

# Epidemiology and Treatment Need for Temporomandibular Disorders

Gunnar E. Carlsson, LDS, Odont Dr,  
Dr Odont hc

Professor Emeritus  
Faculty of Odontology  
Göteborg University  
Göteborg, Sweden

## Correspondence to:

Professor Gunnar E. Carlsson  
Faculty of Odontology  
Göteborg University  
Box 450  
SE 405 30 Göteborg, Sweden  
Fax: +46 31 773 3193  
E-mail: g\_carlsson@odontologi.se

Interest in the epidemiology of temporomandibular disorders (TMD) began in Scandinavia and Northern Europe in the early 1970s. The interest spread to many other countries, and studies from most parts of the world have now been presented. In a review of some early publications,<sup>1</sup> Helkimo, one of the pioneers in TMD epidemiology, concluded that: "Symptoms of dysfunction of the masticatory system are more common in unselected material than hitherto assumed. This implies that dentists in the future must interest themselves more than before for diagnosis and treatment of functional disturbances of the masticatory system in general practice."<sup>1p189</sup> In retrospect, it is obvious that his hope has been realized. The interest, both for epidemiology and other aspects of TMD, increased quite dramatically, especially in North America, where TMD or "TMJ" was termed an "in" malady by the end of the 1980s.

It is the aim of this article to review the epidemiologic literature related to TMD, with some focus on the relationship between prevalence of signs and symptoms and likely treatment need.

## Epidemiology

Prevalence and incidence are basic terms in epidemiology but are sometimes used incorrectly.<sup>2</sup> *Prevalence* indicates the proportion of the population with the disease or condition at a given time. *Incidence* is the rate of onset of the condition over time (conventionally, 1 year). A thorough discussion of incidence and prevalence measures can be found in textbooks of epidemiology. Since most of the epidemiologic studies on TMD have been cross-sectional, the results have focused on prevalence, whereas incidence rates are scarce because they require longitudinal investigations.

Epidemiologic studies have on average revealed a high prevalence of signs and symptoms of TMD, such as pain and tenderness in the temporomandibular joints (TMJs) and masticatory muscles, sounds in the TMJs, and limitation or other disturbances of mandibular movement. One of the problems with interpretations of the results of such studies is the extremely great variation in the presented prevalence rates. A review of 18 epidemiologic studies published during the first part of the 1980s found prevalence rates ranging from 16% to 59% for reported symptoms and 33% to

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86% for clinical signs.<sup>2</sup> A more recent meta-analysis of 51 prevalence studies registered even more extreme variations of prevalences: 6% to 93% based on subjects' reports and 0% to 93% according to clinical assessments.<sup>3</sup> The average value for perceived dysfunction was 30% among 15,000 subjects; the average value for clinically assessed dysfunction was 44% among 16,000 subjects. These high prevalences are due to inclusion of mild signs and symptoms. Severe pain and dysfunction occur more seldom.<sup>4</sup> Pain in the temporomandibular region is a symptom that has been reported to occur in about 10% of adults, with less variation between various studies (5% to 13%) than some of the other symptoms. During the last few years, several investigations from different parts of the world have reported prevalence rates that do not deviate much from the average values found in the previous reviews. A questionnaire study worth mentioning for its exemplary sample selection was performed in Toronto.<sup>5</sup> Overall, 49% of the subjects responded positively to 1 or more of 9 questions concerning symptoms (joint sounds, tiredness or stiffness of jaw muscles, and uncomfortable bite were the most frequent). Functional pain or pain during rest was reported by 13% of respondents.

Concern has been expressed regarding the lack of generally accepted standards for definitions, methods of investigation, and presentation of results. These factors probably explain more of the variation than do any real differences between samples.<sup>2</sup> Although it would be desirable that future researchers use better definitions of criteria and diagnosis, the present epidemiologic research has provided us with data showing that TMD signs and symptoms are a common occurrence in the population. However, it is clear that only a minority of subjects with such signs and symptoms are, or will become, patients with real disorders, and the prevalence rates cannot be translated into either demand or need for treatment.

### Gender Differences in Signs and Symptoms

Practically all series of patients seeking care for TMD have exhibited a strong female preponderance. This was difficult to explain in early population studies, which reported no great differences in the prevalence of TMD signs and symptoms between men and women. More recent epidemiologic studies have generally found significantly more frequent and more severe TMD signs and symptoms in women than in men, even if the dif-

ference is not so great as to fully explain the gender differences in rates of seeking care. Additional explanations that have been discussed are differences between the sexes in behavioral, psychosocial, hormonal, and other constitutional factors. Since no conclusive results have yet been presented, the issue of gender differences in TMD remains a puzzle and warrants further investigation.<sup>2</sup> This is further supported by results of a 10-year follow-up study, which indicated different courses for TMD signs and symptoms in men and women.<sup>6</sup> During the observation period, men seemed to recover from TMD signs and symptoms to a greater extent than women, which indicates a gender difference in duration of TMD. The usually longer duration of TMD symptoms in women may help to explain why they are more likely than men to seek care.

### Signs and Symptoms in Children and Adolescents

Prevalence figures of TMD signs and symptoms reported in epidemiologic studies of children are lower than in adults. Most of the signs and symptoms have been characterized as mild and often fluctuating. Temporomandibular joint clicking, one of the most frequent findings, has been discussed as a potentially severe symptom that may develop into TMJ locking, disc displacement, or osteoarthritis. However, longitudinal studies have found that even if TMJ clicking in children increases in frequency with age, it is highly variable intra-individually, and progress to locking is extremely rare.<sup>7,8</sup>

### Signs and Symptoms in Elderly Persons

Women between 20 and 50 years of age constitute the dominant patient group in TMD clinics. Children, adolescents, and older adults are less common among TMD patients. Older subjects have also reported TMD symptoms less frequently than younger ones according to most epidemiologic cross-sectional studies. A study of a group of 90-year-old subjects revealed no or only mild TMD signs and symptoms and practically no complaints of masticatory difficulties, in spite of varying dental conditions.<sup>9</sup> In longitudinal studies of elderly people, TMD signs and symptoms, especially reported symptoms, decreased with increasing age.<sup>10</sup> These longitudinal findings corroborate cross-sectional epidemiologic results and warrant

the conclusion that there is no increased risk of developing symptoms of TMD with increasing age. One interpretation of these results is that TMD signs and symptoms generally do not progress to a further deterioration of masticatory function, and temporomandibular pain often seems to disappear with advancing age in elderly persons.<sup>2</sup>

### **Epidemiologic Studies of Specific Temporomandibular Disorders**

The name "temporomandibular disorders" has been defined as a collective term that embraces a number of clinical problems that involve the masticatory musculature, the TMJs, or both.<sup>11,12</sup> According to this definition, the mentioned signs and symptoms can represent different disorders under the TMD umbrella. Many diseases can produce signs and symptoms in the components of the masticatory system. For this symposium we have employed the proposed and popularly accepted classification of TMD, which comprises (1) muscle disorders, (2) disc displacements, and (3) arthritis. Separate papers on all 3 topics are presented in these proceedings. However, it should be emphasized that very few attempts have been made to study the prevalence of the various disorders that constitute TMD. The following brief syntheses provide some additional information.

#### **Degenerative Joint Disease of the Temporomandibular Joint**

The most common of the joint diseases that may afflict the TMJ is degenerative joint disease, also known as osteoarthritis or osteoarthritis (OA). The diagnosis is not a simple one, since there is extremely poor correlation between the radiographic changes indicative of OA and its clinical signs and symptoms.<sup>11,13,14</sup> The reported prevalence of OA of the TMJ differs widely depending on methods of examination, criteria for diagnosis, age, and selection of patient sample. An example is a study of 93 TMD patients, 11% of whom received a clinical diagnosis of OA, whereas radiography of the TMJs revealed structural changes in 50% of the joints, or 71% of the patients.<sup>15</sup>

In epidemiologic studies, the recording of crepitation, which is considered a clinical sign of OA, has varied between 1% and 24%. Radiographic changes have been observed in 14% to 44% of subjects, macroscopic degenerative changes found at autopsy have varied between 22% and 84%, and similar great variation has been reported for

microscopic changes.<sup>2,11</sup> One explanation of the variation in radiographic results may be the difficulty—or often impossibility—of distinguishing between adaptive joint changes, functional remodeling, and degenerative changes. This can probably partly explain some extremely high frequencies of radiographic changes reported for a group of adolescents in a recent study of young TMD patients.<sup>16</sup>

It is obvious that the methods used for examination, the principles of diagnosis, selection, and age of the subjects examined are factors of great importance to the prevalence of OA. Also, after acknowledging these problems, it seems safe to conclude that OA of the TMJ is common, that the prevalence of OA increases with age, and that it is higher in women than in men, at least from age 50, as is the case in other joints of the body.<sup>11</sup>

#### **Rheumatoid Arthritis of the Temporomandibular Joint**

Extreme variation has been reported regarding TMJ involvement in patients with rheumatoid arthritis (RA), with frequencies ranging from 2% to 86%.<sup>2,11</sup> After more careful analysis of examination methods, definition of severity, stage of the systemic disease, etc, it has been estimated that between one third and one half of the patients with RA will experience occasional symptoms from the TMJs. Even if it is generally acknowledged that the development of TMJ involvement varies in relation to the progression of the general disease, the onset of symptoms in the TMJs varies greatly. About one third of patients develop TMJ symptoms within 1 year after the onset of the systemic disease, whereas this occurs after more than 5 years in over 40% of the patients.<sup>17</sup> However, in a study of 20 RA patients who were asymptomatic in the TMJs, 45% had TMJ involvement detected by imaging techniques (computed tomography or magnetic resonance imaging).<sup>18</sup> This emphasizes the poor correlation between clinical symptoms and findings from TMJ imaging.

In about 10% of patients with RA, the TMJs are severely damaged, with more or less serious consequences for the dental occlusion, eg, anterior open bite and increased distances between the retruded mandibular position and maximum intercuspal position.

#### **Disc-Interference Disorders**

During the 1980s, an enormous interest developed in the topic of disc-interference disorders as an

**Table 1** Treatment Need for Temporomandibular Disorders of Non-Patient Adolescents and Adults\*

Authors	Country	No. of subjects	Age (y), gender	Treatment need estimate (%), method, criteria
Posselt (1971)	Denmark	269	19 to 22, women	21%, severe symptoms, authors' estimate
Helkimo (1974)	Finland	321	15 to 65, both	22% DIII or 26% AII
Hansson and Nilner (1975)	Sweden	1069	10 to 79, both	25 to 30%, authors' estimate
Solberg et al (1979)	United States	739	19 to 25, both	5%, authors' estimate
Wänman (1987) <sup>†</sup>	Sweden	258	17 to 19, both	Small, authors' estimate, or 9%, symptoms in all examinations
Locker and Slade (1988)	Canada	1002	Over 18, both	3.5 to 9.7%, based on symptoms of pain, joint sounds, limitation of mandibular mobility
Tervonen (1988)	Finland	1275	25 to 65, both	27%, moderate or severe signs of TMD
Agerberg and Inkpaöl (1990)	Sweden	637	18 to 65, both	12.5%, subjects' estimate
De Kanter (1990)	Netherlands	3526	15 to 74, both	1.5%, based on questionnaire and clinical examination
Schiffman et al (1990)	United States	250	22 to 25, women	6%, subjects with SSI values equal to or greater than patients' SSI means
Magnusson et al (1991) <sup>†</sup>	Sweden	119	20, both	27%, authors' estimate
De Kanter et al (1992)	Netherlands	3468	15 to 74, both	3.1%, based on a questionnaire regarding both past and current presence of signs and symptoms of TMD
Magnusson et al (1994) <sup>†</sup>	Sweden	84	25, both	21 to 25%, authors' estimate

\*From Kutila.<sup>4</sup> Reprinted with permission.

<sup>†</sup>Longitudinal study.

D,III = severe signs and A,II = severe reported symptoms (Helkimo Dysfunction Index<sup>1</sup>); SSI = Symptom Severity Index.

important subset of TMD. Advances in imaging techniques paralleled this development and contributed to increased knowledge of the disc-condyle complex. However, similar to diagnosis of OA and RA of the TMJ, there is poor correlation between the imaging of the TMJ structures and the clinical findings in disc interferences. Considerable proportions of healthy subjects (up to 38% in 1 study) have exhibited "disc dislocation" upon imaging investigation of their TMJs. The term "disc displacement," which implies the need for treatment, may not be adequate, since deviations from the "textbook-like" appearance are frequently found in symptom-free individuals.<sup>19</sup> A magnetic resonance imaging study of the TMJs of young children aged 2 months to 5 years showed that all joints had normal superior disc position, which contradicts suggestions that TMJ disc displacement could be a congenital anatomic variant.<sup>20</sup>

Even if an acute disc displacement can be responsible for both pain and a serious reduction in mandibular mobility, clinical signs and symptoms often improve significantly after nonsurgical treatment and without any specific attempt to reduce the disc displacement.<sup>15,21,22</sup>

## Treatment Need for TMD

With the many controversies related to TMD, it is not surprising that the estimation of treatment need has varied considerably. In fact, an extensive review<sup>4</sup> reported rates varying from 1.5% to 30% (Table 1). Twenty-two percent of the population sample studied by Helkimo<sup>1</sup> had severe signs of TMD according to the Clinical Dysfunction Index; 26% had severe symptoms according to the Anamnestic Index. Helkimo concluded that these rates did not necessarily reflect the treatment need, but in a review a few years later he estimated the treatment need for TMD to be between 20% and 25%.<sup>1</sup> Later publications have emphasized that the prevalence figures—not even those indicating severe signs and symptoms—cannot be transferred directly into treatment need. The subjects' own demand must also be considered. Several estimations have suggested the treatment need to be about 5% among adults. This corresponds relatively well with findings that 3% to 7% of the adult population have sought care for TMD-related pain and dysfunction. Those who have not sought treatment usually thought that it was no great problem and that they could live with the symptoms.

The discrepancy between professional assessment of treatment need and the demand for or seeking of treatment is not unique in the TMD field—it is well-known in several areas of clinical dentistry.<sup>11,23</sup>

An interesting approach to evaluation of treatment need for TMD was recently presented by Kuttilla.<sup>4</sup> The author suggested a classification of patients into 3 groups: active, passive, and no treatment need. "Active treatment need for TMD" denotes patients with moderate or severe signs and symptoms of TMD that prompt the individual to seek help, or a patient who is estimated by a clinician as needing care independently of other possible oral health problems. Temporomandibular disorders as such call for treatment. "Passive treatment need for TMD" includes those with mild signs of TMD, perhaps no awareness of TMD, or only minor or fluctuating symptoms. The subjects in this subgroup are assessed as needing no treatment if no other dental care was considered. "No treatment need for TMD" refers to those patients whose TMD problems did not call for treatment in any circumstances.

During a 2-year follow-up of an epidemiologic sample of 515 subjects, the fluctuation of treatment need was small according to Kuttilla.<sup>4</sup> The active treatment need for TMD varied between 7% and 9%, passive treatment need varied from 40% to 46%, and no treatment need varied from 46% to 51%. Women had active treatment need 2 to 3 times more often than men. The subjects in the active treatment subgroup used more health care services (visits to physicians, physiotherapy, and radiography) and had more sick leaves than the subjects in the other subgroups. Similar studies in the United States have shown that TMD patients often see many care providers, a considerable proportion of whom are physicians.<sup>24</sup> Consultations in which patients do not always get an adequate diagnosis may lead to unnecessary prescriptions of imaging, antibiotics, or other medication. The authors of both the Finnish and the American studies concluded that, since TMD are one link between dentistry and medicine, it is desirable to improve cooperation among different medical and dental specialties to eliminate unnecessary examinations and ineffective treatment modalities and thereby reduce the total costs.

Whenever possible, clinical decision-making should be based on scientific principles. Evidence-based care has an accepted position in medicine and receives increasing emphasis in dentistry today. The concept needs to be applied in the controversial field of TMD treatment to improve the

discussion of treatment need. Let us hope that the concern expressed years ago in an extensive textbook on TMD—"in the absence of scientifically tenable etiologies for the various TMD, treatment has to be empirical, and prevention a virtual impossibility"<sup>11p535</sup>—can soon be changed by new evidence-based results. It is well established that a majority of patients suffering from TMD can be managed with simple treatment that can be provided by general dental practitioners.<sup>25</sup> Specialist clinics should be available for patients who do not receive sufficient relief of their symptoms with simple, conservative therapy. However, the question as to why some individuals become TMD patients, whereas others can live with considerable signs and symptoms without seeking care, is difficult to answer. The role of the dental profession in this process is complex and needs further investigation.

## Conclusions

Epidemiologic studies regarding signs and symptoms of TMD have reported great variation in prevalence rates, probably due more to methodologic shortcomings than real differences between samples. Irrespective of this variation, it can be concluded that TMD signs and symptoms are common, which means that dental practitioners should know how to diagnose and manage these conditions. However, prevalence rates do not directly correspond to treatment need. Signs and symptoms of TMD are in general more prevalent, more severe, and more long-lasting in women than in men, which to some extent may explain the preponderance of women among TMD patients. Signs and symptoms of TMD in children are usually mild and often fluctuating, and there is no evidence that they regularly progress to more severe conditions in adult age. Awareness of TMD symptoms decreases with increasing age in elderly people. There is lack of consistent epidemiologic data on specific TMD, such as TMJ osteoarthritis, rheumatoid arthritis, and disc-interference disorders. There is often a substantial discrepancy between need and demand for TMD treatment. Professional assessment of treatment need has varied between 1.5% and 30%, whereas 3% to 7% of subjects in epidemiologic samples have sought treatment for TMD. The solution of remaining problems related to TMD may be facilitated by continuing research, eg, the combination of improved epidemiologic, basic, and clinical methods following evidence-based principles.

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