



MASTEROPPGAVE

Temporomandibular disorders (TMD) in children and adolescents

Prevalence, risk factors and diagnostics of TMD in children and adolescents.

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Index list

Abstract	2
Introduction	2
Prevalence	3
Normal anatomy and function	3
Temporomandibular joint	3
Muscles	3
Pathology and dysfunction	4
Temporomandibular joint	4
Muscles	4
Risk factors	4
Occlusion	4
Oral parafunctions	5
Bruxism	5
Symptoms	5
TMD pain	5
Headache	6
TMJ clicking	6
TMJ locking	6
Ear symptoms	6
Treatment	7
Diagnostics	7
The purpose of our study	8
Material and methods	8
Results	9
Prevalence	9
Gender differences and age	10
General health	11
TMD pain as an index	11
Risk factors	12
Occlusion	12
Oral parafunctions	13
Bruxism	13
Stress	13
Prognosis	14
Discussion	14
Defining TMD	14
Prevalence	14
Risk factors and symptoms	15
Conclusion	17
References	19

Abstract

Aims: *The purpose of our study is to systematically review the literature concerning prevalence, risk factors and diagnostics of TMD in children and adolescents in order to find methods for early detection. Through our study we hope to direct dentists to an evidence-based approach concerning children and adolescents by making a screening guideline.*

Material and methods: *Systematic search of the dental literature was performed via Pubmed and using Google search engine. Unsystematic search was done in "Svenske tandläkartidningen". Search terms used were for instance: "TMD children", "TMD pain", "Temporomandibular dysfunction children" and "Temporomandibular dysfunction adolescent".*

The primary selection of articles was based on the articles title and abstract. After reading the articles the articles which were relevant for our review were chosen.

Conclusions: *The prevalence of TMD in children and adolescents is difficult to establish. There are several risk factors that can be used for predicting signs and symptoms of TMD in adult age, but they cannot be used for predicting manifest TMD. Diagnostics can be based on questions and clinical evaluation, the Clinical Dysfunction Index (Di) and/or the Research Diagnostic criteria (RDC/TMD). More research needs to be done, and the studies should use the same diagnostic criteria, examination methods and population sampling so that the articles are comparable.*

Keywords: *temporomandibular dysfunction, children and adolescents, prevalence, risk factors, diagnostics*

Introduction

Temporomandibular Disorder (TMD) is a collective term which includes several clinical signs and symptoms involving the muscles of mastication, the temporomandibular joint (TMJ) and associated structures [1]. TMD are a major cause of nondental pain in the orofacial region and are considered a subclassification of musculoskeletal disorders. In many TMD patients the most common complaint is pain originating from the muscles of mastication rather than from the TMJ [2]. Some therefore differentiate between muscle-TMD and joint-TMD. Symptoms vary from fatigue, stiffness, tenderness and/or pain in the masticatory muscles, trismus or locking of the jaw, temporomandibular joint sounds (clicking or popping in the jaw), ear symptoms to tension-type headache.

Prevalence

The prevalence of signs and symptoms of temporomandibular disorders has been the focus of interest of many epidemiological studies. The results of such studies are inconsistent, but it has been concluded that signs and symptoms of TMD are common in the population, with higher prevalence in women than in men, and there is a fluctuation over time [3,4,5,6]. Older prevalence studies mentioned in survey by The Cochrane Collaboration [7] indicate that approximately 75% of the population have at least one sign of joint dysfunction (abnormal jaw movement, joint noises, tenderness on palpation etc) and approximately 33% have at least one symptom (facial pain, joint pain etc). From several studies we can conclude that individuals affected by TMD have a distinct profile; females, and the incidence is increasing with age [5,4].

The reason for the gender differences is unknown, but the hormonal differences have been suggested as a causal factor [8]. There is also an association between impaired general health and TMD symptoms, and it has been shown that being a TMD patient has a negative effect on oral health related quality of life [9,10]. Women are overrepresented in most chronic pain conditions, it is reported that women experience pain more frequently, for a longer duration and more intense than men [8].

Normal anatomy and function

Temporomandibular joint

The Temporomandibular Joint (TMJ) is a two-functional joint, which allows the mandible to rotate and slide. In healthy joints the surfaces are covered with cartilage and the disc follows the movements of head of the condyle. It is common with clicking, popping and deviations in the movements of the joint. In a healthy joint, the surfaces in contact do not have any receptors to transmit the feeling of pain. In case of pain it originates from one of the surrounding soft tissues, or from the trigeminal nerve, which runs through the joint area.

Muscles

The masticatory muscles consist of a great number of muscles in a complex co-operation. They open, protrude, laterotrude, retrude and close the mouth. The suprahyoid muscles open the mouth, m. pterygoideus lateralis protrude and also laterotrude the mandible and m. masseter and m. temporalis are responsible for mouth closing [11].

Pathology and dysfunction

Temporomandibular joint

When receptors from the surrounding soft tissues and the TMJ are triggered, the pain can cause a reflex to limit the mandible's movement. Furthermore, inflammation of the joints or damage to the trigeminal nerve can cause constant pain, even without movement of the jaw. Pain can also be induced by a disturbance in the relationship between the condyle and the disc. The sounds produced by this dysfunction are usually described as a "click" or a "pop" when a single sound is heard, and as "crepitation" or "crepitus" when there are multiple, rough sounds. In the case of crepitation there are damages in the cartilage coverage and subsequent direct bone contact causing the sounds. Degenerative changes in the TMJ may occur after eg. overload, traumatic injuries, rheumatic diseases or age related wear. It is normal to see an increased wear of cartilage components among elderly persons, in severe cases in addition even changes in the bone components of the joint.

Muscles

An analysis of condyle-disc position has shown that an anterior-superior position in the fossa are more stable, and all other positions of the condyle are less stable and are maintained at the expense of increased muscle activity [12]. Occlusal factors may affect the condyle position which is critical to the equilibrium of the masticatory system. Condylar displacement can lead to muscle spasms and subsequent pain [13].

Risk factors

Little is known about the risk factors for developing TMD, and the aetiology is a controversial issue. It is generally accepted that the etiology is multifactorial, and there are a large number of direct and indirect causal factors. TMD patients are often not only multisymptomatic but also likely to exhibit more than one clinical sign of TMD [6].

Occlusal interferences are a common finding in all age groups, and have been regarded as one of the major aetiological factors causing TMD [14], but there are only a few weak and inconsistent correlations between occlusal interferences and signs and symptoms of TMD as well as for development of TMD, the only exceptions found by Magnusson et al was posterior crossbite and lateral forced bite when there is a slide from the Retruded Contact Position (RP) to Maximum

Intercuspatation (IP) of 2mm or more, which was correlated to TMJ sounds and symptoms in all age groups [6,4].

Oral parafunctions is an activity besides what is normal, and examples are tongue thrusting, finger sucking, bruxism, nail biting and cheek biting. Oral parafunctions have been reported in several studies in association with symptoms and signs of TMD and can be an etiological factor in TMD development[15,16,6].

Bruxism is defined as “an oral habit consisting of involuntary rhythmic or spasmodic non-functional gnashing, grinding, or clenching of the teeth in other than chewing movements of the mandible, which may lead to occlusal trauma” [the Glossary of Prosthodontic Terms, 2005]. Bruxism is a habit that happens during sleep or during waking hours or both. The term diurnal bruxism refers to habitual parafunction, while nocturnal bruxism is used to describe tooth grinding, which usually occurs during sleep. The involuntary, forced contact between the occlusal surfaces of the teeth during nonfunctional movements may exceed the physiological tolerance of the masticatory system, and cause pain and dysfunction [17]. Bruxism is mainly performed subconsciously, therefore it is difficult to determine its prevalence by questioning alone. However, some studies show that bruxism is more prevalent in TMD subjects [16,6]. Occlusal wear is correlated to reported bruxism, as well as to TMJ pain on palpation and reports on difficulties in mouth opening. Interestingly, men had statistically significantly more tooth wear in all dental regions compared to women [6].

Symptoms

Multiple articles state that both signs and symptoms of TMD fluctuate, and progression to severe pain and dysfunction is rare [6,18,19]. Recovery from frequent symptoms to no symptoms is also rare according to a study by Magnusson et al [6]. However, it is important to remember that symptoms like TMJ clicking and tenderness of the masticatory muscles do not only appear in TMD patients, but also in individuals without problems in the temporomandibular system [20].

TMD pain

The etiology of TMD is the subject of considerable and continuing controversy, and TMD patients typically report masticatory muscle pain. TMD pain has been defined as pain, usually localized in the muscles of mastication, the preauricular area, and /or the temporomandibular joint [21]. A study by Glaros et al tested the hypothesis that experimental clenching would lead to significantly higher

levels of self-reported pain in patients diagnosed with TMD pain. They found that this type of parafunctional activity can increase pain in TMD patients [22]. In addition to complaints of pain, patients with these symptoms frequently have limited or asymmetric mandibular movement and TMJ sounds [23]. Also, TMD pain is more common in women than in men and increases with age.

Headache

The temporal muscle is localized in the region where both TMD and headache pain are reported, and epidemiologic studies have reported an association between headache and TMD. Episodic and chronic tension-type headache often coexists with TMD pain in both genders [21], and occur as a consequence of increased muscle tone in the muscles of the head and neck [13].

TMJ clicking

TMJ clicking occurs when the disc is displaced in front of caput when the mouth is closed, but returns to normal position when opening or protruding the jaw [20]. TMJ clicking was found as a significant predictor of TMD signs and symptoms later in adult life, but not for predicting manifest TMD [15].

TMJ locking

TMJ locking can be open or closed. Open lock is inability to close the mouth and is seen when the mandibular condyle dislocates anteriorly in front of the articular eminence. Closed lock is an inability to open the mouth because of pain or disc displacement [24].

Ear symptoms

Changes in the TMJs and the occlusion is suggested to be a causal factor for various ear symptoms. For example the incidence of tinnitus in TMD patients is much higher than that reported in the general population [25]. Tinnitus may be a problem in TMD patients, but the definition of tinnitus may exclude some patients. Some TMD patients have a self-perceived hearing reduction, and there have been found minor alterations in the middle ear of TMD patients [26]. In a study by Cox it was found that 35% of the TMD patients investigated listed the ear as one of the sites for their TMD pain. However, the jaws, the back of the head, neck, the temple and behind the eyes are more often chosen as sites of pain [27].

Treatment

Wahlund et al found that dentists feel secure when they treat patients with occlusal splints, while treatment with pharmaceuticals, mobility exercises and selective grinding made them feel insecure. Even diagnostics and evaluation of the treatment results made the majority of dentists feel insecure [28].

Different treatment alternatives have been suggested for TMD; reassurance, ultrasound, heat exercises, biofeedback, acupuncture, pharmacotherapy, selective tooth grinding, splints, orthodontic treatment, behavioral therapy, home exercises, physical therapy and combined treatment. Several treatments aim to change the occlusion, for example orthodontic treatment. However, some surveys investigate the claim that orthodontic treatment may be a predisposing factor for TMD [14,7]. A review published in Cochrane Oral Health Group [7], that was done to see if *orthodontic intervention* could reduce symptoms in patients with TMD and also if orthodontic treatment could lead to TMD, they found that there is no evidence to show that orthodontic treatment can prevent or relieve TMD. Orthodontic treatment demands a lot of resources, and has no evidence of effect on TMD. Thus, until there is a better knowledge about the etiology of TMD, orthodontic treatment is not recommended for treating TMD [7]. Also, Magnusson et al have also found that orthodontic treatment does not imply a risk of development of TMD later in life [6].

The most common therapy given for TMD pain in the Public Dental Service (PDS) in Sweden among adolescents besides the provision of information about the condition is occlusal splints [29]. Occlusal splints have long been used in the management of TMD, and several studies have concluded that occlusal splints is the best current therapy compared to the other treatment methods [25,3,30,31]. Nonetheless, in a lot of cases it is enough with information or behavior directing treatment where the patients learn different relaxation techniques [30].

Diagnostics

Diagnosing TMD is in most studies based upon questions and clinical evaluation. The questions most commonly asked are: (1) "Do you have pain in the temple, face, temporomandibular joint, or jaws once a week or more?" and (2) "Do you have pain when you open your mouth wide or chew once a week or more?". These questions were found to have excellent reliability in a previous study [32]. The clinical dysfunction index (Di) can be used for clinical evaluation. Di is determined from five clinical parameters/signs (mandibular mobility, TMJ function, pain on movement of the mandible,

TMJ pain on palpation, and muscle pain on palpation). There is shown a significant correlation between subjective symptoms of TMD and the clinical dysfunction index (Di) [6].

The Research Diagnostic Criteria for Temporomandibular Disorders (RDC/TMD) classifies TMD within three categories and allows multiple diagnoses to be made for a given patient:

1. Myofacial pain
2. Disk displacements
3. Arthralgia, arthritis and arthrosis

The RDC/TMD classification was published in 1992 and was based on international expert recommendations and available empirical data. The reason for making this classification was that it could be used both clinically and for scientific research. The RDC/TMD classification has been translated into 18 languages and used very extensively in international research [33,34].

The purpose of our study is to systematically review the literature concerning prevalence, risk factors and diagnostics of TMD in children and adolescents in order to find methods for early detection. This may prevent a development to a more chronic condition. If methods for early detection are included in a standard dental examination, children and adolescents might avoid developing TMD, and disposed patients can be given interceptive treatment. Through our study we hope to direct dentists to an evidence-based approach concerning children and adolescents by making a screening guideline. This guideline can also be used in the student clinic at Tromsø University.

Material and methods

Systematic search of the dental literature was performed via Pubmed and using Google search engine. Unsystematic search was done in "Svenske tandläkartidningen". Search terms used were for instance: "TMD children", "TMD pain", "Temporomandibular dysfunction children" and "Temporomandibular dysfunction adolescent".

The primary selection of articles was based on the articles title and abstract. After reading the articles the articles which were relevant for our review were chosen.

The inclusion criteria for this review were articles presenting studies about prevalence, risk factors and diagnostics of TMD especially concerning children and adolescents. Only articles published from 1990 or newer were included. Articles written in Scandinavian and English were used.

The classification of TMD by the American Association of Orofacial Pain embraces several TMJ disorders including developmental (i.e. hypo/hyperplasia), acquired (i.e. neoplasms) and inflammatory (i.e. rheumatoid arthritis) disorders. Initially we wanted to exclude TMD caused by inflammatory disorders (i.e. rheumatoid arthritis, JCA (Juvenile Chronic Arthritis), Juvenile Idiopathic Arthritis), because they already have established diagnostic and treatment modalities. This was difficult to achieve because some of the articles used this classification and other did not define the cause of TMD.

Appendixes: Guideline for screening of TMD in English and Norwegian.

Results

List et al stated in a study that when the public dental health were established 60 years ago the primary cause for children being absent from school was toothache, now they are absent from school because of chronic or periodic pain from the masticatory system [20].

Next to caries, trauma and orthodontic problems, is pain related to the jaw (TMD) the most common condition in adolescents with a need of care [20].

Prevalence

The prevalence of TMD among children and adolescents varies considerably. Wahlund found that the prevalence of manifest TMD in children and adolescents (12-18 years) were 7% [3]. Nilsson concludes that TMD pain is common in children and adolescents. Nilsson also found that the prevalence of TMD pain in children and adolescents were 4,2% and significantly higher in girls (6%) than boys (2,7%) and there was a fluctuation, with absence and presence of TMD pain, over time [30]. Between 2-7% of all children and adolescents have pain related to the masticatory system [20]. The majority recovers without major care, although for a small group the pain is recurrent and has a long duration, the majority of these are girls. This last group is of high importance to detect to prevent development to a chronic pain condition [30]. Another study found that children between 12-18 years experienced TMD pain once a week or more [20]. Every second of these wanted professional help for their problems, which means 3,5% of all the examined adolescents. This corresponds well to other studies where they have found that the subjective treatment need has been judged to be 3-5% in children

[20]. Köhler et al. found that TMD- related symptoms are very rare in 3- and 5-year olds. In 10- and 15-years olds 5-9 % reported more severe symptoms, up to 50% showed one or more TMD signs, while it was estimated that 1-2% were in need of TMD treatment [35]. In a study by Pereira et al it is indicated that the prevalence of TMD among children is small and severe dysfunctions are rarely encountered in young children when compared with studies carried out on patients after puberty [16]. The low prevalence in this study by Pereira et al can be a reflection of the sample that contained only younger children (under twelve) and therefore excludes the possible link between disease and hormonal influence [16]. Other studies that have been executed in recent years concerning the prevalence of signs and symptoms of TMD in young populations have shown an increase in the number of children and adolescents affected, and in a study by Thilander et al the recorded prevalence in children and adolescents were 25% [36]. Nilsson et al concluded that TMD prevalence among adolescents aged 12 to 19 years were significantly higher in the cities than rural areas in a study done on Swedish adolescents [5]. Köhler et al concluded that the prevalence of more severe TMD symptoms and signs in children and adolescents are generally low and did not change significantly during a 20-year period. Increasing age, general health factors and oral parafunctions were associated with TMD symptoms and signs in 10- and 15-years-old [37].

Gender differences and age

Gender differences in the prevalence of TMD are less evident in childhood, and become more accentuated between 20 and 40 years of age, and tend to diminish with age [38,9]. Pain is generally more common among girls, and girls has significantly higher prevalence of TMD pain than boys [5,21]. TMD pain increases with age in both girls and boys, although it increases twice as much in girls as in boys. In clinic based studies these differences becomes more obvious than in population studies, and this may be because girls seek care more often than boys [5]. Ernberg concluded that females with TMD pain seek care more often than males. However, Ernberg also mentions other studies that have concluded with the opposite, that the probability for someone to seek care for TMD pain increases with age, frequency and intensity of pain, regardless of gender [8].

It has been suggested that reproductive hormones might be involved in the development of TMD pain [38,21]. The levels of the sex hormones fluctuate vigorously in women and are more stable in men. Based on several studies Ernberg concluded that women have a lower pain threshold in the craniofacial area than men and the pain limit varies during the menstrual cycle. Many pain conditions show a variation correlated with the menstrual cycle, e.g. migraine. The prevalence of TMD in the different age groups show that there is an increase at commencement of puberty when the gender

differences is starting to show. The prevalence is at its peak during the reproductive years and then diminishes after the menopause. Albeit, there is a gender difference after the menopause it may be suspected that TMD is influenced by the sex hormone levels [38,8].

Nilsson et al found that girls reporting TMD pain had significantly greater impact on behavioral and psychosocial factors than boys. Jaw function limitation, depressive symptom scores, somatic complaints, graded chronic pain, and perceived need for TMD treatment were all significantly higher in girls than in boys, however the intensity of TMD pain did not show gender difference [39]. A higher number of adolescent girls than boys reported school absences and analgesic consumption because of their TMD pain in a study by Nilsson et al [39].

General health

It is hard being an adult in pain, but even harder for a child or adolescent since it is difficult for them to describe the pain and claim their rights. Analgesic consumption, school absence and perceived need for TMD treatment had in a study a general increase with age in girls, but a decrease with age in boys [39]. Pain in different parts of the body – headache, pain in the stomach, back, arms and legs – is common in children and adolescents. Longitudinal studies have concluded that pain in childhood and early teens is associated with pain in young adults [30]. Al-Ani [25] claims that there is a high anxiety trait and increased depressive symptoms in bruxists. It has also been suggested that sleep posture, which applies lateral force to the mandible, can be an aetiological factor [25]. List et al found in their study that headache is found to be significantly more common in girls than in boys [21]. In another study List et al also found that tension type headache is the most common headache in school children and adults [20].

TMD pain as an index

To avoid over registration of TMD signs and symptoms an epidemiologic index is defined as TMD pain, and taken in use in Sweden in year 2000 [21,9]. Other signs and symptoms of TMD, for example clicking is a common symptom in the population, but it rarely develops into a more serious disease [40]. Interestingly clicking is found to be significantly more common when pain is present [21]. Nilsson found that self perceived TMD pain in children and adolescents is valid and reliable and therefore a good index for screening TMD patients [30].

To register and diagnose pain intensity in patients you can use a Visual Analog Scale (VAS). VAS has shown to be useful in children, where they grade their own pain experience [20]. It is important to

match the questions and clinical investigation to the patients' intellectual level, because questions related to pain may be difficult for children to comprehend at the early stages of cognitive development since the ability to think in an abstract manner is not completed before 12 years of age [37,41].

Risk Factors

Some studies [15,16,6,42] indicate that several risk factors can be used for predicting signs and symptoms of TMD in adult age, for example children with TMJ clicking, bruxism and other oral parafunctions, but they cannot be used for predicting *manifest* TMD.

In a study by Wu and Hirsch they found obvious differences in the prevalence of TMD between adolescents of different ethnic origins, and this cannot be explained by cultural differences alone, so they concluded that genetic factors is involved in etiology of TMD [43].

Occlusion

The correlation between risk indicators for TMD remains contradictory, especially in childhood. A current school of thought is that variables once considered strong risk indicators for signs and symptoms of TMD, such as malocclusion, have a weak correlation, thereby supporting the multifactorial theory as the cause of TMD pain more than occlusal interference and isolated malocclusions [42,44]. On the other hand, bruxing and posterior crossbite have in one study come out to be statistically significant as risk indicators for the presence of signs and symptoms of TMD in children [16]. Nilsson et al identified in one study that the lowest prevalence of pain was reported by subjects with late mixed dentition, when occlusion is most unstable [5]. In addition, occlusal deviations occur in largely the same proportions between sexes, so occlusal factors would not explain the predominance of TMD pain among girls [5]. Although the role of occlusion as a predetermining factor of manifest TMD cannot be confirmed on conclusive scientific evidence, some occlusal features may place greater adaptive demands on the masticatory system [45]. It is proposed that most individuals compensate without problems, while adaptation in others may lead to greater risk of dysfunction [25]. Some state that occlusal factors initiate symptoms in only a few TMD patients, and suggest that some occlusal interferences may be a result rather than a cause of TMD [45,46].

Oral Parafunctions

Pereira et al found that there is not a significant correlation between oral habits, such as pacifier sucking, nonnutritive sucking, finger sucking and nail biting, and signs and symptoms of TMD [16]. However, Köhler et al found that tooth clenching or grinding was associated with TMD symptoms [37].

Bruxism

In younger children bruxism is considered a consequence of the immaturity of the neuromuscular system [17]. Pereira et al reported that grinding or clenching was a predictor of risk for signs and symptoms of TMD [16,6], and Magnusson et al found a positive relationship between nocturnal bruxism and TMD [6]. A number of studies have also shown a link between bruxism in the primary and mixed dentition and TMD [17,16]. Egermark et al found in their study that nocturnal tooth grinding at 15 years of age were a predictor for seeking care later in life for symptoms in the masticatory system [42]. In a study by Vanderas et al they found that bruxing in children and adults is probably mediated from the central nervous system and usually induced by emotional stress [47].

Stress

In a case-control study adolescents with TMD showed significantly higher levels of stress, somatic complaints, emotional problems and aggressive behavior, and it was concluded that psychological factors in adolescents with TMD might play a more prominent role than dental factors [48]. Nilson found that TMD pain affects behavior and psychosocial factors in a bigger degree in girls than in boys [30], and studies among adolescents show that stress and psychosocial factors contributes to TMD and headache. Wahlund et al found that adolescents with TMD pain are more sensitive for every day experiences, both somatic and emotional, compared to healthy adolescents. Results showed that sensory information, both positive and negative, can be altered as a result of long term chronic pain [3]. Weariness and unease and deeper symptoms like anxiety and depression are more common in TMD patients compared to controls [48]. Psychosocial factors may play a part in the causes of TMD and by managing the factors associated with stress and anxiety the symptoms and signs of TMD can often be reduced or stopped [49].

Prognosis

Due to the multifactorial nature of the condition, the prognosis of TMD has been difficult to establish. For the majority with TMD pain the prognosis is favorable, but a small group develops a long-term complex pain condition [20]. Magnusson et al found in a 20-year follow up study that four different variables registered at the beginning of the study predicted clinical signs of dysfunction 20 years later; deep bite, clinically recorded TMJ clicking, bruxism and bruxism together with other oral parafunctions [6].

Discussion

Defining TMD

To write a review on this topic is a major challenge. Not only because there has been done few studies on children and adolescents, but also because TMD as a term is vague. TMD is commonly called a blanket term, and so could indicate that anything associated with TMD can be placed under this term. When trying to define TMD you find several different definitions that seems to be colored by the writer's opinion on what is most important. Also developing study designs for research on TMD must be a challenge since TMD is so indefinite and based on people's subjective feelings and experience of their health, hence the data will be less accurate and vary more between studies when comparing for instance with a study on the prevalence of DMFT (decayed, missed and/or filled teeth). TMD has in the recent years become a focus of interest, and more research is done on all aspects of TMD. The establishment of the RDC/TMD classification is a good token of the development on this field, and should be used in future studies about TMD, so that studies can be comparable.

Prevalence

Many articles focus on signs and symptoms of TMD, and some articles use the term *manifest* TMD without defining it [15,10]. An individual can have signs and symptoms of TMD without ever developing TMD, and the signs and symptoms fluctuate over time. Our opinion is that the diagnosis manifest TMD should mean that you have TMD signs and symptoms, but more importantly you have TMD pain. And in our review we wanted to focus on our interpretation of manifest TMD. The

RDC/TMD classification has three subdiagnosis: myofacial pain, disk displacements and arthralgia, arthritis and arthrosis. We wanted to exclude TMD caused by autoimmunity or infection, because they already have established diagnostic and treatment modalities. We hope that there will be an international consensus that TMD pain should be the main index for both studies and diagnostics of manifest TMD in patients with recurrent and persistent signs and symptoms. This is also reflected in our screening guidelines, where the main focus is pain; frequency, localization and function.

Because of the different angulations in the articles and the large variations in the reported frequencies of TMD signs and symptoms, it is difficult to obtain a comprehensive picture of the actual prevalence of TMD in children and adolescents. The variation can be explained with the differences in the population investigated, but also which examination method and diagnostic criteria's that is used. Other explanations are the inter- and intra-individual variations between examiners. Another important, yet frequently disregarded reason is that examination methods designed for adults have been utilized on children, and they have not taken into consideration the difficulties and limitations that exist in the examination of children. It is important that questions asked to children and adolescents match their stage of cognitive development.

Risk factors and symptoms

There is a substantial fluctuation of all TMD symptoms over time that may be related to the different stages in life. The prevalence of TMD among adolescents could be related to the great stress they experience. This stress can be caused by the transition from child to adult, school requirements, expectations from friends and family, and raging puberty hormones. Bruxism is one of the mentioned risk factors for TMD development, and there has been found an association between emotional stress and nocturnal bruxism in children [47]. Bruxing in children can be a reaction to stress, since they have not learned how to cope with such psychosocial problems, and unconscious let the stress out as a physical response. Also, it has been claimed that bruxism in children is a consequence of the immaturity of the neuromuscular system. We find this odd since bruxism also occurs in adolescents and adults [17], and if this is found to be true it means that we have no explanation for bruxism in these individuals.

The different risk factors for TMD can cause an increased load and tension, and also futile use of both the jaw muscles and the temporomandibular joint. Occlusion was previously regarded as the main cause of TMD, but it seems to play a less dominating role than traditionally thought. The lack of an association between occlusal interferences and TMD may be due to the universal presence of such interferences and that inadequate and invalid study designs have led to false-negative results.

Interestingly, when the occlusion is most unstable in children there is the lowest prevalence of pain [5]. This confirms the fact that occlusion cannot be as important, as earlier regarded, in the development of TMD. The occlusion as the major aetiological factor for TMD is largely based on observation of the results from various occlusal therapies. Success in therapy, however, does not demonstrate an association between occlusion and development of TMD.

Occlusal deviations occur in largely the same proportions in boys and in girls, so occlusal factors do not either explain why there is a gender difference in TMD pain. One explanation for the gender differences can be the expectations related to the social roles and the stress that follows. It has been shown that the females have a higher stress level than men throughout life, and coping with this stress could theoretically lead to TMD because of increased parafunctions, tension, anxiety, headaches and overload of the masticatory system [50]. Also, it has been shown that men have more occlusal wear and therefore probably grind and clench more than women, regardless they have a lower prevalence of TMD. We might suspect that the hormonal differences, which several articles have proposed as one of the reasons for gender differences, may alter the pain perception. The fluctuating hormone levels in women has been proposed to decrease the pain threshold, and thereby increase the TMD pain prevalence.

Concerning the risk factors it seems that no risk factors can be used for predicting manifest TMD, only if there will be signs or symptoms of TMD and if the patient will seek care for TMD later in life. Using the screening guidelines in the routine dental examination we might be able to detect the patients at risk. It is important to prevent all chronic pain conditions on behalf of the patients, and also save the public for money and resources. Though, it is difficult to treat a condition where the etiology is indefinite and multifactorial.

Little is known about the overall disability and impact of TMD in children and adolescents. We have found that increased analgesic consumption, absence from school and psychosocial stress is some of the effects, and girls are more affected than boys. Some skeptics have questioned whether TMD pain in children and adolescents is a significant public health problem, however List et al found that it is the fourth most common condition in children and adolescents with a need of care (next to caries, trauma and orthodontic problems) [20]. We may also suspect that the majority of children and adolescents are not aware that pain in face- and head regions can be related to the masticatory system, and therefore these symptoms will not be mentioned to the dentist. Perceived need for treatment and actual treatment-seeking behavior are complex and imperfectly understood issues, especially in the case of children. The prevalence in children and adolescents may seem low because

children are exposed to frequent pain, e.g. sports-related pain, headache, pain in the stomach and more, also, increased analgesic consumption may indicate that children and adolescents do not seek professional care for TMD pain, and instead handle the pain by self-medication. Nonetheless, it is found that TMD pain is the main reason that patients in all age groups seek care, and not for others symptoms like clicking and/or popping of the TMJ [51].

TMD has not been a focus of major interest in Norway, and there has been done little research to our knowledge. The articles we have used are mainly Swedish and executed on the Swedish population. This is something to take into consideration when critically reading our review. Also, the prevalence of TMD has shown to differ between individuals of different ethnic origins, so our conclusions may not automatically be converted to other populations or cultures.

Conclusions

- The prevalence of TMD among children and adolescents is difficult to establish. More research needs to be done, and the studies should use the same diagnostic criteria, examination methods and population sampling so that the articles are comparable.
- There are no strong correlations between malocclusions and TMD [42], except posterior crossbite and lateral forced bite, when there is a slide from RP to IP of 2mm or more [6,4].
- Children and adolescents have difficulties with concentration, use pharmaceuticals and are away from school because of frequent TMD pain [3,21,39,30]. TMD pain has significantly greater impact on behavioral and psychosocial factors in girls than in boys [39].
- Signs and symptoms of TMD are common in the population, but it rarely develops into a more serious disease [40].
- Severe dysfunctions is rarely encountered in young children [36,20].
- Gender differences in the prevalence of TMD are less evident in childhood, become more accentuated between 20 and 40 years of age and then tend to diminish with age [38,9,52].
- Girls have significantly higher prevalence of TMD than boys and there is a fluctuation over time [3,4,6,30,5,21].
- Reproductive hormones might be involved in the development of TMD [38,21].
- TMD pain increases with age [5].
- Risk factors can be used for predicting signs and symptoms of TMD, but they cannot be used for predicting manifest TMD [15,16,6,42].
- Genetic factors may be involved in the etiology of TMD [43].

- Psychosocial factors may play part in the etiology of TMD [48,49].
- The majority recovers without major care. Nevertheless, a small group has recurrent and persistent pain [30].
- The questions most commonly asked are: (1) “Do you have pain in the temple, face, temporomandibular joint, or jaws once a week or more?” and (2) “Do you have pain when you open your mouth wide or chew once a week or more?”.
- These questions were found to have excellent reliability in a previous study [32]. The clinical dysfunction index (Di) can be used for clinical evaluation.

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Screening guidelines for TMD

Screening for TMD

Screening for TMD should be an essential part of routine dental and medical examinations. A brief TMD screening evaluation may include two questions.

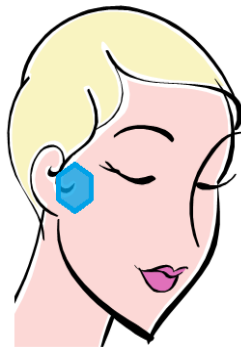
Anamnesis/Screening

1. Do you have pain in the temple, face, temporomandibular joint, or jaws once a week or more?
2. Do you have pain when you open your mouth wide or chew, once a week or more?

Significant findings in the anamnesis/screening should lead to a more comprehensive anamnesis and clinical examination.



Temple



Temporomandibular joint



Jaw

Retningslinjer for screening av TMD

Screening for TMD

23

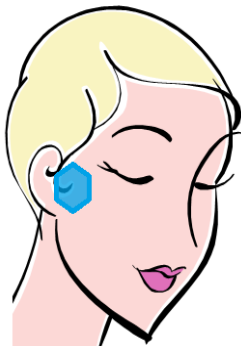
Screening for TMD bør være en essensiell del av undersøkelse hos tannpleier og tannlege. En kort og enkel TMD-screening bør inkludere følgende to spørsmål;

- 1) Har du smerter i tinningen, ansiktet, kjeveledd eller kjeve en gang i uken eller mer?
- 2) Har du smerter når du åpner munnen høyt eller tygger en gang i uken eller mer?

Positive funn bør føre til en mer omfattende anamnese og klinisk undersøkelse.



Tinning



Kjeveledd



Kjeve