RT ED	Maxillary central incisor + supernumerary tooth	Fusion	Fusion of permanent central incisor with supernumerary tooth	Extraction of fused tooth	Esthetics and function successfully restored
33	Cetinbas et al. (2007)	Case Report	10/M	Maxillary left central incisor + supernumerary tooth	Fusion	Enlarged interior tooth with midline diastema	Hemisection, extraction of supernumerary portion & composite restoration	Tooth remained vital and healthy at 24 months
34	Mochizuki et al. (1999)	Case Report	2/F	Maxillary primary central incisors and right lateral incisor	Triple tooth fusion	Fusion of three primary incisors with a single root and fused pulp chamber; no systemic abnormalities	Preventive care and observation	No associated congenital abnormalities reported

Epidemiology

The reported prevalence of fused teeth varies with different populations and geographical regions as shown in Table 1.1. Studies from Croatia, Japan, Turkey and Western India reported prevalence rates between 0.5% and 4.1%. Despite these differences, fusion still remains a rare developmental dental anomaly.

In general, fusion was more frequently reported in the primary dentition than in the permanent dentition, which was consistent with the results of several studies. [35]

Etiology

The etiology of fused teeth is not well understood and seems to be multifactorial. Several studies have suggested the possible role of genetic factors in the development of fusion, suggesting a possible hereditary nature. [36] Other reported factors were local pressure between adjacent developing tooth germs, [37] trauma during odontogenesis, [36] environmental influences, [39] endocrine disturbances, nutritional deficiencies and infectious or inflammatory processes. [38]

While several mechanisms have been suggested there is no single causative factor that has been

consistently identified across the studies reviewed.

Clinical Features

The clinical features reported in the included studies are summarized in [Table 1.2.](#) & in the [Introduction](#) The most common clinical presentation described in all the reviewed studies was enlarged or double teeth with aberrant crown morphology. Developmental grooves at the junction were reported often. [40] Some studies also reported esthetic concerns, malalignment, eruption & spacing problems associated with fused teeth.

[41] Such dental anomalies may also complicate further surgical treatment [40]

Diagnosis

The diagnosis of double teeth in all the studies was mainly based on clinical examination but also used radiographic assessment. Clinically, the affected teeth usually had an enlarged or bifid crown, increased mesiodistal width, and abnormal number of teeth. The clinical features of fusion and gemination are often similar. [44] Definitive differentiation between the two conditions often required radiographic evaluation. [43] Crown and root morphology, pulp chamber configuration and the extent of union of the involved teeth were assessed using conventional radiographs (periapical and panoramic radiographs). [45] In selected complex cases, cone beam computed tomography (CBCT) was used.

[46] In the studies, the diagnosis was also most often made in childhood, which is in line with the greater occurrence of tooth fusion in the primary dentition. [42]

Associated Anomalies

Several dental anomalies associated with tooth fusion have been reported in the included studies. Fusion in the primary dentition was most commonly associated with the absence of the corresponding permanent successor tooth. [42]

Other anomalies that have been associated with this condition in the studies include supernumerary teeth and talon cusps, which have been found in combination with fused teeth in several case reports and clinical studies. [44]

Treatment

The studies included in this review reported that the treatment of the fused teeth varied according to the clinical presentation and the complexity of the anomaly. In many instances no active treatment was required and patients were followed by periodic observation. Treatment strategies reported included restorative treatment, endodontic therapy, surgical separation, extraction and orthodontic management. Several studies indicated that treatment could be complex and invasive, especially in cases with extensive crown or root fusion. [[Table 1.2](#)] [47] [1]

Prognosis

The studies included generally showed a good prognosis for fused teeth.

Patients who received treatment were generally asymptomatic at follow-up and exhibited acceptable clinical outcomes. Follow-up data

differed substantially with respect to length of follow-up and availability in the studies. Many reports did not provide information on long-term outcome. [[Table 1.2](#)]

Discussion

Epidemiology

The epidemiology of fused teeth is still not well understood due to the limited evidence available. Epidemiological studies have been mostly on small populations, making it difficult to accurately estimate the true prevalence of the anomaly. The prevalence rates from studies in Croatia, Japan, Turkey and Western India varied from 0.5% to 4.1% [[Table 1.1](#)].

However, these studies are limited to a few geographic regions and populations, and show the

paucity of epidemiological data on fused teeth. Differences in sample size, study design, diagnostic criteria and population characteristics may account for variation in reported prevalence. A few authors have also proposed that genetic factors may be involved in the development of fused teeth [49] [50]

If genetic influences are implied, then geographical and ethnic differences may at least partly explain the differences in prevalence between populations. However, the present evidence is not strong enough to draw firm conclusions and larger population-based studies are necessary to better characterise the epidemiology and global distribution of fused teeth. One of the most consistent findings in the literature is that fused teeth are more frequently reported in the primary dentition than in the permanent dentition [51] [4] although there is no epidemiological evidence. This has been noted by a number of authors, and seems to be one of the few grounds of knowledge in the epidemiological literature.

However, the reasons for this difference are unclear. More research is needed to know if it reflects real biological variation

Etiology

Fused teeth are not well comprehended, and no single etiologic mechanism has been universally accepted. Most authors consider dental fusion as a multifactorial developmental anomaly due to the interaction of genetic and environmental factors [39][36]. According to one of the most accepted theories, fusion occurs when two developing tooth germs come into close contact during odontogenesis. This contact may result in pressure necrosis of the intervening tissues, so that the neighbouring tooth germs may fuse together and develop as a single enlarged tooth.[52][35] This theory is often quoted in the literature, however the exact biological mechanisms behind the process are unclear. Several authors have also suggested the involvement of genetic factors in the etiology of fused teeth. The familial occurrence has raised speculation of a hereditary component and recent genetic studies have identified variants in genes involved in tooth development that may be associated with the anomaly.[49][53] Furthermore, differences in prevalence between populations may indicate a genetic and ethnic susceptibility to tooth fusion. But the evidence is scant so far; no specific genetic mechanism has been conclusively pinned down. Genetic influences have been implicated along with environmental and developmental factors. Local injuries during tooth development, metabolic disturbances, and other disturbances affecting Odontogenesis have been suggested as a possible contributing factor [52][41]. However, these hypotheses are mostly based on individual observations and case reports and it is difficult to determine their real significance. No single etiological factor can be attributed as the sole cause of tooth fusion based on the available evidence. According to the current literature, the multifactorial hypothesis seems to be the most complete in explaining the development of fused teeth. The anomaly is likely due to an interplay between genetic susceptibility and local environmental and developmental effects. But the current state of knowledge is still limited by the publications of case reports and the absence of large genetic and epidemiological studies, showing the need for further research on the reasons for the condition.

Clinical Features

The clinical picture of fused teeth varies greatly, depending on the teeth involved, the stage of development at which the fusion occurs, and the extent of the union between the tooth germs involved. However, one of the most consistent findings reported in the literature is the presence of an enlarged or atypical shaped crown. During clinical examination, the affected tooth is readily distinguishable from neighboring teeth, as it is often wider than normal and has an irregular morphology. In such cases a bifid crown may also be found, [37] [54] [55] especially if the fusion is incomplete. The other common finding is the presence of developmental grooves along the crown and sometimes toward the root surface. These grooves can make it difficult to clean and serve as plaque retentive sites. As a consequence, affected teeth may be more susceptible to dental caries and periodontal complications. In several of the studies included in this review, developmental grooves

were identified as an important clinical feature that needs to be monitored and managed carefully. [56] [41] The most common reason for seeking treatment was esthetic concerns, particularly when the anterior teeth were involved. The abnormal size and appearance of fused teeth can have a significant impact on smile aesthetics and may lead to psychological or social concerns for some patients. [1] [26] In addition to esthetic problems, fused teeth have been reported to be associated with malocclusion, crowding, spacing aberrations, and eruption disturbances. These complications may affect the development of the arch and sometimes require orthodontic treatment. [56] [57] In general, the reviewed literature suggests that while some patients with fused teeth are asymptomatic, others may have a variety of esthetic and functional problems. [Table 1.2] The most consistent clinical findings are enlarged crown morphology and developmental grooves. The variable clinical presentation underscores the necessity for individualized evaluation and treatment, as the effect of fused teeth can differ greatly between patients

Associated Anomalies

Tooth fusion is a developmental dental anomaly where two nearby tooth germs join together while the teeth are forming. This results in one very large tooth instead of two separate ones. Depending on when this happens during development, the fused tooth can share enamel, dentin, and sometimes the pulp. It is important clinically because it changes the normal tooth count in most cases and also makes diagnosis and treatment planning more complicated. [2] [36]

There are several other developmental dental conditions that have been reported together with tooth fusion in studies, which suggests that something may be affecting normal tooth development in more than one way.

Hypodontia means missing teeth from birth because one or more tooth germs never form properly. It is one of the most common dental developmental problems. In studies, hypodontia is often seen in patients who also have tooth fusion. This has been thought to suggest that something goes wrong in early tooth development, affecting both the number and shape of teeth. Among the associated conditions, hypodontia is reported more often with fusion than extra teeth. [58] [59]

Gemination is when a single tooth germ tries to split into two during development, so it ends up looking like a big tooth with a notch or divided crown. [10] In clinics and studies, gemination and fusion are often talked about together because they look very similar and are both called “double teeth.” [39] The main difference is that gemination comes from one tooth germ, while fusion comes from two. In real practice, it is often hard to tell them apart. And usually radiographic statements are required. Though. They usually cannot be distinguished by physical characteristics. [9] Because of this overlap, studies sometimes report inconsistent numbers for how common each condition is.

Macrodonia means a tooth that is larger than normal. [60] In tooth fusion, the tooth is naturally very big because two teeth are joined, [11] so it can look like macrodonia at first glance. This can make diagnosis confusing, especially in front teeth where size and shape are very obvious. X-rays may be needed to tell the difference between a truly big single tooth and a fused tooth.

Concrescence is a condition where two fully formed teeth become joined together only by cementum (a layer on the root surface). This usually happens after the roots are already formed. It is different from fusion because it does not involve enamel or dentin joining. [60] It is quite rare. Even though it is related in the sense that teeth are joined together, most studies do not include it in tooth fusion discussions because it happens in a different way and at a different stage of development, though it is also under the umbrella term “double teeth”. [61]

Overall, studies show that tooth fusion is most commonly linked with hypodontia. The link with supernumerary teeth is less common, but still reported. The presence of both missing teeth and extra teeth in different cases suggests that tooth development can be affected in different directions. Also, because fusion can look similar to gemination and sometimes even macrodonia, it can be hard to classify correctly, which is why studies sometimes disagree on exact numbers. Concrescence is usually left out of most fusion discussions because it is a different process, even though it looks somewhat related.

Treatment

The management of fused and geminated teeth varied according to the clinical presentation and level of difficulty of the anomaly. Conservative approaches, including periodic observation, were commonly used for asymptomatic cases that didn't have functional or esthetic concerns. In contrast, restorative procedures such as composite restorations, crown recontouring, and full-coverage crowns were employed to address esthetic issues, developmental grooves, and carious lesions.

Endodontic treatment was used in symptomatic teeth or those with pulpal involvement, with reported cases demonstrating good outcomes following root canal treatment. The use of advanced imaging modalities such as CBCT was highlighted in some studies, emphasizing the importance of accurately analyzing the complexities of this condition.

More invasive tricks, including surgical hemisection and removal of the fused component, were reserved for cases presenting with significant esthetic, functional, or orthodontic complications. Overall, treatment outcomes were generally favorable; however, the available evidence is limited primarily to case reports with short follow-up periods, making it difficult to establish standardized treatment guidelines. [[Table 1.2](#)] [[1](#)] [[47](#)]

Prognosis

The prognosis of fused and geminated teeth is generally favorable when the condition is diagnosed early and managed according to the patient's health safety and clinical needs. Long-term outcomes largely depend on things such as the extent of fusion, pulpal involvement, periodontal status, and the presence of associated complications including caries and malocclusion. Early intervention and regular follow-up are important in stopping disease progression and keeping up with function and esthetics. However, the available evidence is taken primarily from case reports with limited follow-up periods, restricting definitive conclusions regarding long-term prognosis. [[Table 1.2](#)]

Limitations

The findings of this systematic review should be interpreted in light of the limited body of available literature on fused and geminated teeth. Due to the relatively small patient base of these developmental anomalies, considerably few studies have been published, resulting in quite a small evidence base. Moreover, variations in clinical presentation and reporting among the included studies may have influenced the ability to draw broader conclusions. Nevertheless, the available literature provides good insights into the diagnosis, treatment, and prognosis of fused teeth conditions.

Recommendations For Future Researchers

Future studies should have an immense focus on larger patient count and longer follow-up consistency to improve understanding of the clinical behavior and long-term behaviour of fused and geminated teeth. The development of universal diagnosis criteria and reporting protocols would be amazing for comparison across studies. Further research is also needed to evaluate the effectiveness of different treatment approaches and establish evidence-based management guidelines for these developmental anomalies.

REFERENCES

1. Veeraiyan DN, Fenton A, Jokstad A. A conservative approach to the aesthetic management of dental fusion: a case report. *Quintessence Int.* 2009;40(10):801-803.
2. Mader CL. Fusion of teeth. *J Am Dent Assoc.* 1979;98(1):62-64. doi:10.14219/jada.archive.1979.0037.
3. Kariya PB, Shah S, Buch S, et al. Bilateral Fusion of Deciduous Teeth in Mandibular Arch with the Absence of Permanent Successor: Concomitant Fusio-agenesia. *J South Asian Assoc Pediatr Dent* 2020;3(2):80–83.
4. Mukhopadhyay S, Mitra S. Anomalies in primary dentition: Their distribution and correlation

- with permanent dentition. *J Nat Sci Biol Med.* 2014 Jan;5(1):139-43. doi: 10.4103/0976-9668.127313. PMID: 24678213; PMCID: PMC3961919.
5. Yonezu T, Hayashi Y, Sasaki J, Machida Y. Prevalence of congenital dental anomalies of the deciduous dentition in Japanese children. *Bull Tokyo Dent Coll.* 1997 Feb;38(1):27-32. PMID: 9566151.
 6. Skrinjarić I, Barac-Furtinović V. Anomalije mliječnih zuba i stanje trajne denticije [Anomalies of deciduous teeth and findings in permanent dentition]. *Acta Stomatol Croat.* 1991;25(3):151-6. Croatian. PMID: 1819942.
 7. Järvinen S, Lehtinen L, Milén A. Epidemiologic study of joined primary teeth in Finnish children. *Community Dent Oral Epidemiol.* 1980 Aug;8(4):201-2. doi: 10.1111/j.1600-0528.1980.tb01286.x. PMID: 6936120.
 8. Kapdan A, Kustarci A, Buldur B, Arslan D, Kapdan A. Dental anomalies in the primary dentition of Turkish children. *Eur J Dent.* 2012 Apr;6(2):178-83. PMID: 22509121; PMCID: PMC3327494.
 9. Budayri R W, Morad M, Alhazmy R, et al. (September 20, 2025) Bilateral and Unilateral Fused Primary Teeth With Hypodontia in Permanent Dentition: A Case Series. *Cureus* 17(9): e92772. doi:10.7759/cureus.92772
 10. Nandini DB, Deepak BS, Selvamani M, Puneeth HK. Diagnostic dilemma of a double tooth: a rare case report and review. *J Clin Diagn Res.* 2014 Jan;8(1):271-2. doi: 10.7860/JCDR/2014/6556.3928. Epub 2014 Jan 12. PMID: 24596793; PMCID: PMC3939503.
 11. Luder HU. Malformations of the tooth root in humans. *Front Physiol.* 2015 Oct 27;6:307. doi: 10.3389/fphys.2015.00307. PMID: 26578979; PMCID: PMC4621611
 12. Muthukumar RS, Arunkumar S, Sadasiva K. Bilateral fusion of mandibular second premolar and supernumerary tooth: A rare case report. *J Oral Maxillofac Pathol.* 2012 Jan;16(1):128-30. doi: 10.4103/0973-029X.92990. PMID: 22434949; PMCID: PMC3303507.
 13. Li, S., Li, Y., Sun, W. et al. Panoramic radiographic analysis of primary tooth fusion and associated permanent successor anomalies in 2989 Chinese children: a retrospective epidemiological study. *BMC Oral Health* 26, 1033 (2026). <https://doi.org/10.1186/s12903-026-08283-w>
 14. Venkatesh A, Mitthra S, Prakash V, Prasad T. S. Gemination or Fusion ? – A case report. *Biomed Pharmacol J* 2016;9(3).
 15. Badole GP, Shenoi PR, Parlikar A. Endodontic management of central incisor associated with large periapical lesion and fused supernumerary root: a conservative approach. *Restor Dent Endod.* 2018 Oct 26;43(4):e44. doi: 10.5395/rde.2018.43.e44. PMID: 30483468; PMCID: PMC6237732.
 16. Tasa GL, Lukacs JR. The prevalence and expression of primary double teeth in western India. *ASDC J Dent Child.* 2001 May-Jun;68(3):196-200. PMID: 11693013.
 17. El Backly RM, Kotry GS, Moussa H. Multidisciplinary management of a fused maxillary incisor: Case report with 5-year follow-up. *Clin Case Rep.* 2020 Dec 10;9(2):775-786. doi: 10.1002/ccr3.3629. PMID: 33598244; PMCID: PMC7869352.
 18. Sammartino, G., Cerone, V., Gasparro, R. et al. Multidisciplinary approach to fused maxillary central incisors: a case report. *J Med Case Reports* 8, 398 (2014). <https://doi.org/10.1186/1752-1947-8-398>
 19. Matthew J. Page, et al. The PRISMA 2020 statement: an updated guideline for reporting systematic reviews. *BMJ.* 2021;372:n71
 20. Ramamurthy S, Satish R, Priya K. Surgical and orthodontic management of fused maxillary central and lateral incisors in early mixed dentition stage. *Case Rep Dent.* 2014;2014:109301. doi: 10.1155/2014/109301. Epub 2014 Oct 13. PMID: 25371828; PMCID: PMC4209776.
 21. Türkaslan S, Gökçe HS, Dalkız M. Esthetic rehabilitation of bilateral geminated teeth: a case report. *Eur J Dent.* 2007 Jul;1(3):188-91. PMID: 19212565; PMCID: PMC2638247.
 22. Pandya-Sharpe, A., & Puryer, J. (2021). A Geminated Mandibular Second Molar—A Case Report. *Reports*, 4(4), 31. <https://doi.org/10.3390/reports4040031>

23. Mohan RP, Verma S, Singh AK, Singh U. Double tooth in mandibular incisor region: a case report. *BMJ Case Rep.* 2013 Feb 20;2013:bcr2012008647. doi:10.1136/bcr-2013-008647. PMID: 23429027; PMCID: PMC3604312.
24. Agarwal R, Chaudhry K, Yeluri R, Munshi AK. Esthetic management of a primary double tooth using a silicone putty guide: a case report. *J Calif Dent Assoc.* 2013 Mar;41(3):203-6. PMID: 23600163.
25. Rao P, Veena K, Chatra L, Shenai P. Twin tooth on either side: a case report of bilateral gemination. *Ann Med Health Sci Res.* 2013 Apr;3(2):271-3. doi: 10.4103/2141-9248.113677. PMID: 23919204; PMCID: PMC3728877.
26. Chen, M., Bai, X., Wang, X. et al. Conservative management of double teeth in molar teeth with pulp or periapical disease: a report of five cases and literature review. *BMC Oral Health* 23, 738 (2023). <https://doi.org/10.1186/s12903-023-03463-4>
27. Hattab FN. Double talon cusps on supernumerary tooth fused to maxillary central incisor: Review of literature and report of case. *J Clin Exp Dent.* 2014 Oct 1;6(4):e400-7. doi: 10.4317/jced.51428. PMID: 25593664; PMCID: PMC4282909.
28. Akitomo, Tatsuya, Satoru Kusaka, Momoko Usuda, Mariko Kametani, Ami Kaneki, Taku Nishimura, Masashi Ogawa, Chieko Mitsuhashi, and Ryota Nomura. 2024. "Fusion of a Tooth with a Supernumerary Tooth: A Case Report and Literature Review of 35 Cases" *Children* 11, no. 1: 6. <https://doi.org/10.3390/children11010006>
29. Demircioglu Guler, Derya, Sen Tunc, Emine, Arici, Nursel, Ozkan, Nilüfer, Multi disciplinary Management of a Fused Tooth: A Case Report, *Case Reports in Dentistry*, 2013, 634052, 5 pages, 2013. <https://doi.org/10.1155/2013/634052>
30. Kamath JS, Hegde S, Ajila V. Dental fusion: A report of 2 cases [Internet]. *IP Int J Maxillofac Imaging.* 2018 [cited 2026 Jun 20];4(3):99-101. Available from: <https://doi.org/10.18231/2581-3838.2018.0025>
31. Liang, RZ., Wu, JT., Wu, YN. et al. Bilateral maxillary fused second and third molars: a rare occurrence. *Int J Oral Sci* 4, 231–234 (2012). <https://doi.org/10.1038/ijos.2012.62>
32. Velasco LF, de Araujo FB, Ferreira ES, Velasco LE. Esthetic and functional treatment of a fused permanent tooth: a case report. *Quintessence Int.* 1997 Oct;28(10):677-80. PMID: 9477888.
33. Cetinbas T, Halil S, Akcam MO, Sari S, Cetiner S. Hemisection of a fused tooth. *Oral Surg Oral Med Oral Pathol Oral Radiol Endod.* 2007 Oct;104(4):e120-4. doi: 10.1016/j.tripleo.2007.03.029. Epub 2007 Jul 25. PMID: 17656128.
34. Mochizuki K, Yonezu T, Yakushiji M, Machida Y. The fusion of three primary incisors: report of case. *ASDC J Dent Child.* 1999 Nov-Dec;66(6):421-5, 367. PMID: 10656127.
35. Sultan N. Incidental finding of two rare developmental anomalies: Fusion and dilaceration: A case report and literature review. *J Nat Sci Biol Med.* 2015 Aug;6(Suppl 1):S163-6. doi: 10.4103/0976-9668.166129. PMID: 26604610; PMCID: PMC4630754.
36. Goswami M, Lohia S. Exploring Dental Fusion in Primary Dentition: A Pediatric Dental Perspective. *Cureus.* 2024 Sep 2;16(9):e68469. doi: 10.7759/cureus.68469. PMID: 39360086; PMCID: PMC11446408.
37. McKinney R, Brizuela M, Olmo H. Developmental Disturbances of the Teeth, Anomalies of Shape and Size. [Updated 2025 Feb 15]. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2026 Jan-
38. Rajendran R, Sivapathasundharam B. Developmental disturbances of oral and paraoral structures. In: Rajendran R, Sivapathasundharam B, editors. *Shafer's Textbook of Oral Pathology*. 8th ed. New Delhi: Elsevier; 2016.
39. Brook AH. Multilevel complex interactions between genetic, epigenetic and environmental factors in the aetiology of anomalies of dental development. *Arch Oral Biol.* 2009 Dec;54 Suppl 1(Suppl 1):S3-17. doi: 10.1016/j.archoralbio.2009.09.005. Epub 2009 Nov 13. PMID: 19913215; PMCID: PMC2981858.
40. Developmental Anomalies of Tooth Shape: A Review of Clinical Presentation, Diagnosis, and

- Management. (2026). *European Journal of Dental and Oral Health*, 7(3), 1-5. <https://doi.org/10.24018/ejdent.2026.7.3.70336>
41. Tuna EB, Koruyucu M, Seymen F, Gencay K, Ozgen M. Fused teeth: a review of the treatment options. *J Dent Child (Chic)*. 2009;76:109-116.
42. Ben Salem M, Chouchene F, Masmoudi F, Baaziz A, Maatouk F, Ghedira H. Fusion or Gemination? Diagnosis and Management in Primary Teeth: A Report of Two Cases. *Case Rep Dent*. 2021 Jun 1;2021:6661776. doi: 10.1155/2021/6661776. PMID: 34123435; PMCID: PMC8189771
43. Shrivastava S, Tijare M, Singh S. Fusion/double teeth. *J Indian Acad Oral Med Radiol*. 2011;23:S468-70. doi:10.5005/jp-journals-10011-1200.
44. Uys H, Morris D. 'Double' teeth-a diagnostic conundrum. *Dent Update*. 2005 May;32(4):237-9. doi: 10.12968/denu.2005.32.4.237. PMID: 15938344.
45. Ünçag Ö, Candan Ü, Arian F. Comprehensive therapy of a fusion between a mandibular lateral incisor and supernumerary tooth: case report. *Int Dent J*. 2005;55(4):213-216. doi:10.1111/j.1875-595X.2005.tb00315.x
46. Shokri A, Miresmaeili A, Farhadian N, Falah-Kooshki S. Fusion of mandibular second molar and a supernumerary tooth: a case report using cone beam computed tomography. *Dent Res J (Isfahan)*. 2014;11(5):631-636 .
47. Velasco LF, de Araujo FB, Ferreira ES, Velasco LE. Esthetic and functional treatment of a fused permanent tooth: a case report. *Quintessence Int*. 1997 Oct;28(10):677-80. PMID: 9477888
48. Analysis of the distribution and characteristics of supernumerary teeth in the pediatric population of Shanghai, China: a retrospective study
49. Park, H.; Hosomichi, K.; Kim, Y.-I.; Hikita, Y.; Tajima, A.; Yamaguchi, T. Comprehensive Genetic Exploration of Fused Teeth by Whole Exome Sequencing. *Appl. Sci*. 2022, 12, 11899.
50. Kantaputra, Piranit, Peeranat Jatooratthawichot, Kanoknart Chintakanon, Worrachet Intachai, Prapat Pradermdutsadeeporn, Ploy Adisornkanj, Sissades Tongsima, Chumpol Ngamphiw, Bjorn Olsen, Abigail S. Tucker, and James R. Ketudat Cairns. 2022. "Mutations in LRP6 Highlight the Role of WNT Signaling in Oral Exostoses and Dental Anomalies." *Archives of Oral Biology* 142: 105514. <https://doi.org/10.1016/j.archoralbio.2022.105514>
51. Açikel H, İbiş S, Şen Tunç E. Primary Fused Teeth and Findings in Permanent Dentition. *Med Princ Pract*. 2018;27(2):129-132. doi: 10.1159/000487322. Epub 2018 Feb 1. PMID: 29402820; PMCID: PMC5968246.
52. Rohilla M. Etiology of various dental developmental anomalies: review of literature. *J Dent Probl Solut*. 2017;4(1):019-025. doi:10.17352/2455-8418.000042.
53. William K. Duncan, Mark L. Helpin, Bilateral fusion and gemination: A literature analysis and case report, *Oral Surgery, Oral Medicine, Oral Pathology*, Volume 64, Issue 1, 1987, Pages 82-87, ISSN 0030-4220, [https://doi.org/10.1016/0030-4220\(87\)90121-6](https://doi.org/10.1016/0030-4220(87)90121-6).
54. Dinesh Rao B, Hegde S. A talon cusp on fused teeth associated with hypodontia: report of a unique case. *Eur J Dent*. 2010 Jan;4(1):75-80. PMID: 20046484; PMCID: PMC2798794.
55. White SC, Pharoah MJ. *Oral Radiology: Principles and Interpretation*. 7th ed. St. Louis, MO: Elsevier Mosby; 2014.
56. Yu YQ, Qiu LH. [Considerations of the classification and treatment for fused teeth]. *Zhonghua Kou Qiang Yi Xue Za Zhi*. 2023 Jan 9;58(1):25-30. Chinese. doi: 10.3760/cma.j.cn112144-20221021-00547. PMID: 36642449.
57. Prabhakar AR, Marwah N, Raju OS. Double teeth in primary dentition: A series of case reports. *Journal of Indian Society of Pedodontics and Preventive Dentistry*. 2010.
58. Whittington BR, Durward CS. Survey of anomalies in primary teeth and their correlation with the permanent dentition. *N Z Dent J*. 1996 Mar;92(407):4-8. PMID: 8649664.
59. Seema Lochib, K.R. Indushekar, Bhavna Gupta Saraf, Neha Sheoran, Divesh Sardana (2015) Occlusal characteristics and prevalence of associated dental anomalies in the primary dentition, *Journal of Epidemiology and Global Health* 5:2, 151– 157, DOI:

<https://doi.org/10.1016/j.jegh.2014.07.001>

60. Mamdani, S., Pathak, D., Harrison, M. et al. Macrodonia and double teeth: a review and case series. *Br Dent J* 234, 315–321 (2023). <https://doi.org/10.1038/s41415-023-5571-9>
61. Ahuja V, Pathak A. Fluke of Fusion and Concrescence in Maxillary Deciduous Incisors: A Case Report. *Int J Clin Pediatr Dent* 2023;16(S-3):S327–S330.
62. Woźniak Ł, Łukaszuk K, Antonowicz B, Szarmach J, Borys J. Concrescent Teeth: Extraction Implications – A Case Report. *The Open Dentistry Journal*. 2022;16:e187421062201311. <https://doi.org/10.2174/18742106-v16-e2201311>