Epidemiological analysis on 2375 patients with TMJ disorders: basic statistical aspects

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Summary
The aim of this work was to present data from a large sample of patients with Temporo-Mandibular Disorders (TMD) in order to clarify some aspects of the development of pathological conditions that affect large parts of the population.
This preliminary work put in relation, through an epidemiological evaluation, anamnestic and clinical data collected from a sample of 2375 patients affected by TMD. Personal data were provided by questionnaire (age, sex, status, etc.), while clinical data were collected following a specific medical chart compiled in accordance with international criteria for TMD. An analysis of these data clearly showed that there were large quantities of variables involved in these disorders and which occur with a wide variety possible of clinical signs. This complexity, in accordance with the current knowledge that it is not able to clarify the etiology of these disorders, makes intricate both diagnostic then therapeutic aspects. You would find in front of a multifactorial systemic disease that, interfering with the individual bioavailability, exposes him to the possibility of perceiving noxious stimuli which otherwise would not able to reach the pain threshold. To support this hypothesis is the data founded in this report that showed how many patients suffered, at the same time, by muscle and spinal pain associated to headache, pain that occur with high frequency from the same side. The presence of these painful conditions tends to underestimate the dysfunctional problems even if they occur with greater clinical prevalence. Further research should be carried out to clarify these controversial issues.

Key words: temporo-mandibular disorders, statistical analysis, epidemiology.

Introduction

The Temporo-Mandibular Disorders (TMD) are a set of dysfunctional patterns concerning the temporo-mandibular joints (TMJ) and the masticatory muscles with frequent involvement of other structures of various body districts with the result of making complicated the classification and the diagnostic processes (1-4).
This complexity has led, in recent years, to consider the origin of the TMD as multifactorial both for the undoubted frequent association of several factors in causing the disease then for the current inability of the researchers to recognize the real factors causing the dysfunction (5-10). In this context it might be useful to have clinical data emerging from epidemiological studies of large numbers of patients to better understand the various and complex symptomatology and to try to framing the patient need of care in particular to be able to set an early diagnosis and to apply prevention therapies (11-12).
The data analyzed in this work are the outcomes of the patients who spontaneously arrived requiring a specialist visit at the Gnathological Service of the Oral and Maxillo-Facial Department of University "Sapienza" of Rome during the period from July 1983 to July 2006.
Taking into account as diagnostic reference the RDC/TMD, our researches are related exclusively to the Axis 1 clinical aspects, complemented by other possible variations in the clinical section of muscle disorders.
All data were analyzed with statistical evaluation techniques and, in view of the amount and complexity of the results, they were divided into two papers. In this early work the authors have been illustrated and described the epidemiological basic characteristics of the sample with the aid of elementary statistical techniques and tools. This preliminary phase was necessary to carry out further analysis aimed for identifying most sophisticated and significant links between the different dysfunctional frames. In order to give a logical and statistically useful to the large

amount of clinical variables describing the population affected by temporo-mandibular disorders (TMD), it was necessary to encode the different aspects studied in this work in an analytical way. The mat and met paragraph explained the details of the type of coding adopted for the symptomatic variables considered and highlighted the motivations that have addressed these scientific choices. Following the same codifications we were described and analyzed the results and through their analysis the subsequent concluding remarks.

Materials and methods

1.1 Selection of sample

As mentioned above, patients were selected retrospectively from the medical records registered at the Clinical Gnathology Service of the Oral and MaxilloFacial Sciences Department of Sapienza University of Rome. The Service was created at the chair of Maxillofacial Surgery, then it was transferred under the direction of the Periodontal chair and finally it became special unit, during the entire period the division has always been managed by the same calibrated team. The patients considered in the study were selected with two inclusion/exclusion criteria, the only inclusion criterion adopted was to have a diagnosis of TMJ disorders, the only one for exclusion was not having the medical records duly completed. The authors were considered those who have made a specific treatment and those who were only observed and recorded because these data could be useful for epidemiological and statistical considerations. The period from 1983 to 2006 was the time interval considered, during that time patients come to clinical attention were over 8000. The lack of information founded in medical records present in the chart compiled during the first years, however, has required the authors to take into account only the data related to the patients who have come for a visit during the decade 1996-2006, this examination has involved 3087 patients. In the light of the application of above mentioned selection criteria the study sample has been composed of 2375 patients.

2.2 Description and coding of variables: from the medical records to statistical data

The medical chart which were originally used at the Department was formed by 2 front pages. Later also to observe the international criteria for the diagnosis of TMD the medical records has been changed to 4 pages, in which were sequentially well-ordered: the patient's personal data, history, subjective pain symptoms, symptoms and objective by masticatory muscles and articular joint functionality other articular features, occlusal and structural examination, symptoms of other districts. This chart was subsequently update to improve and complete the medical records introducing specific area regarding the intra-and extra oral inspection, the presence of structural or systemic diseases, to describe the results of the imaging, to introduce a severity code of each case. The last part has been left to the spaces specially dedicated to the description of the working diagnosis and the subsequent treatment plan, and finally an adequate space for describing the evolution of symptoms during treatment controls was added. The final version of the medical records used for TMD patients was put into current use in the mid-nineties, this explains the choice of the period under review.

Based on the semeiotics suggested by the structure of medical proceedings it was therefore possible to identify four groups of variables, for a total of 33 characteristics that clearly define a TMJ disorders:

1. General features and age;
2. Biomechanical characteristics, which include data relating to the symptoms of functions and dysfunctions and occlusal characteristics;
3. Muscle characteristics, including data related to the presence/absence of the different type of neuromuscular pain;
4. Data describing the treatments and their outcome.

In the first section were enclosed the variables described below:

- Sex: several studies have to give particular important to this issue not only because it is well know the high percentages of women compared to men involved in the temporo-mandibular disorders.
- Age: to analyze this variable was deemed appropriate to adopt, in the following analysis, a division into different classes of age: 0-15 years (children), 16-25 years, 26-40 years, 41-50 years, 51-60 years, 61-70 years, more than 70 years.
- Civil status: Although not known for many of the patients examined, in our view, it is an aspect to be considered in order to evaluate the emotional impact of private life context (separation, divorce, bereavement).
- Occupation: the occupation and the type of activity performed by any subject may be determinant to evaluate certain attitudes, postural factors and the social stress. Furthermore this variable was again divided by grouping different professions in the nine categories proposed by Istat Classification of Occupations: intellectual professions and scientific, technical and specialized, used, non-specialized in commercial, craft, industrial and services; housewives, students, pensioners, unemployed; more.
- Existence of a history of trauma: this file is clinically considered as a factor that most often lead to TMJ (temporo-mandibular joint) functional alterations with related pain, neck pain and or other type of pain.
- Presence of a previous treatment: this element has been recorded in order to assess if the visited patients have previously undergone to some therapies in one or more of the stomatognathic components. These variables have been codify for type of therapy (gnathologic, orthodontic or prosthetic) and for numbers of treatments one, two or more.
- Presence of a disease (different from TMD): it was decided to organize, the corresponding variable collected by the questionnaire, into four major groups:

absence of pathology, presence of systemic diseases, presence stomatognathic diseases or both.

The information collected in the "biomechanical characteristics" section, were combined in the following variables:

- Presence of tmj pain on the right side and presence of pain on the left side: for these two variables other than the presence/absence of pain it was also quantified the pain intensity using the Visual Analogic Scale (VAS). To both variables were assigned the following classes of values: 0 (no pain joints), 0-20 (mild pain), 20-50 (moderate pain), 50-80 (severe pain), 80-100 (severe pain).
- Presence of joint noise both left and right side: the sounds considered were: click, crepitus, noise of different nature and not attributable to the two previous types called unclassifiable. If the same structure had multiple symptoms, we have based the classification on the severity of the disease considering as principal noise the presence of crepitus. The categories of the variables considered were: No noise, Click, Crepitus, Other.
- Value of the maximum opening of the mouth: this feature was expressed in mm and divided into the following classes of values: 0-20 mm, 21-30 mm, 31-40 mm, 41-45 mm, 46-50 mm and more than 50 mm.
- Missing teeth in the left and/or right dental arch: the corresponding variables were coded by defining the following classes of modes: 0 (presence of all dental elements in the right or left arch), 1-2, 3-4, 5-8 (number of missing teeth in the posterior area).
- Missing teeth in anterior area (upper an lower arch including): for this area we had considered the same parameter explained above: 0 (presence of all dental elements), 1-2, 3-6, more than 6 (number of missing teeth in the anterior area).
- Molar Occlusal Classes (right and left): whereas that for many occlusal situations the occlusal class it often was not attributable, we were considered four modes: occlusal Class I, occlusal Class II, occlusal Class III, occlusal Class not definable;
- Limitation of maximum opening of the mouth: we have considered only the presence/absence
- Laxity of ligaments: we have considered only the presence/absence.

Other variables of which have been calculated only the presence/absence were the following:

- TMJ Subluxation: discriminating only the sides (right, left or both);
- Mandibular Dislocation discriminating only the sides (right, left or both);
- Asymmetry of the mandible: comparing the right with the left side with clinical approach and following the cephalometric procedures proposed by Habets;
- Steep Incisal guidance: it was considered to be vertical when the cephalometric measure of the angle formed by long axis of central upper incisor and Frankfurt plan is less or equal to 100°;
- Decrease of posterior vertical dimension of occlusion: this parameter was inferred from a clinical and radiological evaluations without specific measurement;

Another cluster of variables considered were the one related to the masticatory muscles disorders. In this group, the following variables were embraced:

- Masticatory muscles pain: we was detected only the presence / absence not considering the size and soreness;
- Headache: this pain condition was considered without classifying, evaluating only the side of onset when its referred. For these two characteristics it was used as a method of evaluation based on the VAS scale working with the same classes of encoding methods utilized for the TMJ pain: 0 (no headache), 0-20 (mild headache), 20-50 (moderate headache), 50-80 (severe headache), 80-100 (very severe headache).
- Spinal pain: there have been recorded the presence / absence regardless of the location (cervical, lumbar or sacral). The presences of these symptoms were an important aspect to be investigated because, in the literature, several studies agree in highlighting a possible correlation or comorbidity with TMD;
- Emotional factors: state of anxiety or generic stress that could help to promote the onset of dysfunction, were evaluated by clinical method and deducted by the anamnestic records.
- Parafunctions: these parameters were divided into two different comportments "bruxism" and "clenching", they were assessed from the clinic analysis of the masticatory muscles and from the evaluation of the teeth status.

The last parameters that we have been evaluated from the comparison of the above variables were the therapies performed and its results. Under the wording therapies the authors have included the main type of conservative treatment used in different and custom combinations to solve a TMD: plates, physiotherapy and pills.

Outcome of the therapy: the results of the treatments were classified in 4 possible outcomes: healed, improved, stable, worsened. This evaluation has been assumed from the pre and post treatment comparison of the semeiological data of each patient. The development of any other new symptoms or the aggravation of the previous indicated a worsening condition. The presence of the same symptoms showed a stable condition, the only improvement without a complete resolution of the symptoms showed an improved situation, the stable absence of any symptoms indicated a condition of healing. The authors included in this analysis only the treated patients with a long distance assessments.

2.3 Statistical analisys

In this work, the statistical analysis of the data obtained from medical questionnaire and medical charts were primarily used to characterize the basic epidemiological aspects of the 2375 dysfunctional patients. For this purpose descriptive statistical tools, as frequency distributions and percentages, graphical representations and - according to levels of data measurement - various measures of central tendency (including mean, median and mode) and variability (i.e. standard deviation and variance), were essentially used.

Results

Considering the high number of variables that have been submitted to statistical analysis, in this section will be presented and discussed only the most significant results. In order to make more clear the subsequent illustration of the general characteristics of our dataset, the most important descriptive statistics of the quantitative variables are presented in Table 1.

3.1 Defining general aspects

Firstly, we considered composition of our sample by gender and age. About gender, we observed a strong prevalence of women over men, with a percentage respectively of 79.5% for women and of 20.5% for men. These results confirmed the 8/3 - 8/1 ratio already known in the literature. The age of the patients was known for almost all those visited (97.1%). The analysis of age data showed an high percentage of patients belonging to the middle compared to the pediatric age (0-15 class of years): 36.8% and 3.6% respectively. The same results were found for the advanced senile age (70 +), 1.8% of subjects. The mean and median matched with the class 26-40 years, in particular, the mean age was 35.6 years (Tab. 1).
The high number of students in the sample could explain the high presence of patients in the group of 16-25 years. Since the lowest frequencies were found in the most extreme age groups, this confirms that young and the elderly people represent a minority in the sample. Further, when we analyzed the gender respect to age, results showed that mean and median both matched the 26-40 class years. However, these measures for women (36 and 33 years respectively) were greater than men (34 and 30 years respectively).
In conclusion with respect to age and gender variables it was established that, the patient type that addressed to the Dental Clinic Department of Sapienza University of Rome during the years 1996-2006 asking a gnathologic visit was mostly a women, aged between 26 and 40 years.
The medical records about the civil state of patients were known only in 16.2% of cases, (statistically insignificant), while their "profession" was widely known (75 7%). An inspection on such the data indicated that students, housewives and employees were the "working" categories that characterize mostly our sample data. We found a very relevant percentage of subjects belonging to the intellectual and scientific professions, as well to the so called unskilled workers.
Concerning the "trauma" variable, 79.2% of the patients didn't told a history of trauma previous their dysfunction. While, for the "stomathognathic treatments performed before the onset of the TMD" variable, the descriptive analysis showed that only 2.8% of the patients underwent to two treatments, 21.7% to one treatment, and the majority of 75.5%, said that they did not have undergone to any dental treatment.
We have reported the frequency distribution of the 2375 patients respect to other diseases (systemic and/or stomathognathic) in Table 2. We can observe that that the majority of subjects 84.2%, (2000) had no disease, while the 13.1% (310) had a systemic diseases in their medical history.
As mentioned earlier, the low frequencies associated with the 12 groups of systemic diseases and the 4 groups of stomathognathic diseases originally considered, did not allow to deduce any evident connection between these variables and TMD's; that is, it was not possible to detect any statistically significant association between such variables which might substantiate some pathogenic interactions.

Table 1. Descriptive statistics of the quantitative variables.

Variable	Meaw	Median	Standard deviation	Minimum	Maximum
Age	35,64	32,00	15,047	2	86
Riht articular pain*	22,57	,00	28,891	0	100
Right articular pain**	49,58	50,00	22,227	5	100
Left articular pain*	21,16	,00	28,838	0	100
Left articular pain**	50,35	50,00	22,559	5	100
Maximum mouth opening	43,58	45,00	8,911	1	68
Maximum mouth opening***	46,21	46,00	6,786	1	68
Missing teeth in the arch right	1,08	,00	1,746	0	8
Missing teeth in the arch left	1,10	,00	1,747	0	8
Missing teeht in front area	,42	,00	1,639	0	12
Headache right*	24,91	,00	32,241	0	100
Headache right**	58,53	50,00	21,775	10	100
Headache left*	24,01	,00	31,939	0	100
Headache left**	58,60	50,00	21,504	15	100

* These variables are, in this case, not considered quantitative and ordinal.
** The values of the indices calculated refer to the variable considered in relation to the symptomatic sample.
*** The values of the indices are calculated in relation to the variable "maximum mouth opening", evaluated by excluding cases with the presence of LAB.

Table 2. Composition of the sample by type of other diseases.

Pathology	Values of disease	Percentages
Absence values of disease	2000	84,2
Systemic disease/stomatognatic	2	0,1
Systemic disease	310	13,1
Stomatognatic pathology	63	2,7
Total	2375	100,0

3.2. The analysis of the bio-mechanical characteristics

The statistical analysis of the TMJ pain in the sample showed that the 63% of patients presented articular pain (compared with the 37% asymptomatic); in particular, 24.6% of them had bilateral pain, while about 38% of them showed pain to one of the temporo-mandibular joints.
The analysis of the symptom "TMJ pain" have been carried out considering separately the two joints. Table 3 presents the frequency distribution of "TMJ pain" in the form of class VAS intervals. The frequencies in such table show that more than a half of the subjects (54.5% and 58% respectively) had no pain in both joints. In both right and left "TMJ pain", the means fall in the 20-50 class with a very close value to the low of 20, which indicates a moderate degree of pain (the medians both coincide to "0", that is no right and left pain); dispersion measures were almost similar in both situations.

In order to assess the relative meaning of the different degrees of "TMJ pain" (left and right) only in the symptomatic sample, we excluded all those subjects showing zero VAS value from the sample. Such new sub sample was made up of 1081 patients with right "TMJ pain" and 998 patients with left "TMJ pain"; data in Tab. 4 show that the moderate degree of articular pain was the most frequently occurring in about half of the cases, followed by mild and strong; pain assessed as serious showed a very low frequency in both joints, 2.3% and 2.8% respectively.
Further, for both joints we investigated the relation between pain and age: analysis showed an high frequency of subjects falling in the middle-class (20-50 class of years), but the media was closer to the class endpoint of 50 years of age.
The analysis of noisy symptoms led to the following results: 53.2% of the patients had joint noises, 35.2% of them had noises at one joint, 18% of them had noisy symptoms at both joints (TMJ).

Table 3. Frequency distribution right and left articular pain (VAS scale class intervals).

Classes VAS	Right TMJ pain		Left TMJ pain	
	Absolute value	Percentages	Absolute value	Percentages
0	1294	54,5	1377	58,0
1-20	275	11,6	243	10,2
20-50	515	21,7	469	19,7
50-80	266	11,2	258	10,9
80-100	25	1,1	28	1,2
Total	2375	100,0	2375	100,0

Table 4. Frequency distribution of right and left "TMJ pain" in symptomatic sub sample.

Classes VAS	Right TMJ pain		Left TMJ pain	
	Absolute value	Percentages	Absolute value	Percentages
1-20	275	25,4	243	24,3
20-50	515	47,6	469	47,0
50-80	266	24,6	258	25,9
80-100	25	2,3	28	2,8
Total	1081	100,0	998	100,0

Also for the noisy symptoms we considered separately the right and left temporo-mandibular joints. The basic statistical data showed that: the 35.3% of the subjects had noises at the right tmj, 21.1% of them had noise identified as “clicking”, 5.5% diagnosed as “crepitus“ and a share of 8,7% have noisy symptoms unidentifiable in the two previous categories. About the left side, the 36% of the sample had noises in the left TMJ, the 21.7% of them had diagnosis of noise identified as clicking, 9.7% as non-specific and only a portion 4.4% showed a noises classified as crepitus. Also in this case to evaluate the relative importance of the three types of the TMJ noises, the authors have been considered only the symptomatic sample excluding from the statistical calculation the subjects who did not show any articular noises, this has been done both to total count then for each of left and right joint sides. The results showed that the symptomatic sample respectively consists of 838 and 852 patients. In both cases it was found that the clicking sounds were the kind of articular noises that occur more frequently having a high relative statistical weight, followed by the not identifiable noises and finally the crepitus, both as a much more reduced percentage.

Considering the “limitation of mouth opening“ variable, data showed a significant percentage of the sample, 78.7% with “no limitation of mouth opening” and, then only the 21.3% of the subjects was found affected by this symptom.

Consider now the “maximum opening of the mouth” variable, evaluated in millimeters; we had data for such variable in the 83.7% of the medical records. In analyzing such data we found that mean, median and mode falling in the same class 41-45 mm; further, the smallest opening value was 1 mm while the largest was 68 mm (Tab. 1). The patients were distributed in a rather uniform way starting from 31 mm value until 40 mm value, and only the 8.1% of patients fallen in a mouth opening class “less than 30 mm“. Considering the gender of such subjects, we also found that mean and median were higher in the group of men compared to women, and, in addition, by comparing these measures with those calculated for the whole sample, we found that the mouth opening mean and median in women were lower than those ones, while for men the same values were higher. Further, in order to avoid influences by those subjects suffering by a limitation, we excluded from the analysis of “maximum opening of the mouth” variable, all the patients who have some difficulties in performing the mandibular opening movement (the dimension of resulting new sample was 1522 subjects). In this last case we found that, for both women and men, the mean and median were increased compared to the whole sample and falling in the class opening 46-50 mm. If now consider the gender of such 1522 subjects, despite the average and the median value increased both for women then for men, we found that female gender showed lower values than male one. Therefore, these results confirm the quantitative difference in the maximum opening of the mouth in favors of men than women, and also confirm that female gender has been shown to be more sensitive to the TMJ internal disorders.

Dislocation of the jaw was analyzed by considering the two joints in the right and left sides separately. This dysfunctional alteration occurred at the right TMJ in 3.6% of the subjects and at the left side in 3.8% of the subjects. Also about the condylar subluxation, the authors carried out an analysis by right and left side separately. Frequency distribution showed that 1.6% of the sample suffered of this functional characteristic at the right TMJ, while 1.5% of the subjects suffered at left side. TMJ laxity of ligaments was found to be present in 14.1% of the sample.

These elements see med to question on the possibility that, a ligamentous laxity and/or a joint hypermobility focused to the TMJ, had a possible role in the determinism of internal disorders of this articulation.

The evaluation of the absence of teeth examined in the patients had led to the following results, the 42.9% of the sample had missing teeth in at least one of the three sectors investigated (posterior right and left dental arches, anterior area), these sectors were instead simultaneously involved in 9.3% of cases. The frequency distributions in these three specific areas are reported in Tab. 5. In the right sector we found the 84.7% of subjects having at least 1 or 2 missing teeth. The mean fells in “1-2” class, while the median coincided with the mode “0”, indicating the presence of all the dental elements; the maximum number of missing teeth in the posterior right arches has been equal to eight teeth missing (Tab. 1).

The 84% of the sample showed one or two missing teeth in the posterior left arch. Also in this case, the average value fells in the “1-2” class and the median coincided with the mode “0”, as well the maximum number of missing teeth was equal to eight (Tab. 1).

Table 5. Frequency distribution of the “missing teeth”.

Number	Missing teeth in the right posterior dental arch		Missing teeth in the left posterior dental arch		Missing teeth in the front side		
	Absolute value	Percentages value	Absolute value	Percentages	Number	Absolute value	Percentages
0	1363	57,4	1341	56,5	**0**	2074	87,3
1–2	649	27,3	654	27,5	**1–2**	197	8,3
3–4	212	8,9	235	9,9	**3–6**	61	2,6
5–8	151	6,4	145	6,1	**6+**	43	1,8
Total	2375	100,0	2375	100,0	**Total**	2375	100,0

In the anterior area the 87.3% of the sample has not presented missing teeth, the maximum number of missing teeth founded was "12 "teeth (Tab. 1).
These data seem to give particular importance to the absence of teeth, especially in the posterior region. On the basis of this significance, although preliminary, the authors hypothesized that the loss of teeth could be a very important factor in the determination of TMJ dysfunction. This finding should also be considered in the prevention phase although out of line with the data present in the current literature.
The evaluation of dental classes was separately conducted for the right and the left sides. Concerning the right side we found that the 44.5% of the sample had a class I, the 25.5% a class II and the 10% a class III; in the 20% of cases was not possible to ascertain the class due to particular dental situations that made it impossible to definite it. On the left side the 42.6% of the sample presented a class I, followed by a 26.4% who had a class II and by 10.8% of a class III. This finding according to what emerged from the literature has demonstrated the lack of reliability of the relationship between occlusal classifications and TMJ disorders.
Two other data relating to the occlusion were particularly significant, the first was the steep of incisal guidance (vertical incisal guide) which was detected in the 26.1% of the sample, the second was the loss of posterior vertical dimension which was detected in the 27.3% of cases. These variables, which were positive in previous epidemiological studies, may deserve closer attention in the evaluation of occlusal pathogenic factors for TMJ disorders.
With regard to facial asymmetry, this variable was present in 3.8% of cases. This finding seems to confirm a lack of relation, at least in the sample considered in this paper, between the presence of facial asymmetry and TMD.

3.3. Analysis of muscle characteristics

As concerns this group of variables, we observed that the muscular pain was present in the 30.7% of the cases, while the spinal (postural) pain was present in the 37.7% of the cases analyzed. These so high percentages could be related to the presence of a strong comorbidity between TMD and other pain arising from different areas of the spine. Therefore the dysfunctional patient needed to be considered a complex patient with concomitant issues that often lead to problems both in diagnosis than in therapeutic approach.
The impact of emotional factors such as stress and anxiety was 8.9%.
The parafunction "bruxism" was highlighted in 9.3% of cases, while the "clenching" was positive in 28.5% of subjects analyzed; such last parafunction seems to be the most widespread and the most potentially harmful for the individuals who are affected.
About the "headache" almost half of the sample analyzed, 46.8%, presented this symptom, the most of the sample showed, according to VAS scale, an average level of pain (20-50). This data confirms the high co-morbidity of this disease with the TMD's; the data was in agreement with the findings emerging from the literature. The data led the authors to state the hypothesis that potentially, at least for the group of patients analyzed in this study, a patient with headache could be considered at risk for dysfunction and vice versa. The frequency distribution by site of headache is reported in Tab. 6.
To assess the relative impact of different degrees of cephalic pain in the sample, it was necessary to exclude from analysis all those who were free from this symptom (Tab. 7). In that way it was possible to detected how the moderate degree of headaches, followed by high-grade headaches, were the most commons among those who were suffering.
It was also possible to observe that the majority of patients revealed a medium or high intensity head pain, this has led us to reflect on the capacity of the dysfunctional patients to underestimate the headache until it reaches high threshold levels.
In conclusion to the illustration of the previous results we now present data on "treatment variable" and its outcomes.
About treatment the 48.5% of sample was subjected to a conservative treatment (pills, plates and physiotherapy), the 15.9% of patients was suggested a distance reassessment of the disorders, the remaining part (35.6%) of patients were not treated due to one of the following reasons:
- did not require specific treatment;
- in need of other therapy than that gnathological;
- needed surgery (Orthognathic or TMJ surgery);
- refused or couldn't practice, for personal grounds, the proposed therapeutic plan.

Table 6. Frequency distribution of headache symptoms (VAS scale class intervals).

Classes VAS	Right headache		Left headache	
	Absolute value	Percentages	Absolute value	Percentages
0	1364	57,4	1402	59,0
1–20	132	5,6	119	5,0
20–50	454	19,1	449	18,9
50–80	369	15,5	351	14,8
80–100	56	2,4	54	2,3
Total	2375	100,0	2375	100,0

Table 7. Frequency distribution of headache symptoms in the symptomatic sample.

Classes VAS	Right headache		Left headache	
	Absolute value	Percentages	Absolute value	Percentages
1–20	132	13,1	119	12,2
20–50	454	44,9	449	46,1
50–80	369	36,5	351	36,1
80–100	56	5,5	54	5,5
Total	1011	100,0	973	100,0

It was therefore interesting to evaluate the efficacy of therapy carried out. The results are presented in Tab. 8. The sample was made up of 649 patients (we excluded those patients for which the therapeutic process was still under way).
For the 649 patients who had finished their course of treatment and had also completed a period of post-treatment control, and for whom it was possible to make a judgment about the validity of the therapy it has been claimed that the 37.8 % of patients were recovered and the 46.4% were improved. The 84,1% of patients had a positive or very positive post-treatment conclusion. The 14.5% of the treated sample showed no change in symptom and was considered stable, while only the 1, 4 % reported a worsening of their initial symptoms.
These findings have led us to state that the gnathologic treatments performed can be considered to be particularly effective in treating temporo-mandibular disorders. Our results are consistent with the current literature that indicates the individualized management of conservative gnathologic treatment as the most appropriate versus the TMD.

4. Discussion and conclusions

The large quantity of data that has been collected from the examination of thousands of medical records during the years 1996-2006 suggested to us to separate the study in two parts, the second, carried out by more refined statistical means, will aim to identify any possible relation and significant associations between the symptoms and the different clinical forms of the dysfunctional disorders. The data collected in this preliminary retrospective study were subjected to a simple statistical analysis to describe the basic epidemiology aspects of a large sample of patients with TMJ dysfunctions (2375 patients).
The first data to be collected are related to age and gender. These variables in the sample, are similar to those indicated in the literature, in fact, the average age was 35.6%, and the majority of patients are in the group of years ranging from 26 to 40; the gender proportion is generally about 8 to 2 in favor of the female. This confirms the reliability of the current sample.
Between the symptoms analyzed, the more detected was the joint pain present in over 60% of the sample examined, with a double prevalence compared to muscle pain, which has proved to be present in just over 30% of patients this finding does not agree with the literature (Kononen et all. 1996, Magnusson et all 2000). The target of population that has turned in our Service of Gnathology seems mainly affected by biomechanical TMJ dysfunctions and that the masticatory muscle are involved secondary to the functional problems. This result is confirmed by the second prevalent symptom founded that was the joint noises, which have been revealed, in clicking form, in the 53.2% of the sample.
The postural pains in the spine and especially the headache appear simultaneously present in just under an half of the sample (respectively 37% and 46%). These data confirm the high relationship, at least of co-morbidity, present between TMD and the above painful conditions. In the case of headache it could even be argued that a TMD patient is potentially at risk for some headache development forms (probably tensive type) and vice

Table 8. Frequency distribution of outcome treatment.

Result	Absolute values	Percentage valid	Percentage valid
Cured	245	10,6	37,8
Improved	301	13,0	46,4
Worse	9	0,4	1,4
Stable	94	4,1	14,5
Total	649	28,1	100,0
Missing	1664	71,9	
Total	2313	100,0	

versa. The clinician who should be confronted with patients affected by these painful complaints, especially when they are chronic, should always be suspected in the diagnostic phase, the possible presence of the other pathological forms, and also during the therapeutic management he shall be prepared to approach these patients with combined multidisciplinary treatments.
The statistics also revealed a direct proportionality between the different levels of pain intensity reported by patients, regardless of location. This may mean that a patient who reports a moderate headache suffered by the same grade of pain both joint and masticatory muscle. Moreover a patient who simultaneously presents noises and pain, is very likely that he refer this symptoms to the same joint and at the same side.
The biomechanical variables analysis led to the following considerations. The average value of opening of the mouth of a dysfunctional population was found to be 43.5 mm that is slightly lower than that considered normal (45 mm), with mean values increased by about 3 mm in the male compared to female. Patients who have skilled a significant limitation of this parameter (less than 30 mm) were a minority, the 8.1%, but they still significant in view of the seriousness of this problem. This information should address the clinical approach in the evaluation of the opening of the mouth to consider the quantitative value always in association with the qualitative and with the pain.
The joint hyper mobility was detected in about 15% of the sample. This data should be confirmed in other studies as it calls into question the possible role of ligaments laxity as a risk factor for a joint disorders.
Several values related to the state of the occlusion merit some reflections.
The first data confirm that the analysis of occlusal classes does not represent a substantial interest when analyzing patients with TMD in fact, the findings are in line with that of the population free from dysfunctions and this is in agreement with the results aroused from the literature.
Between the evaluations of the static occlusion the most significant data was the steepness of the incisal guidance present in 26.1% of the sample.
Another indicative value was the absence of the teeth. This condition is present in over 40% of the subjects in particular in the posterior dental arches. If we add to this the value of the reduction of the posterior vertical height of occlusion, present in 27.3% of the subjects, it becomes possible to assume that the loss of dental elements can be a risk factor for the development and maintenance of a TMJ dysfunction. Highly dangerous seems to be the contemporary association of the two factors that lead the mandible in a posture which would facilitate the development of a disc dislocation. Another risk factor could be the overloaded caused by the clenching, type of parafunction which has present in almost 30% of patients.
So we can suggest that these are some of the factors on which it would be appropriate to take action as a preventive measure in order to ensure that a “healthy” subject does not become “dysfunctional” patient.
A proper analysis of the full data, clearly shows that there are a large amount of variables involved in these disorders that occurred in a wide range of possible clinical shades. This complexity is in line with the current knowledge that it not be able to clarify the etiology of these disorders making intricate both diagnostic and therapeutic aspects. We may be in front of a multi-systemic disease that it interferes with the bioavailability of the individual, exposing him to the possibility of suffering noxious stimuli, which otherwise not could able to achieve the pain threshold. Confirmation of this it has been shown, with a high frequency, that many patients contemporary presented muscle pain, spinal pain and headache to overshadow the dysfunctional type problems even if they occur with a greater clinical prevalence. Finally we have to mention the good results obtained from the patients undergoing to a complete specialist conservative treatments who are about half of the sample. In fact over 80% of these patients showed a complete recovery or a significant improvement of the previous state.
Further researches should be carried out to clarify these controversial aspects.

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