# Temporomandibular Disorders in Children and Adolescents, Including Those with Special Health Care Needs

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## Abstract

*This best practice assists dental practitioners in recognizing and diagnosing temporomandibular disorders and identifying evidence-based treatment options. Temporomandibular disorders are a group of musculoskeletal and neuromuscular conditions that include clinical signs and symptoms involving the muscles of mastication, the temporomandibular joint, and associated structures and occasionally occur in chidren and adolescents, including those with special health care needs. Temporomandibular disorders generally are classified into 2 broad categories: temporomandibular joint conditions and masticatory muscle disorders. Diagnosing temporomandibular disorders should be based on a screening history, clinical examination, and diagnostic aids (eg, temporomandibular joint imaging). Temporomandibular disorder treatment goals include restoring function, decreasing pain, reducing risk factors, and improving quality of life. Treatment approaches include reversible and irreversible therapies. Common reversible approaches include patient instruction, physical therapy, behavioral therapy, pharmacotherapy, and occlusal splints. Meanwhile, with limited evidence for effectiveness of irreversible therapies (eg, occlusal adjustments, orthodontic treatment, surgery), such approaches should be avoided in children.*

*This document was developed through a collaborative effort of the American Academy of Pediatric Dentistry Councils on Clinical Affairs and Scientific Affairs to offer updated information and guidance on temporomandibular disorders in children and adolescents, including individuals with special health care needs.*

KEYWORDS: EVIDENCE-BASED DENTISTRY; PEDIATRIC DENTISTRY; TEMPOROMANDIBULAR JOINT DISORDERS; TEMPOROMANDIBULAR JOINT

## Purpose

The American Academy of Pediatric Dentistry (AAPD) recognizes that disorders of the temporomandibular joint (**TMJ**), masticatory muscles, and associated structures occur in children and adolescents, including those with health care needs. These recommendations are intended to assist the practitioner in the recognition and diagnosis of temporomandibular disorder (**TMD**) and to identify possible treatment options.

## Methods

Recommendations on temporomandibular disorders in children and adolescents were developed by the Clinical Affairs Committee—Temporomandibular Joint Problems in Children Subcommittee and adopted in 1990.[1] This document by the Council on Clinical Affairs is a revision of the previous version,[2] last revised in 2019. A search was conducted using the PubMed/MEDLINE database with the parameters: terms: *TMJ and occlusion* OR *TMJ and treatment* OR *TMJ and dysfunction* OR *TMJ and disorders* OR *temporomandibular joint dysfunction syndrome* OR *TMD treatment* OR *TMD occlusion* OR *temporomandibular joint* OR *temporomandibular joint disc* OR *mandible/physiopathology/masticatory muscles/physiopathology* AND *bruxism* OR *sleep bruxism or prevalence* OR *pain measurement* OR *facial pain/etiology* OR *headache/diagnosis* OR *pain measurement* AND *adolescent* OR *child* OR *sex characteristics* OR *gender differences* OR *dental care for children* OR *pediatric dentistry* OR *evidence-based dentistry*; limits: within the last 15 years, humans, English. One hundred ninety-eight articles met these criteria. Papers for review were chosen from these searches and from references within selected articles; textbooks also were used. When data did not appear sufficient or were inconclusive, recommendations were based upon expert and/or consensus opinion by experienced researchers and clinicians.

## Background

### Definition of TMD

TMD is a collective term for a group of musculoskeletal and neuromuscular conditions which includes several clinical signs and symptoms involving the muscles of mastication, the TMJ, and associated structures.[3] Joint disorders (eg, arthralgia, disc-condyle complex disorders), joint diseases (eg, osteoarthritis),

**ABBREVIATIONS**
**JIA:** Juvenile idiopathic arthritis. **MRI:** Magnetic resonance imaging. **TMD:** Temporomandibular disorder. **TMJ:** Temporomandibular joint.

and masticatory muscle disorders (eg, myalgia) fall under the umbrella of TMD.[4(pp204,205)]

**Prevalence of TMD in children and adolescents**

TMDs is a major cause of nonodontogenic pain in the orofacial region.[5] The reported prevalence of TMD in children and adolescents varies widely in the literature.[6-11] This variation may be due to[6,8-10,12,13] differences in populations studied, diagnostic criteria, examination methods, and lack of a universally-accepted and validated tool for pediatric and adolescent TMD assessment. The Diagnostic Criteria for Temporomandibular Disorders (DC/TMD) examination decreases variability in diagnosis but is designed for patients over age 18.[14,15] A systematic review using this instrument found TMD prevalence in patients aged 10- to 19-years-old ranged from 7.3% to 30.4%.[6] Another systematic review demonstrated a higher prevalence of TMD in females (44.7%) than males (30%).[9] Data suggest the prevalence increases with age; yet, few studies include patients under age 9.[8,14,16] A 2021 meta-analysis reported joint-related TMD in 31% of adults and 11% of children and adolescents.[11] Regional studies demonstrate a 2% to 3% incidence (rate of new cases that will develop over time) of TMD in adolescence.[17] Recent adaptation of the Diagnostic Criteria for Temporomandibular Disorders for children (6- to 9-years-old) and adolescents (10- to 19-years-old)[18-21] has the potential to facilitate pediatric and adolescent research.

Headaches are common during pediatric and adolescent years,[22] with an overall prevalence of 38% in females and 27% in males.[23] Although TMD may occur alongside a primary headache disorder (eg, migraine, tension-type headache), the International Classification of Headache Disorders includes "headaches attributed to temporomandibular disorder" as a distinct headache diagnosis.[22,24] TMD pain is highly associated with headaches in adolescents, with headaches most often occurring before the onset of jaw pain.[25] The development of headache and symptomatic TMD have been correlated with the onset of puberty in girls.[26]

**Etiology of TMD**

A universal unambiguous cause of TMD has not been identified.[4(p194)] Therefore, it is impossible to reliably predict which patients will or will not develop TMD. Nevertheless, TMD pain in adolescence triples the risk of TMD pain as a young adult.[27] Predisposing (risk) factors, precipitating (initiating) factors, and perpetuating (sustaining) factors contributing to the development of TMD have been identified.[28] The available evidence base suggests a poor correlation between any single etiological factor and resulting signs (ie, findings identified by the dentist during the examination) and symptoms (ie, findings reported by the child or parent).[29] Factors reducing the adaptive capacity of the masticatory system contribute to TMD development.[4(p194)]

Etiologic factors include

- *Macrotrauma*: chin trauma, a common occurrence in childhood because of falling, is a reported factor in the development of TMD in pediatric patients.[30-32] A direct blow to the mandible from a traumatic incident (eg, motor vehicle accident, sports collision, physical abuse) can damage masticatory structures and lead to signs and symptoms of inflammation and TMD.[4(p195)] TMJ injuries following jaw dislocation and mandibular hyperextension during medical and dental procedures (eg, oral intubation, bite block placement, third molar extraction) have been reported.[30,33,34] Subcondylar fractures are the most common mandibular fractures in children.[35] Treatment of jaw fractures with closed reduction and prolonged immobilization can result in TMJ ankylosis and subsequent jaw dysfunction.[36,37] Mandibular fractures in a growing patient may result in facial asymmetry.[36,37] Because the TMJs are near the base of the skull, traumatic brain injury or concussion may accompany jaw injuries.[30] Indirect trauma such as flexion-extension (whiplash) injuries may alter pain processing and lead to TMD symptoms; yet, a direct relationship between TMD and indirect trauma has not been established.[4(p196)]
- *Microtrauma*: Tooth grinding, clenching, and other repetitive parafunctional mandibular behaviors are thought to contribute to the development of TMD.[38] Prolonged wind instrument use or fingernail biting also can strain the masticatory system.[28] Overtime, excessive loading of the TMJ can lead to cartilage breakdown, synovial fluid alterations, and anatomic changes within the joint (eg, degenerative joint disease) and masticatory musculature (eg, masseter hypertrophy).[39] Bruxism, repetitive jaw movements characterized by tooth clenching and grinding, occurs with variable intensity and frequency during periods of sleep and wakefulness.[40] Sleep bruxism—classified as a sleep-related masticatory muscle activity with potential physiologic or protective relevance[41,42]—is most prevalent during childhood and decreases with age.[40(p373)] One in 4 children experiences probable or possible sleep bruxism with no difference between genders.[43] The literature on the association between parafunction and TMD in pediatric patients and adult patients is contradictory.[44-46] However, childhood parafunction was found to be a predictor of the same parafunction 20 years later.[47] A systematic review found a positive association between awake bruxism and painful TMD in children and adolescents, although none for sleep bruxism.[48] Sleep bruxism and sleep breathing disorders (eg, snoring, obstructive sleep apnea) commonly occur together; yet evidence regarding the pathophysiological association and the temporal relationship between the 2 conditions is lacking.[49] Individuals with neurologic disorders (eg, spastic cerebral palsy) have an increased likelihood of presenting with parafunctional oral habits and bruxism.[50,51]
- *Anatomical factors (skeletal and occlusal) and orthodontic treatment*: The association of skeletal and occlusal factors and the development of TMD is relatively weak.[4(p197),52,53] Some occlusal findings (eg, anterior open bite, nonworking

occlusal interferences) may be the result, and not the cause, of TMD.[52] Furthermore, data do not support that the development of TMD is caused or improved by orthodontic treatment,[53-60] regardless of whether premolars were extracted.[33] Changes in freeway dimension of the rest position (normally 2 mm to 4 mm) may be impinged by occlusal changes or restorations.[61] While most children and adolescents compensate to changes in vertical dimension without problem, TMD may develop in others due to failure of the masticatory system to adapt.[4(pp197,198)] A recent pediatric cohort study demonstrated that increasing the vertical dimension with the Hall technique for preformed crowns did not lead to TMD over a 12-month period.[62] Little evidence links skeletal or occlusal factors with TMD, but the following have some association across studies.[54-56,58,63-70]

- skeletal anterior open bite
- steep articular eminence of the temporal bone
- overjet greater than 6 to 7 mm
- skeletal Class II profile
- Class III malocclusion
- unilateral posterior crossbite
- functional posterior crossbite

Craniocervical posture has been suggested to be associated with TMD because patients with jaw pain and dysfunction commonly present with neck pain, hypomobility, and dysfunction.[71,72] Nevertheless, craniocervical posture was found to be similar in patients with or without TMD.[71]

*Psychosocial factors*: Major psychological factors associated with painful TMD include somatization,[73,74] anxiety,[67,73] depression,[73,74] obsessive-compulsive feelings,[75] catastrophizing,[76(p216)] emotional stress,[73] physical symptom reporting,[76(p216)] and fear avoidance behavior[76(pp216,217)] (ie, fear of pain from jaw movement). Lack of family support, access to care, and stigma are examples of social factors influencing TMD.[76(p216)] Emotional stress and other psychosocial factors predispose children over the age of 6 to sleep bruxism.[77] Depression, anxiety, posttraumatic stress disorder, psychologic distress, and sleep dysfunction may influence TMD prognosis and symptoms.[20,78] Higher pain intensity in the orofacial region correlated with greater impact on quality of life including difficulty with prolonged jaw opening, eating, and sleeping.[78] Persistent TMD pain has been associated with other comorbid pain complaints and pain-related disability.[27] Currently, evidence to support that psychological therapies alone effectively reduce TMD pain is limited.[79]

*Systemic, developmental, and pathologic factors*: Rheumatic diseases such as systemic lupus erythematosus, juvenile idiopathic arthritis (**JIA**), and psoriatic arthritis can involve the TMJs.[28,80,81] Imaging studies confirm the majority of children with JIA demonstrate TMJ degeneration, regardless of the presence of pain.[80,82] Connective tissue disorders involving generalized joint laxity or hypermobility (eg, Ehler-Danlos syndrome, Marfan syndrome) show an association with chronic pain and TMD signs and symptoms.[83-85] Congenital or acquired hypoplasia, pathologic hyperplasia, bifidity, and condylar tumors represent a unique category of TMDs.[81,86]

6. biochemical, genetic, and endocrine factors: Although there are no specific biomarkers for TMD, studies of patients with painful TMD show elevations in inflammatory cytokines (eg, interleukins, tumor necrosis factor) and neurotransmitters (eg, glutamate, serotonin, cortisol).[87,88] Genes influence biological systems involved with pain processing and the study of genetic polymorphisms related to pain sensitivity is an active area of research.[4(p200),89] Both genetic variations and mutations in specific genes (eg, catechol-O-methyl-transferase; glucocorticoid or serotonin receptor genes) increase the risk of developing orofacial pain and TMD.[4(p200),90] The role of hormones (eg, estrogen)in the etiology of TMD is debatable. Females have a higher prevalence of symptomatic TMD than males[9]; however, a clear relationship between TMD development and estrogen levels related to menstrual or pregnancy status has not been established.[4(p199),74,91] A systematic review demonstrated TMJ symptom reporting may be related to depression and somatization during puberty, especially in females.[74]

**Screening for TMJ health**

Obtaining a patient's dental history guides the practitioner's clinical assessment to make an accurate diagnosis and develop a comprehensive preventive and therapeutic program for each patient.[92] The following questions represent a TMD screening history.[28,93(p38)]

- Do you have difficulty opening your mouth?
- Do you hear noises within your jaw joint?
- Do you have pain in or around your ears or your cheeks?
- Do you have pain when chewing, talking, or using your jaws?
- Do you have pain when opening your mouth wide or when yawning?
- Has your bite felt uncomfortable or unusual?
- Does your jaw ever lock or go out?
- Have you ever had an injury to your jaw, head, or neck? If so, when? How was it treated?
- Have you previously been treated for a temporomandibular disorder? If so, when? How was it treated?

The following procedures are components of a basic TMD screening evaluation.[93(p38)]

- palpation of the muscles of mastication for tenderness
- palpation of the lateral capsule of the TMJs
- palpation and listening for TMJ sounds
- evaluation of mandibular range of motion

Based upon the results of the screening history and examination, the need for a more detailed history and/or clinical examination or other diagnostic assessments to determine or rule out TMD can be made.

**Diagnosing TMD**

TMD diagnosis is based upon information collected from a detailed history, clinical examination, and ancillary aids (eg, imaging, laboratory tests, diagnostic casts, diagnostic anesthesia) if indicated.[21,93(p36),94(pp50-56)] Classification systems based on common symptoms and signs assist with TMD diagnosis.[94(p63)] TMD symptoms include acute or chronic (ie, >3 months) jaw pain, focal or widespread jaw pain, ear pain, headaches, and other subjective findings (eg, muscle tension, fatigue). TMD signs include TMJ sounds, TMJ locking or catching, altered pattern of mouth opening, and limited mandibular opening (interincisal distance <40 mm for adults, <36 mm for adolescents, <32 mm for children).[15,21] Patients with TMD often present with complaints of painful masticatory structures,[93(p1)] and tender areas can be identified by palpating the jaw muscles and TMJs.[21] Lateral tongue scalloping, buccal mucosa ridging, tooth mobility, and excessive dental wear can provide additional diagnostic information regarding parafunctional habits associated with TMD.[93(p36)] Dental and medical conditions occasionally mimic TMD. Dental pain,[95] sinus pain,[96] ear pain,[97] headaches,[98] neoplasias,[99] parotid diseases,[100] cervical dysfunction,[101] and Eagle's syndrome[102] can cause symptoms similar to TMD. Identification of the patient's source of pain (eg, joint, muscle) aids in the diagnosis and management of TMD.[93(p36);94(p53)]

TMJ imaging provides diagnostic information related to the hard and soft tissue components of the TMJs. In some cases, imaging is needed to make a baseline assessment or monitor for change related to trauma or a developing facial asymmetry, or when patients fail to respond to conventional treatment.[103] Additional indications for joint imaging include new TMJ sounds (eg, crepitus, clicking, popping).[39,103] Panoramic radiographs detect gross hard tissue changes; however, they are not sensitive enough to rule out signs of degenerative TMJ disease (eg, subcortical cysts, surface erosions, osteophyte formation, sclerosis).[104] Panoramic radiography is more reliable for evaluating the mandibular condyle than the articular eminence or fossa of the TMJs[105] and does not permit evaluation of the joint space, soft tissues, or condylar motion.[28] Cone-beam computed tomography (CBCT) imagining detects bony abnormalities within the TMJ with high sensitivity but exposes a patient to more radiation than the panoramic image.[106] Magnetic resonance imaging (**MRI**) provides visualization of soft tissues, specifically the position and contours of the TMJ disc when opened and closed mouth views are included in the imaging protocol.[94(p51)] Contrast-enhanced MRI detects active hard tissue degeneration and joint inflammation[28,103,107] and is considered the gold standard for evaluating patients with JIA.[82,108] Ultrasound is a noninvasive imaging method for viewing superficial lateral aspects of the TMJ; however, the capability to detect signs of active synovitis is low compared with MRI.[109,110]

Diagnostic classification of TMDs includes[4(pp201-203),111,112]

1. TMJ disorders.
   - Temporomandibular joint disorders (joint pain, arthralgia, disc condyle complex disorders [eg, disc displacement with reduction, disc displacement without reduction])
   - Ankylosis of joint (fibrous and bony ankylosis)
   - Other specific joint disorders not elsewhere classified (fibrous adhesion and adherence)
   - Hypermobility disorders (subluxation, luxation, dislocation)
   - Primary osteoarthritis of other specified joint (degenerative joint disease, osteoarthritis, osteoarthrosis)
   - Rheumatoid arthritis, serology unspecified (systemic arthridities including JIA, psoriadic arthritis, reactive arthritis)
   - Idiopathic aseptic osteonecrosis
   - Disorder of ligament (ligamentous laxity)
   - Structural anomalies primarily affecting one body system, unspecified (aplasia)
   - Other specified anomalies of jaw size (hyperplasia, hypoplasia)
   - Neoplasm (benign or malignant)
2. masticatory muscle disorders.
   - Myalgia (local myalgia, myofascial pain with or without pain referral, centrally-mediated myalgia)
   - Certain specified disorders of synovium or tendon (tendonitis, myositis)
   - Spasm
   - Contracture of muscle
   - Dental parafunctional disorders (includes hypertrophy of chewing muscles)
   - Neoplasm (benign or malignant)
3. other diagnoses.
   - Headache or orofacial pain associated with chronic pain secondary to TMDs
   - Movement disorders (lack of coordination, fasciculation, other specified primary dystonia, other specified disorder associated with tremor)
   - Fractures (condylar or subcondylar process)
   - Chronic primary pain

**Treatment of TMD**

TMD therapeutic recommendations are inconsistent across systematic reviews and published guidelines.[4(p224),113] Therapeutic outcome measures commonly used in randomized controlled trials include pain scores (eg, visual analogue scale), maximum mandibular opening, jaw function, and jaw movement.[114] Treatment goals include restoration of function, decreased pain, decreased aggravating or contributing factors, and improved quality of life.[76(pp215-7),115] Conservative and reversible therapies are effective in reducing most TMD symptoms in most patients including children.[3,115,116] Both active and passive treatment

modalities have been advocated for TMD management. Active modalities include patient participation whereas passive modalities (eg, occlusal splint, acupuncture), do not.[113,117] Effective early management of acute TMD (eg, anti-inflammatory medication, education) can reduce the potential for developing chronic pain.[4(p225),118] Combined approaches may be more successful in treating chronic TMD than single treatment modalities[119]; however, evidence-based strategies for children and adolescents have yet to be established.[6,115,117]

Jaw function is painless for many patients with disc displacement with reduction.[4(p224),120] These patients may present with pain-free TMJ clicking, and generally no treatment is needed aside from reassurance and explanation of the condition.[4(p224),120]

Treatment of TMD can be divided into reversible and irreversible treatment. Reversible therapies may include

- patient education (eg, describing the nature of the disorder, the significance of predisposing, precipitating, and perpetuating factors, anatomy of the TMJ, management options, and goals of therapy).[4(pp225-227),115]
- physical therapy (eg, jaw exercises, dry needling, transcutaneous electrical nerve stimulation [TENS], ultrasound, iontophoresis, massage, TMJ distraction and mobilization, thermotherapy, coolant spray and stretch therapy).[4(pp232-235),39,113,115,121-123]
- behavioral therapy (eg, biofeedback, relaxation training, cognitive behavioral therapy [CBT] for developing behavior-coping strategies and modifying perceptions about TMD, habit reversal and awareness of daytime bruxing, avoiding excessive chewing of hard foods or gum, voluntary avoidance of stressors, treatment of comorbid behavioral health conditions, obtaining adequate, uninterrupted sleep).[39,113,115,124]
- pharmacotherapy (eg, nonsteroidal anti-inflammatory drugs, anxiolytic agents, muscle relaxants).[125,126] Current evidence does not support the use of opioid analgesics for chronic TMD.[113] While antidepressants (eg, tricyclic antidepressants, serotonin norepinephrine reuptake inhibitors) sometimes are prescribed for adults with chronic orofacial pain conditions, evidence supporting the use of these agents in children and adolescents is lacking.[4(pp227-229),39,115,126-128]
- occlusal splints. The goal of appliance therapy is to provide orthopedic stability to the TMJ or alter the patient's occlusion temporarily to decrease parafunctional activity and pain.[129,130] Adolescents treated with occlusal splints showed significantly lower pain intensity compared to those treated with relaxation therapy alone.[130] Occlusal stabilization splints are made of hard or soft acrylic, cover teeth on either the maxillary or mandibular arch, and normally are worn at nighttime. In a balanced appliance, all teeth are in occlusion when the patient's jaw is closed in a stable mandibular physiologic posture.[4(p236)] Dentoalveolar growth and development and erupting teeth present challenges for occlusal splint use in patients with mixed dentition.[131] Additional reversible therapies for orofacial pain reported in studies of adult patients include[39,82,132-136] TMJ arthrocentesis, TMJ injections, nerve blocks, acupuncture, trigger point injections, and off-label use of botulinum toxin A injections.

Irreversible therapies for TMD include occlusal adjustments, orthodontics, and surgery. Occlusal adjustment (including restorative care) and orthodontics strictly for the treatment of TMD are not supported as part of evidence-based care as they neither prevent nor treat TMD.[61,137-139] Surgical intervention (orthognathic surgery, open joint TMJ surgery, and TMJ reconstruction) should be limited to cases of severe degeneration or destruction following trauma or tumor resection.[81,115,140]

## Recommendations

Important considerations in the diagnosis of and treatment options for TMD include the following.

- Every comprehensive oral evaluation should include a screening history and clinical assessment of TMJ health.[92] Screening questions should address the presence of head and neck pain and mandibular dysfunction, previous orofacial trauma, and current symptoms (eg, location, timing, characteristics).[141(pp25-27)]
- In the presence of a positive history and/or signs and symptoms of TMD, a focused TMD examination (eg, palpation of masticatory and associated muscles and the TMJ's, documentation of joint sounds, occlusal analysis, and assessment of active and passive range of mandibular opening) should be performed.[93(p38),142(p50)]
- Joint imaging is recommended when the primary source pain appears to come from the TMJ or when crepitation or bite changes are noted clinically.[103,143]
- A TMD diagnosis should be made before providing information regarding treatment and prognosis.[141(p28)]
- Acute TMD often can be managed with education and analgesics (eg, nonsteroidal anti-inflammatory drugs), whereas chronic TMD may require a multimodal approach (eg, physical therapy, behavior evaluation, medications).[119]
- Anti-inflammatory medications are indicated for TMJ inflammation and arthritis, while physical therapy techniques may provide more benefits to individuals with a TMD that is muscular in nature.[4(p232)]
- Opioids are not indicated for chronic TMD, and medical consultation is warranted if advanced or long-term pharmacologic management is needed.[125]
- Referral should be made to other dental or medical health care providers, including those with expertise in TMD, oral surgery, behavioral health, or pain management, if the diagnostic and/or treatment needs are beyond the treating dentist's scope of practice.[142(p68)]
- Consider reversible therapies for all patients, including children and adolescents, with signs and symptoms of

TMD.[130,144] In general, irreversible therapies are to be avoided or considered only as a last option.[130,145,146]

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