TMD Treatment Need in Relation to Age, Gender, Stress, and Diagnostic Subgroup

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Associations between treatment need for temporomandibular disorders (TMD) and age, gender, stress, and diagnostic subgroup were analyzed in an adult Finnish population sample of 506 subjects. When analyzed separately, the association between TMD treatment need and all the studied factors was statistically significant. This finding is in accordance with earlier results. When the studied factors were included into an explanatory model, however, the picture changed. The logistic regression analysis revealed that diagnostic subgroup was the strongest predictor for the TMD treatment need. Total stress score significantly added to the explanatory power of the model, but age and gender did not. The commonplace observation that women show more signs and symptoms of TMD seems to be explainable by their higher stress scores and by the type of symptoms.
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Temporomandibular disorders (TMD) are a heterogenous set of clinical conditions, characterized by pain and dysfunction of the masticatory system. Pain in the masticatory muscles, in the temporomandibular joint (TMJ), and in associated hard and soft tissues, limitation in jaw function, and sounds in the TMJ are the common signs and symptoms of TMD.[1] Because of the descriptive nature of the diagnosis of TMD and the large variation in prevalence figures,[1–3] the treatment need for TMD tends to be controversial.

Earlier treatment need estimates are usually based on prevalence figures and, accordingly, have varied greatly, from 5% to 25%.[4–8] The need for treatment has seldom been analyzed as such.[9] According to Salonen et al,[10] treatment need estimates cannot be deduced directly from the prevalence figures of TMD signs and symptoms. In a recent study of a group of 20-year-old men and women, 27% were in need of some kind of functional treatment.[11] In an earlier study by the present authors,[12] a new classification system for TMD treatment need was proposed. In this system, those with active treatment need, those with passive treatment need, and those with no need for treatment were grouped separately. According to this classification, 7 to 9% of the subjects were in the group of active treatment need.[12,13]

Early cross-sectional epidemiologic studies have demonstrated equal prevalence figures for men and women and for different age groups.[5,14–16] These studies also suggested that women are overrepresented in patient materials.[14] In more recent studies, however, the highest prevalence figures have been found among 20- to 40-year-old women,[10,17–21] and the lowest among children, adolescents, and elderly people.[10,11,22,23] Another recent study by the present authors[24]

indicated that women seem to suffer from TMD more often than men. That study showed that women needed treatment for their TMD problems three times as often as men. This is in accordance with newly published data on Brazilian high school and university students showing that women had moderate or severe symptoms of TMD four times as often as men.[25] Accordingly, differences between genders in the use of health care services are explained by true differences in prevalence figures. This agrees well with the studies by Berkanovic et al[26] and by Rakowski et al.[27]

Little is known about the significance of TMD diagnostic subgroups, eg, with myogenous or arthrogenous symptoms, in the treatment need for TMD. According to de Leeuw et al,[28] it is reasonable to suggest that patients with myofascial pain dysfunction (MPD) have a more acute need for treatment and a less favorable prognosis. For example, MPD patients have longer pain duration, more symptoms, and more medication than TMJ patients. They also report greater anxiety, more unpleasant pain experiences, and more difficulty in enduring the pain than do TMJ patients. Moreover, TMD patients with mainly myogenous signs and symptoms have the least successful treatment outcome and the highest percentage of renewed treatment.[29]

The importance of psychophysiologic factors has been emphasized in the etiology of TMD.[30–32] Subsequently, the symptoms of anxiety, depression, and anger, as well as the role of life stress, have been the focus of some research.[33–37] In the studies by Beaton et al[38] and by Niemi et al,[39] a higher level of stress symptoms was found among the TMD patients when compared to healthy subjects. Therefore, it seems likely that life stress may play an important role in some aspects of TMD. It has been suggested that some TMD patients may have problems in coping with increased life stress and daily hassles.[40] Consequently, they tend to respond with elevated muscle tension.[34,38,39] Different sources of stress may contribute to TMD by increasing parafunctional habits such as bruxism and clenching, which may increase the adverse loading of the masticatory system.[1]

Further studies with larger and unselected population samples are needed to identify those at risk of TMD. The aim of this study was to analyze the associations of age, gender, stress symptoms, and diagnostic subgroup to TMD treatment need.

Materials and Methods

Starting in 1992, a total of 515 subjects—246 men and 269 women, born in the years 1927, 1937, 1947, 1957, or 1967—participated in a 2-year follow-up study of TMD. The sample was drawn from records representing the population of the municipality of Jyväskylä, Finland. The present report is based on 506 subjects on whom complete data were available at the baseline. The clinical examination included measurement of the range of movements of the mandible, deviation during opening-closing, registration of TMJ sounds using a stethoscope, locking or luxation, registration of pain on movements, and pain on palpation of TMJ and masticatory muscles. The following muscles were palpated bilaterally: the anterior part and insertion of the temporal muscle; the superficial and deep part of the masseter; the digastricus posterior; and the medial and lateral pterygoids. The radiographic examination was based on an orthopantomogram taken from all subjects.

After the clinical examinations, subjects were interviewed for symptoms related to TMD. An experienced clinician (MK) performed all the clinical examinations and interviews. Before the study, this clinician, together with another experienced clinician (YLB), went through a calibration period at the University of Turku to increase the validity and reliability of the observations. A detailed description of the sampling procedure, sample, and clinical examinations was published earlier.[12]

Diagnostic Subgroups

Based on the entire set of data and, in principle, on the criteria defined by de Leeuw et al,[41] as well as the corresponding guidelines of the American Academy of Orofacial Pain,[1] subjects were classified into four subgroups according to their signs and symptoms: *(1)* mainly myogenous (TMD-myo, n = 107); *(2)* mainly arthrogenous (TMD-arthro, n = 144); *(3)* combined myogenous and arthrogenous (TMD-combined, n = 106); and *(4)* nonclassified subjects, those not fitting into any of the diagnostic subgroups (n = 149).

Subjects were classified as mainly myogenous when they reported pain on palpation of one or more masticatory muscle(s) or indicated pain in the area of one or more masticatory muscle(s) during active movements of the jaw. In addition, no clinical or radiographic evidence of organic changes in the TMJs was noted, and no tenderness of TMJ on palpation was reported. Subjects were classified as mainly arthrogenous when they indicated pain in the TMJs, exhibited TMJ sounds (clicking and crepitation), and/or if radiographs revealed organic changes in the TMJs, with no major involvement of the masticatory muscles. Subjects were classified as

combined myogenous and arthrogenous when the clinical signs and symptoms indicated both myogenous and arthrogenous components. Subjects without symptoms but with some subclinical finding, such as transient clicking and/or a single muscular sign, were also classified according to this grouping. Most of the nonclassified subjects who did not fit in any of the other subgroups were healthy from a stomatognathic point of view.

Treatment Need Classification

For TMD treatment need analyses, a new classification system was introduced. Subjects were classified into *(A)* active (n = 46), *(B)* passive (n = 245), or *(C)* no treatment need (n = 215) groups.[12] The classification was based on anamnestic data, clinical and radiologic findings, and clinical experience. Subjects in the active treatment need group had moderate or severe signs and subjective symptoms of TMD, prompting them to seek help or designating them as needing care independently of other possible oral health problems (ie, TMD alone requires treatment). Subjects in the passive treatment need group needed stomatognathic treatment in association with other dental care, such as prosthetics or periodontal care, to ensure the success of the dental care. Subjects in this group showed some minor signs or symptoms of TMD, but were assessed as needing no stomatognathic treatment if no other dental care was considered necessary. Subjects were classified into the no treatment need group if TMD problems did not call for treatment in any circumstances. The principles of this classification system, and the distribution of the subjects according to this classification, have been described in detail earlier.[12,13]

Assessment of Symptoms of Stress

After the examination, and independently of the classification of the subjects into clinical diagnostic subgroups and treatment need subgroups, physical, behavioral, and psychologic symptoms of stress were assessed. The Symptoms of Stress (SOS) inventory, derived from the Cornell Medical Index by Nakagawa-Kogan and Betrus[42] and Beaton et al,[38] was used. Subjects were asked to rate for the preceding month the frequency with which they had been bothered by a particular stress symptom, using a 0 to 4 graded scale (0 = never, 4 = very often). A total of 94 items and 10 subscale scores were counted. The subscales were peripheral, cardiopulmonary, neurologic, muscle tension, gastrointestinal, habit patterns, depression, anxiety, anger, and cognitive disorganization. The reliability and validity of SOS and its use as a screening instrument have been shown in both American and Finnish studies.[38,39,42,43]

Table 1 TMD Treatment Need in Different Age Groups

	Treatment Need Group			
Year of birth	Active	Passive	No need	Total
1927	7	54	43	104
1937	10	55	30	95
1947	7	55	39	101
1957	15	47	38	100
1967	7	34	65	106
Total	46	245	215	506

Chi-square = 26.98; $P < .001$.

Statistical Analyses

Analysis of variance (ANOVA) and chi-square tests were used for analyzing separately the associations of age, gender, diagnostic subgroup, and total stress score with treatment need. Age, gender, diagnostic subgroups, and total stress scores were included in the step-wise polychotomous logistic regression analysis to explain the treatment need of the subject.

Results

When analyzed separately, statistically significant associations were found between TMD treatment need, age, gender, diagnostic subgroup, and stress scores of the subject (Tables 1 to 4). The youngest subjects were more often classified in the group of no treatment need (Table 1). More men than women were classified in the no treatment need group, and women were more often in the active treatment need group (Table 2). The subjects in the active treatment need group were evenly distributed among the "TMD-arthro," "TMD-myo," and "TMD-combined" subgroups (Table 3). Contrary to the even distribution in the active treatment need group, there were differences with regard to diagnostic subgroups in the "passive treatment need" and "no treatment need" groups. Subjects from the "TMD-combined" group were most often found in the passive treatment need group, while "TMD-arthro" subjects were found in the group with no need of treatment more often than the others (Table 3). Women more often than men belonged to the "TMD-combined" subgroup ($P < .001$). The subjects in the "TMD-myo" subgroup were younger than those in the other subgroups ($P < .01$).

Table 2 TMD Treatment Need Among Male and Female Subjects

	Treatment Need Group					
	Active		Passive		No need	
Gender	%	n	%	n	%	n
Male	4.5	11	43.5	107	52.0	128
Female	13.5	35	53.1	138	33.5	87
Total		46		245		215

Chi-square = 23.89; $P < .001$.

Table 3 TMD Treatment Need in Clinical Diagnostic Subgroups

	Treatment Need Group					
	Active		Passive		No need	
Diagnostic subgroup	%	n	%	n	%	n
TMD-arthro	10.4	15	47.2	68	42.4	61
TMD-myo	13.1	14	60.7	65	26.2	28
TMD-combined	16.0	17	77.4	82	6.6	7
Nonclassified	0	0	20.1	30	79.9	119
Total		46		245		215

Chi-square = 150.51; $P < .001$.

Table 4 Means and Standard Deviations of Stress Scores in TMD Treatment Need Groups (One-Way ANOVA)

	Treatment Need Group				
	Active (n = 46)	Passive (n = 245)	No need (n = 215)		
SOS scale	Mean (SD)	Mean (SD)	Mean (SD)	F	*P*
Peripheral	8.91 (5.02)	6.75 (3.93)	5.67 (3.80)	13.55	.0000
Cardiopulmonary	18.00 (8.52)	13.96 (7.65)	11.44 (6.76)	17.14	.0000
Neurologic	5.09 (2.88)	2.89 (2.35)	2.00 (2.16)	34.97	.0000
Gastrointestinal	11.54 (5.92)	7.89 (5.07)	6.79 (4.56)	17.70	.0000
Muscle tension	16.56 (7.11)	10.74 (6.48)	7.92 (5.71)	39.17	.0000
Habit patterns	16.40 (9.02)	12.99 (7.84)	10.81 (7.27)	11.32	.0000
Depression	8.28 (7.04)	5.53 (4.90)	4.43 (4.39)	11.99	.0000
Anxiety	13.04 (6.65)	9.07 (6.26)	7.65 (5.21)	16.33	.0000
Anger	9.63 (5.16)	7.31 (4.26)	6.38 (4.25)	10.99	.0000
Cognitive disorganization	7.33 (4.17)	5.84 (3.88)	5.02 (3.47)	7.93	.0004
SOS total	114.80 (47.3)	83.00 (39.2)	68.10 (35.9)	29.39	.0000

SOS = symptoms of stress inventory.

Table 5 An Explanatory Model for TMD Treatment Need in an Adult Population Aged 25 to 65 Years

	DF	Chi^2	*P* value
Diagnostic subgroup (TMD-myo, TMD-arthro, TMD-comb)	2	28.91	< .001
Stress score	4	39.11	< .001
Gender	2	5.70	.058
Year of birth	8	7.84	.450

TMD-myo = subjects with tender muscle dominance; TMD-arthro = subjects with affected TM joint dominance; TMD-comb = subjects with the combination of affected muscles and joints. Stress score refers to SOS inventory scale.[38] All tested factors shown. Among the test factors, diagnostic subgroup had the best explanatory power, followed by stress score which significantly improved the fit of the model. Inclusion of gender and age did not further improve the fit of the model. Stepwise polychotomous logistic regression analysis. DF = degrees of freedom.

The treatment need groups differed from each other in the total score of stress symptoms and in all the SOS subscales. All the paired comparisons of total stress score between the subgroups were statistically significant. The highest stress scores were found in the active treatment need group, followed by the passive treatment need group, while the lowest levels of stress were found in the group of no treatment need (Table 4). Women showed higher total stress scores than men ($P < .001$). The total stress scores were highest in the "TMD-myo" and "TMD-combined" subgroups ($P < .001$).

The profile of the mean SOS subscale scores (average subscale score divided by the number of items) clearly showed the highest peak on the muscle tension scale (Fig 1).

When the studied factors were included in an explanatory model, the picture changed considerably. In the stepwise polychotomous logistic regression analysis, the strongest predictor for TMD treatment need was the diagnostic subgroup. The total stress score significantly added to the explanatory power of the model (Table 5), while age did not. In addition to diagnostic subgroup and stress score, the role of gender

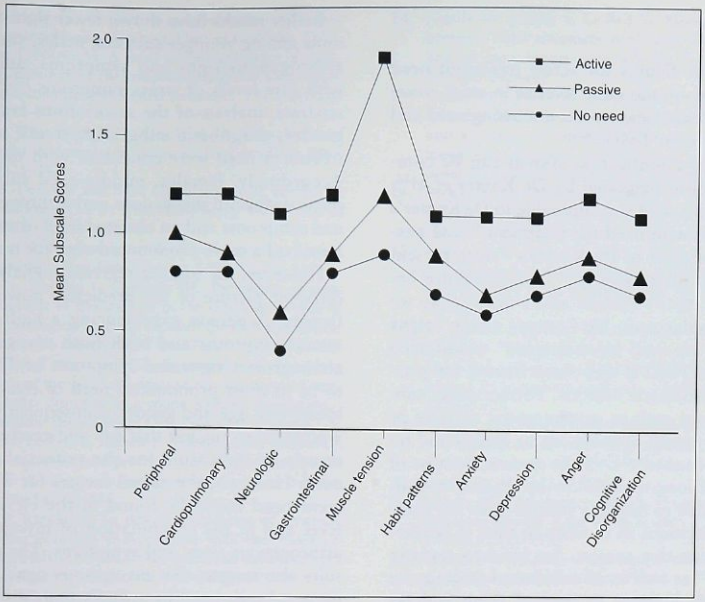

Fig 1 Mean scores from the Symptoms of Stress Inventory subscales (average subscale score divided by the number of items).

Table 6 Risk Ratios for Active or Passive Treatment Need in Different Diagnostic Subgroups

	Active vs no treatment need			Passive vs no treatment need		
	Risk ratio	95% CI		Risk ratio	95% CI	
TMD-myo vs TMD-arthro	2.00	0.80	4.80	2.10	1.20	3.60
TMD-comb vs TMD-arthro	6.90	2.30	21.00	9.70	4.10	23.00
20 stress score points above average	1.64	1.62	1.65	1.15	1.14	1.16
50 stress score points above average	3.43	3.40	3.47	1.42	1.41	1.44

TMD-myo = TMD-myogenous subgroup; TMD-arthro = TMD arthrogenous subgroup; TMD-comb = TMD-combined subgroup.
Average stress score = 85.0 for the whole study group. All risk ratios, except the ratio TMD-myo versus TMD-arthro at the active treatment need level, are statistically significant.

showed some tendency to increase the explanatory power of the model ($P = .058$). When the same analyses were performed separately for men and women, identical explanatory models resulted.

Subjects with both myogenous and arthrogenous signs and symptoms had a significantly higher risk of belonging to a treatment need group (Table 6). Furthermore, the risk for subjects with myogenous signs and symptoms of being in a treatment need group was doubled in comparison to the arthrogenous group. A subject with a high total stress score also had a significantly heightened risk of being in a treatment need group.

Discussion

The prevalence figures for active treatment need for TMD were on the same level as in most cross-sectional epidemiologic studies discussing need and demand of care for TMD.[44–46]

The present classification system can be compared with those suggested by De Kanter et al[46]: active treatment need is comparable to De Kanter's "signs present with need for treatment," and passive treatment need to De Kanter's "signs present with no need for treatment." The difference between De Kanter's system and ours is that we think many subjects in De Kanter's group "signs present with no need for treatment" would need treatment for TMD if they were treated for periodontal or prosthetic reasons. Furthermore, subclinical findings such as asymptomatic clicking or deviation on mouth opening can be benign and require no treatment.[1pp117–130] At present, because of a shortage of long-term follow-up studies, it is almost impossible to find any reliable basis for making clinical decisions as to when to treat in borderline cases. For this reason, we tried to register "everything," as well as all subclinical findings for the follow-up analyses, to learn if some findings are indicative for later clinical signs or symptoms.

Several investigators have suggested using diagnostic subgroupings to get a more accurate picture of the different TM disorders.[2,28,41] In the study by de Leeuw et al,[41] 32% of the patients belonged to the TMD arthro-group, 33.5% to the myo-group, and 16% to the combined group, while the figures from our study were 28%, 21%, and 21%, respectively. There is a basic difference between these studies, however, which makes direct comparison impossible: our study was an epidemiologic one, while de Leeuw et al examined patients seeking care. Our figures coincide more closely with the figures from an epidemiologic study by Schiffman et al,[45] in which 23% of patients belonged to the TMD-myo group, 19% to the arthro group, and 27% to the combined group.[45]

The earlier studies have demonstrated that the Symptoms of Stress (SOS) inventory has adequate internal consistency, test-retest reliability, and concurrent validity.[38,39,42,43] It has also proved to be a useful screening device in the identification of stress-related psychologic and somatic symptoms in TMD patient and nonpatient samples.[38,39] In the present study, the total stress scores differed significantly among the TMD treatment need subgroups. The overall stress level in the active treatment need group corresponded to the stress level of TMD patients in the previous study on Finnish TMD patients.[39]

Earlier results have shown fewer signs and symptoms among younger subjects, males, subjects with arthrogenous signs and symptoms, and subjects with low levels of stress symptoms.[10,25,28,39] Our separate analysis of the associations between age, gender, diagnostic subgroup, stress, and TMD treatment need were consistent with these results. Accordingly, females, middle-aged subjects, and those with both myogenous and arthrogenous signs and symptoms and an elevated level of stress symptoms had a more pronounced need for treatment.

However, the logistic regression analysis gave a different picture of the predictive power of these factors. A person experiencing a high degree of stress symptoms and with both myogenous and arthrogenous signs and symptoms of TMD seems to be in most pronounced need of treatment irrespective of age and gender. Consequently, it seems warranted to suggest that age and gender can serve merely as indicators for the potential treatment need. However, the causal factors for TMD treatment need might be found in the elevated stress level and in the combination of myogenous and arthrogenous signs and symptoms. The present results also suggest that myogenous signs and symptoms, as compared to arthrogenous disorders, are better indicators of active need for treatment, in accordance with the observations of de Leeuw et al[28] and Scholte et al.[29]

The common observation that women show more signs and symptoms of TMD seems to be associated with their higher stress scores and the type of symptoms they have. This finding calls for further studies to understand the role of different background factors in TMD.

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Resumen

La necesidad de tratamiento de los desórdenes temporomandibulares en relación a la edad, género, estrés y subgrupo de diagnóstico

Se analizaron la asociación entre la necesidad de tratamiento para los desórdenes temporomandibulares (DTM) y la edad, género, estrés y subgrupo de diagnóstico, en una muestra de población finlandesa adulta compuesta por 506 personas. Cuando se analizó separadamente la asociación entre las necesidades de tratamiento de los DTM y todos los factores estudiados, esta fue estadísticamente significativa. Este hallazgo concuerda con resultados anteriores. Cuando se incluyeron los factores estudiados en un modelo explicativo, sin embargo, la situación cambió. El análisis de regresión logística reveló que el subgrupo de diagnóstico era el mecanismo de predicción más importante en cuanto a la necesidad de tratamiento para la articulación temporomandibular. La puntuación del estrés total intensificó significativamente el poder explicativo del modelo, pero la edad y el género no. La observación común de que las mujeres muestran más signos y síntomas de DTM parece ser explicable debido a que sus puntuaciones de estrés son más altas y al tipo de síntomas.

Zusammenfassung

TMD-Behandlungsnotwendigkeit in Beziehung zu Alter, Geschlecht, Stress, sowie diagnostische Untergruppen

Beziehungen zwischen Behandlungsnotwendigkeit von temporomandibulären Erkrankungen und Alter, Geschlecht, Stress, sowie diagnostischen Untergruppen wurden in einer Auswahl von 506 Personen aus der erwachsenen finnischen Bevölkerung analysiert. Wenn getrennt analysiert wurde, war die Beziehung zwischen TMD-Behandlungsnotwendig und allen untersuchten Faktoren statistisch signifikant. Dieses Ergebnis stimmt mit früheren Resultaten überein. Wenn die untersuchten Faktoren dagegen in ein Erklärungsmodell eingeschlossen werden, ändert sich das Bild. Die logistische Regressionsanalyse zeigte, dass die diagnostische Untergruppe der stärkste vorhersagende Faktor für die TMD-Behandlungsnotwendigkeit war. Der totale Stresswert vergrösserte die erklärende Leistung des Modells signifikant, Alter und Geschlecht jedoch nicht. Die alltägliche Beobachtung, dass Frauen mehr Zeichen und Symptome einer TMD zeigen, scheint mit deren höheren Stresswerten und mit dem Typ der Symptome erklärbar sein.