

The concepts prevalence, need for treatment, and prevention of temporomandibular disorders: a suggestion for terminology

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The concepts active and passive treatment need and active and passive prevention need are suggested, to systematize some concepts used in discussions about temporomandibular disorders (TMD), to separate the treatment need figures from the prevalence figures, and to understand the great variation among TMD prevalence studies. On the basis of a summary of recently published papers and on a clinical 2-year follow-up study of 411 subjects, the suggestions seem to provide a reasonably good fit with clinical experience and earlier epidemiologic studies of TMD. □ *Epidemiology, oral; longitudinal study; taxonomy, active, passive; temporomandibular joint*

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The descriptive nature of the diagnosis temporomandibular joint (TMJ) dysfunction or temporomandibular disorders (TMD) and the large variation in prevalence figures (1–3) are main reasons for the many controversies in the literature discussing the prevalence and treatment need of TMD. Different degrees of severity in TMD signs do not necessarily represent separate stages of one and the same disease. As stated by Kirveskari (4), 'CMD may just represent a loose conglomerate of signs and symptoms with no systematic causal relationships, or the signs and symptoms could represent different stages of a process progressing at different speeds. Other possibilities also exist'. Partially due to the lack of precise definitions for every type of functional problem in the stomatognathic system, the prevalence figures show considerable variation among studies (5, 6). Magnusson et al. (7) state that the variation is probably due to differences in definitions and lack of reliability and validity in measures of demand and need for treatment. The high prevalence figures and the wide variation among studies have also aroused suspicion about the very existence of TMD as a health problem (8).

Patient populations have been used to estimate the treatment need in TMD. The need for treatment is seldom analyzed (4). Likewise, the discrepancies between prevalence and treatment need figures are seldom systematically discussed. According to Salonen et al. (9), some writers make a clear distinction between relatively high prevalence figures and quite low treatment need figures; others suggest that prevalence figures are indicative of treatment need. Studies making a distinction between prevalence and treatment need figures suggest that only moderate and severe cases need treatment. It would naturally be rational to treat also the mild, borderline, and subclinical cases if they represent the early stages of a progressive process leading to

more severe signs and symptoms. The fluctuation of TMD signs and symptoms and, in many cases, the unknown order of events, however, preclude a systematic and correct identification of early cases of TMD.

A summary of some new prevalence studies (9–44, and Table 1) shows that TMD is very often classified as moderate or severe. The prevalence figures for severe signs and symptoms are around 10% (range, 2–25%), the highest figures being often among 20- to 40-year-old women, with the lowest among children (11, 12), adolescents, young subjects (13), and also in old age groups (9).

Dworkin and co-workers (10) have published an extensive analysis on the taxonomies developed to overcome the well-known classification problems. The number of suggested taxonomies already suggests that there is no agreement among researchers on these questions. We have selected a different point of view when trying to systematize these problems. Some new concepts are suggested to offer a partial explanation of the large variation among prevalence study results and of the difference between prevalence and treatment need figures. We also believe that it is possible to clarify the role of prevention of TMD in clinical treatment in the present situation, even though the etiology of TMD is still far from clear.

We suggest the following concepts:

1) *Active treatment need for TMD*: Moderate or severe signs and subjective symptoms of TMD prompting the individual to seek help, or estimated as needing care by a clinician independently of other possible oral health problems: TMD as such calls for treatment.

2) *Passive treatment need for TMD*: Mild signs of TMD, perhaps no awareness of TMD, or only minor or fluctuating symptoms. To be carefully diagnosed and treated together with other dental care affecting

Table 1. Prevalence of temporomandibular disorders (TMD) according to some recent studies

Study	N	Age (years)	Comments	Prevalence
Agerberg, Inkapööl, 1990 (17)	637	Adults		88% with some signs; men, treatment need 9%; women, treatment need 16%
Heikinheimo et al., 1989 (15)	167	12–15	Follow-up study	26–30%; 0–7% with symptoms at every examination
Imai et al., 1990 (24)	308	13.1	Orthod. patients	9%
Mohlin et al., 1991 (32)	1000	12		50% with some signs; few with severe signs; few with treatment need
Morinushi et al., 1991 (16)	160	12–14	Follow-up study	31%; 9% with symptoms at every examination
	48	15–17		40%; 13% with symptoms at every examination
Norheim & Dahl, 1978	358	20–69		13% with subjective symptoms
Ohno et al., 1989 (11)	145	12–14	Follow-up study	31%; 3% at every examination
	429	15–17		40%; 5% at every examination
Ohno et al., 1988 (36)	2198	10–18	Cross-sectional	11% with subjective symptoms
Olsson et al., 1992 (45)	245		Orthod. patients	16% with subjective symptoms; 33% with moderate and 9% with severe signs
	245		Controls	5% with subjective symptoms; 22% with moderate and 8% with severe signs
Pilley et al., 1992 (37)	791			50% with moderate signs, few with severe signs
Pullinger et al., 1988 (38)	222			65% with moderate signs, 3% with severe signs
Seligman et al., 1988 (46)				80% of the subjects with TMD signs not aware of them
Tosa et al., 1990 (47)	533		Orthod. patients	28% with signs

occlusion such as prosthetics, periodontology, and orthodontics: TMD calls for treatment to ensure adequate treatment for other dental problems.

3) *Active prevention need for TMD*: Not even theoretically possible to assess before the effective causal complex(es) of TMD become(s) better known. Theoretically, prevention is possible if treatable causal factors are known, subjects at risk can be identified, and they can be divided into potentially active or passive treatment groups. The same is true of the early stages of a progressive process leading to TMD, if identified: TMD can be prevented to the extent that non-redundant causal factors are known and can be eliminated.

4) *Passive prevention need for TMD*: No occlusal interferences or other suspected risk factors should be introduced through sealings, fillings, prosthetics, and other dental treatment affecting occlusion, regardless of the functional state of the stomatognathic system of the subject. For example, even if the clinician does not believe that occlusal interferences have anything to do with TMD, it is still relevant to avoid producing interferences in the occlusion through dental treatment. Dental treatment is practically always possible without any changes in the natural occlusion at no extra cost: Unclear etiology is no excuse for introducing suspected risk factors such as occlusal interferences in association with any dental treatment.

Instead of these concepts, the concepts primary and secondary (conditional) treatment need and primary prevention need could also be suggested. The concept secondary prevention has, however, a different meaning in everyday use. Treatment is usually understood as secondary prevention if it aims at avoiding further stages of the treated disease. It is, therefore, more relevant to prefer the words active and passive. Because prevention is often some kind of treatment too, more

logical concepts could be care and cure need, as compared with prevention need. The concept treatment need is, however, so routinely used that we feel that no confusion is created by separating the concepts treatment need and prevention need from each other in the suggested manner.

The aim of the present study was to test the suitability of the proposed classification in a random population sample aged 25–65 years at base line.

Subjects and methods

During 1992–93 we collected a stratified random sample of 515 subjects, 246 men and 269 women, aged 25–65 years at base line for a follow-up (Table 2). The subjects were re-examined twice at 12-month intervals. Altogether 446 subjects, 87% of the original sample, participated in all three examinations. At every examination the subjects were examined in a similar manner by the same clinician (M. Kuttilla) in accordance with generally applied principles in stomatognathic physiology (1, 2). The anamnestic information included questions about noises of TMJ, symptoms during chewing, ear symptoms, problems during swallowing, parafunctions such as chin or nail biting,

Table 2. Subjects of a Finnish follow-up study at base-line examination on the basis of age and sex

	Born in					Total
	1927	1937	1947	1957	1967	
Men	49	50	46	48	53	246
Women	57	50	55	53	54	269
Total						515

bruxing or clenching habits, frequency, intensity, and location of pain in head and cervical or brachial areas, medication for the above-mentioned aches, dizziness, sleeping habits, traumas in oral region, dental treatment during the preceding year, and questions about stress and general health. The clinical examination included a systematic and intensive analysis of the function of the stomatognathic system on the basis of generally accepted principles (1, 2).

The TMJs and the following muscles were palpated: temporalis and its insertion in the coronoid process, masseter superficialis and profunda, and lateral and medial pterygoid. All painful sites were registered. The TMJs during movements were auscultated by means of a stethoscope. The deviations of the mandible during opening-closing and maximal opening capacity were measured. On the basis of all this information, an experienced specialist (M. Kuttila) classified the subjects in accordance with the above suggestions into active and passive treatment need or no treatment need groups. (A detailed description of signs and symptoms of the subjects during the whole follow-up period will be published separately.) For the present analysis all subjects without active or passive treatment need were grouped into a no treatment group. This classification was made every year in a similar manner. After the second examination, altogether 35 subjects had sought help for their severe TMD symptoms. They were treated and excluded from the present classification analysis.

Results

Of the 411 subjects who had participated in all 3 examinations and were not treated during the study years, 8% had been classified at base line into the active treatment need group, and 45% into the no treatment group. The corresponding figures for the second examination were 9% and 56%, and for the third examination 9% and 48% (Table 3). The cumulative active treatment need figure at the end of the clinical examinations (= active treatment need in at least one examination) was 16%. Two subjects classified into the active treatment need group at base line ($n = 31$) were later once classified into the no treatment need group. Of 193 subjects classified into the passive treatment need group at base line, 33 were later classified once (23

subjects) or twice (10 subjects) into the active treatment need group. Three subjects of 187 classified into the no treatment need at base line were later once classified into the active treatment need group. If the 35 subjects treated after the second examination were included in the 1st- and 2nd-year figures, the corresponding figures for the active treatment need group were 10% for the 1st year and 12% for the 2nd year.

Discussion

An unavoidable methodologic problem emerged during the study: many subjects with severe TMD symptoms had tried to find help for their symptoms before the study by visiting, for example, otorhinolaryngology specialists, because most of the subjects had never heard of TMD. After the first study they become aware of the possibility of having TMD. Therefore, at the second and third examinations they probably more readily connected their anamnestic data and symptoms with TMD, thus possibly affecting comparisons between the first and later examinations. The fact that we could not prevent all the subjects from seeking care during the study led to underestimation of the active treatment need figures. Real-life circumstances—the suffering of the subjects—thus made it impossible for us to find ‘the natural course’ of TMD in all subjects.

As we see it, the changes from active treatment need group to no treatment group and the changes from no treatment group to active treatment need group were few and do not suggest over- or under-treatment if our classification were applied in real life. Besides, since the symptoms of the suffering patient dictate the treatment decisions, no overtreatment as such is involved, given that the applied treatment modalities are relevant. In comparison, severe headache, even if known to show considerable fluctuation, calls for help when acute. The fluctuation of signs and symptoms of TMD is a well-documented fact (14). A detailed fluctuation analysis of the present material will be published separately.

The treatment of mild and moderate signs and symptoms is a controversial matter, but, in general, we believe that when dental care includes rehabilitation or other extensive therapy, such as orthodontic and prosthetic treatment, surgery, and periodontal care, one should routinely make a functional clinical examination of the stomatognathic system and provide

Table 3. Number of subjects needing active or passive treatment for temporomandibular joint (TMD) problems among 411 subjects at annual cross-sectional examinations

Treatment need	1st examination		2nd examination		3rd examination		Cumulative frequency	
	<i>n</i>	%	<i>n</i>	%	<i>n</i>	%	<i>n</i>	%
Active	31	8	36	9	37	9	67	16
Passive	193	47	145	35	175	43		
No need	187	43	230	53	199	48		

treatment if necessary, to ensure that TMD problems do not jeopardize the success of the primary goals of the given dental care (2, p. 93). The suggested figures for passive treatment need, estimated on the basis of epidemiologic studies, are 30–50% (range, 20–80%) in adult populations. Our results agree with these figures.

One has to keep in mind that the figures for active and passive treatment need, based on cross-sectional examinations, can be misleading. The group needing active treatment in consecutive cross-sectional examinations can remain constant at around 5–10% but can consist of different subjects at different examinations (11, 14–16). The cumulative (period) prevalence figure for active treatment need could therefore be higher in long-term follow-up studies. In our study the figure was 16%, about twice as high as at every single cross-sectional examination. Therefore, repeated cross-sectional examinations have a tendency to underestimate true treatment need figures.

Patients receiving dental care such as prosthetics or orthodontics do not represent a normal distribution in the population but are selected cases. It is therefore probable that the need for passive treatment of TMD is much higher among patients receiving prosthetic treatment. The possible differences between the epidemiologic figures for mild or moderate TMD in representative population samples and the true treatment need in patient populations would not, therefore, contradict the suggested classification. Among our 515 subjects at base line, about 80% of those classified as needing passive gnathophysiologic treatment also needed prosthetic treatment, and practically all the remaining 20% needed periodontal treatment, too. Some of the subjects also needed fillings or orthodontic treatment.

The possibility of preventing TMD by eliminating occlusal interferences is often strongly objected to (48). This criticism is usually based on the conviction that occlusal interferences have nothing to do with TMD or on the belief that mild signs and symptoms are not necessarily indicative of a more severe situation in the future. Even if occlusal interferences are a non-redundant causal factor in TMD, a systematic elimination of interferences to prevent TMD would have a weak cost-benefit ratio: a) an adjusted occlusion is not stable enough in the long run, b) everybody has interferences, c) perhaps only 10–20% will need active treatment, and d) risk subjects cannot be identified beforehand. On the other hand, however, a clinician does no harm and wastes no—or very little—time or money if (s)he works so that the 'natural' occlusion is not altered during the dental treatment—that is, no suspected iatrogenic interferences are introduced. This kind of passive prophylaxis should be routine already today.

Active prevention depends on knowledge of etiology. The suggested passive prevention can be carried out already today even if the etiology is still under dispute. It

is a different question whether all clinicians and/or researchers would call this kind of clinical practice passive prevention at all. By treating mild dysfunctions in association with general dental care, we can, perhaps, prevent some severe cases, and by avoiding introduction of new interferences during routine dental treatment in patients without signs or symptoms of TMD, we can perhaps also prevent some iatrogenic cases.

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References

- McNeill C. Craniomandibular (TMJ) disorders—the state of the art. II. Accepted diagnostic and treatment modalities. *J Prosthet Dent* 1983;49:393–7.
- McNeill C, editor. Temporomandibular disorders. Guidelines for classification, assessment, and management. 2nd ed. Carol Stream (IL): Quintessence Publishing Co, Inc, 1993.
- Dworkin SF, LeResche, von Korff MR. Diagnostic studies of temporomandibular disorders: challenges from an epidemiologic perspective. *Anesth Prog* 1990;37:147–54.
- Kirveskari P. Are craniomandibular disorders a general health problem? *Proc Finn Dent Soc* 1991;87:309–13.
- Carlsson GE. Epidemiological studies of signs and symptoms of temporomandibular joint-pain-dysfunction. *Aust Prosthodont Soc Bull* 1984;14:7–12.
- Nydell A, Helkimo M, Koch G. Craniomandibular disorders in children—a critical review of the literature. *Swed Dent J* 1994; 18:191–205.
- Magnusson T, Carlsson GE, Egermark I. Changes in subjective symptoms of craniomandibular disorders in children and adolescents during a 10-year period. *J Orofacial Pain* 1993;7:76–82.
- Greene CD, Marbach JJ. Epidemiological studies of mandibular dysfunction: a critical review. *J Prosthet Dent* 1982;48:184–90.
- Salonen L, Helldén L, Carlsson GE. Prevalence of signs and symptoms of dysfunction in the masticatory system: an epidemiological study in an adult Swedish population. *J Craniomandib Disord Facial Oral Pain* 1990;4:241–50.
- Dworkin SF, LeResche L, editors. Research diagnostic criteria for temporomandibular disorders: review, criteria, examinations and specifications, critique. *J Craniomandib Disord Facial Oral Pain* 1992;4:301–55.
- Ohno H, Morinushi T, Ohno K, Oku T, Ogura T. A longitudinal study on individual fluctuation of signs in accordance with TMJ dysfunction syndrome in adolescents. *Shoni Shikagaku Zasshi* 1989;27:64–73.
- Heikinheimo K, Salmi K, Myllärniemi S, Kirveskari P. A longitudinal study of occlusal interferences and signs of craniomandibular disorder at the ages of 12 and 15 years. *Eur J Orthod* 1990;12:190–7.
- Magnusson T, Carlsson GE, Egermark-Eriksson I. An evaluation of the need and demand for treatment of craniomandibular disorders in a young Swedish population. *J Craniomandib Disord Facial Oral Pain* 1991;5:57–63.
- Wänman SA. Craniomandibular disorders in adolescents. *Swed Dent J* 1987; Suppl 44.
- Heikinheimo K, Salmi K, Myllärniemi S, Kirveskari P. Symptoms of craniomandibular disorder in a sample of Finnish adolescents at the ages of 12 and 15 years. *Eur J Orthod* 1989;11:325–31.
- Morinushi T, Ohno H, Oku T, Ogura T. Two year longitudinal study of the fluctuation of clinical signs of TMJ dysfunction in Japanese adolescents. *J Clin Pediatr Dent* 1991;15:232–40.
- Agerberg G, Inkäpööl I. Craniomandibular disorders in an

- urban Swedish population. *J Craniomandib Disord* 1990;4:154-64.
18. Carlsson GE, LeResche L. Epidemiology of temporomandibular disorders. In: Sessle BJ, Bryant PS, Dionne RA, editors. *Temporomandibular disorders and related pain conditions. Progress in pain research and management*, vol 4. Seattle (WA): IASP Press, 1995:211-26.
 19. De Kanter RJAM, Käyser AF, Battistuzzi PGFCM, Truin GJ, Van Hof MA. Demand and need for treatment of craniomandibular dysfunction in the Dutch adult population. *J Dent Res* 1992;71:1607-12.
 20. Dibbets JM, van der Welle LT. Prevalence of TMJ symptoms and X-ray findings. *Eur J Orthod* 1989;11:31-6.
 21. Eskola S, Ylipaavalniemi P, Turtola L. TMJ-dysfunction symptoms among Finnish university students. *J Am Coll Health* 1985;33:172-4.
 22. Gross AJ, Rivela-Morales WC, Gale EN. A prevalence study of symptoms associated with TM disorders. *J Craniomandib Disord Facial Oral Pain* 1988;2:191-5.
 23. Gunn SM, Woolfolk MW, Faja BW. Malocclusion and TMJ symptoms in migrant children. *J Craniomandib Disord Facial Oral Pain* 1988;2:196-200.
 24. Imai T, Watanabe F, Nakamura S. Clinical study on the prevalence of temporomandibular joint dysfunction in orthodontic patients. *Dent Jpn Tokyo* 1990;27:97-9.
 25. Jendresen MD, Allen EP, Bayne SC, Hansson TL, Klooster J, Preston JD. Report of the committee on scientific investigation of the American Academy of Restorative Dentistry. *J Prosthet Dent* 1992;68:137-90.
 26. Kess K, Bakopulos K, Witt E. TMJ function with and without orthodontic treatment. *Eur J Orthod* 1991;13:192-6.
 27. Kirveskari P, Alanen P, Jämsä T. Association between craniomandibular disorders and occlusal interferences. *J Prosthet Dent* 1989;62:66-9.
 28. Kirveskari P, Alanen P, Jämsä T. Association between craniomandibular disorders and occlusal interferences in children. *J Prosthet Dent* 1992;67:692-6.
 29. Kritsineli M, Shim YS. Malocclusion, body posture, and temporomandibular disorder in children with primary and mixed dentition. *J Clin Ped Dent* 1992;16:86-93.
 30. Lundeen TF, Scruggs RR, McKinney MW, Daniel SJ, Levitt SR. TMD symptomatology among denture patients. *J Craniomandib Disord Facial Oral Pain* 1990;4:40-6.
 31. Magnusson T, Egermark-Eriksson I, Carlsson GE. Five-year longitudinal study of signs and symptoms of mandibular dysfunction in adolescents. *J Craniomandib Pract* 1986;4:338-44.
 32. Mohlin B, Pilley JR, Shaw WC. A survey of craniomandibular disorders in 1000 12-year-olds. Study design and baseline data in a follow-up study. *Eur J Orthod* 1991;13:111-23.
 33. Moss RA, Garrett JC. TMJ dysfunction syndrome and myofascial pain dysfunction syndrome: a critical review. *J Oral Rehabil* 1984;11:3-28.
 34. Norheim PW, Dahl BL. Some self-reported symptoms of temporomandibular joint dysfunction in a population in Northern Norway. *J Oral Rehabil* 1978;5:63-8.
 35. Ogura T, Morinushi T, Ohno H, Sumi K, Hatada K. An epidemiological study of TMJ dysfunction syndrome in adolescents. *J Pedod* 1985;10:22-35.
 36. Ohno H, Morinushi T, Ohno K, Ogura T. Comparative subjective evaluation and prevalence study of TMJ dysfunction syndrome in Japanese adolescents based on clinical examination. *Community Dent Oral Epidemiol* 1988;16:122-6.
 37. Pilley JR, Mohlin B, Shaw WC, Kingdon A. A survey of craniomandibular disorders in 800 15-year-olds. *Eur J Orthod* 1992;14:152-61.
 38. Pullinger AG, Seligman DA, Solberg WK. Temporomandibular disorders. I. Functional status, dentomorphological features, and sex differences in a nonpatient population. *J Prosth Dent* 1988;59:228-35.
 39. Pullinger AG, Seligman DA, Solberg WK. Temporomandibular disorders. II. Occlusal factors associated with temporomandibular joint tenderness and dysfunction. *J Prosth Dent* 1988;59:363-7.
 40. Riolo ML, Brandt D, TenHave TR. Associations between occlusal characteristics and signs and symptoms of TMJ dysfunction in children and young adults. *Am J Orthod Dentofacial Orthop* 1987;92:467-77.
 41. Seligman DA, Pullinger AG. The role of functional occlusal relationships in temporomandibular disorders: a review. *J Craniomandib Disord Facial Oral Pain* 1991;5:265-79.
 42. Shiau Y-Y, Chang C. An epidemiological study of temporomandibular disorders in university students of Taiwan. *Community Dent Oral Epidemiol* 1992;20:43-7.
 43. Wedel A. Heterogeneity of patients with craniomandibular disorders. *Swed Dent J* 1988;55 Suppl:1-51.
 44. Whitney CW, von Korff M. Regression to the mean in treated versus untreated chronic pain. *Pain* 1992;50:281-5.
 45. Olsson M, Lindqvist B. Mandibular function before orthodontic treatment. *Eur J Orthod* 1992;14:61-8.
 46. Seligman DA, Pullinger AG, Solberg WK. The prevalence of dental attrition and its association with factors of age, gender, occlusion and TMJ symptomatology. *J Dent Res* 1988;67:1323-33.
 47. Tosa H, Imai T, Watanabe F, Sumori M, Tsuchida T, Matsuno I, et al. The clinical study on occurrence of TMJ dysfunction in orthodontic patients. *Nippon Kyosei Shika Gakkai Zasshi* 1990;49:341-51.
 48. Clark GT. Etiologic theory and the prevention of temporomandibular disorders. *Adv Dent Res* 1991;5:60-6.

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