

STATISTICAL ANALYSIS OF THE FREQUENCY DISTRIBUTION OF SIGNS AND SYMPTOMS OF PATIENTS WITH TEMPOROMANDIBULAR DISORDERS

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SUMMARY

The purpose of this text is to evaluate the distribution by sex and age of TMD patients and the frequency of pain on palpation of the lateral pterygoid muscle, pterygoid internal, sternocleidomastoid, masseter, temporal. The purpose is also to assess the existence of direct correlations between the articulating click and lateral deviation, the headache and tenderness of the temporal, the back pain and tenderness of the sternocleidomastoid, the postural disorders and difficulty finding the exact mating closing, the disorders related to previous dental procedures (large conservative reconstructions, rehabilitations fixed dentures and dental extractions) and tenderness to the temporal and masseter. 623 medical records, including 451 males and 175 females were randomly selected. It was statistically calculated the F/M ratio, age distribution and frequency of muscle tenderness to palpation through the relationship of positive feedback on the total sample multiplied by one hundred. The correlation between various disorders was calculated by estimating the Mantel-Haenszel common odds ratio. For each result it has been finally calculated the asymptotic level of significance.

Key words: temporomandibular disorders, muscle pain, temporomandibular joint, orofacial pain.



Introduction

The temporomandibular disorders (TMD) are, as defined by American Academy of Orofacial Pain (AAOP), a pathological condition associated by the masticatory muscles, the temporomandibular joint (TMJ) and their associated structures. The main symptoms reported by patients with TMD are: TMJ problems, including pain, joint locks, click opening/closing, showers, muscle tension-type pain of temporal muscle, masseter, pterygoid external and internal, cervical, sternocleidomastoid, trapezius, and digastrics suprahyoid; ear load disturbance; parafunctions such as clenching and bruxism and postural disorders

(1). The major clinically detectable signs are: pain on TMJ and muscles palpations, limitation of joint movement, including reduced mouth opening and lateral deviation of the jaw in the opening and closing movements, TMJ blocks on opening and closing; wear of teeth. Although TMD occur with great variability from patient to patient, the knowledge of how these signs and symptoms occur in terms of frequency is of very important both from an epidemiological point of view both clinical (2). The clinician must know, to get faster to the correct diagnosis, what are usually muscle contracts and what are the symptoms most frequently blamed by patients with temporomandibular joint dysfunction.

The aim of the study was to evaluate the distri-

bution of the main signs and symptoms in a sample of patients with TMD. In particular, in the first part of the work, it was analyzed the distribution by gender and age of patients with TMD. After that, they examine what are the most common symptoms, which are the muscles usually painful on palpation and what is the frequency of lateral deviation of the jaw in the opening and closing movements (3). The study also arises of whether there is a possible correlation between TMD and the open bite, deep bite, cross-bite, lack of teeth and the canine and molar dental class (4). Finally, the objective is to evaluate through statistical estimation of Mantel-Haenszel if there is a correlation between certain signs and symptoms (5).

Materials and methods

Between 2011 and 2014 were examined at the AFO of Dentistry of Tor Vergata hospital of Rome 638 patients who came in gnathological first visit reporting TMJ disorders, muscle-tension-pain by the masticatory muscles, neck and back, at the ear disorders and/or parafunctions. Each patient was made to fill a large folder to a series of questions regarding the main symptoms of TMD to which the patient was asked to reply with YES/NO. The questions were as follows:

1. Have you disorders opening his mouth, chewing or talking?
2. Have you difficulty finding the exact mating between teeth in closing?
3. Do you warn TMJ disorders?
4. He feels a sense of fullness of the ear?
5. Do you suffer from headaches?
6. Do you suffer from back pain?
7. Do you suffer from neck pain?
8. Do you warn joint sounds?
9. Do you suffer from vertigo?
10. Have you suffered trauma or head injury and neck?
11. Do you warn postural disorders?
12. Do you report parafunctional activities?
13. Do you underwent dental procedures such as

orthodontics, dentures, extractions or fillings that relates to his ailments?

14. Have you performed orthodontic treatments?

15. Do you suffer from ear pain?

After doing fill in the questionnaire, each patient was seen clinically. During the visit it was investigated muscle contraction through the palpation of the following muscles:

- I. lateral pterygoid
- II. internal pterygoid
- III. sternocleidomastoid
- IV. temporal
- V. masseter
- VI. mouth floor
- VII. digastric
- VIII. trapeze
- IX. cervical.

Achiness to palpation manifested by the patient, a sign of muscle contraction, has been reported in the folder. The clinician have also noted in the folders at the time of the visit the following signs detected by physical examination:

- a. lateral mandibular deviation on opening/closing
- b. missing teeth
- c. deep bite
- d. open bite
- e. cross-bite.

Were placed as exclusion criteria negativity all questions regarding the symptoms and the absence of pain on palpation at the expense of all the muscles examined, as such conditions are not covered by definition in the TMD symptoms, and were considered valid all the others. Of the 638 medical records examined, 12 were excluded because meeting the above exclusion criteria, considering valid for studying the remaining 626. The medical records in paper format were reported on an EXCEL file, where a table was created to enter all the information in folders and evaluate the statistical frequency more easily. Two different worksheets for males and females were also created, in order to assess sex differences of each sign and symptom analyzed.

The demographic characteristics of the sample were analyzed in the first part of the study. It was calculated the distribution of the sample by gender, by analyzing the male/female ratio.

Distribution was also calculated by age, by dividing the sample into the following seven classes: <20 years; 20 ->30 years; 30->40 years; 40 ->50 years; 50 ->60 years; 60->70 and >70 years. Finally, it was calculated the average age of the separate specimen by gender. Later symptoms of patients seen were analyzed by evaluating the responses in the folder. Were calculated, therefore, the absolute and relative frequencies of positive answers to the questions and the relative comparisons between females and males with their significance levels. Similarly the data in the resulting folder by clinical examination were evaluated. It has therefore to

calculate the absolute and relative frequencies of the positive responses to muscle palpation test, the mandibular lateral deviation, lack of teeth, the deep bite, open bite and to the cross-bite and dental classes canine and molars and relative comparisons between males and females with the respective levels of statistical significance.

Finally we compared some signs and symptoms to evaluate a possible statistical correlation by estimating Mantel-Haenszel. The reports considered were:

a) TMJ disorders and disorders opening his mouth, chewing or talking

Table 1 - Absolute and relative frequency of positive responses to questions and its relation between males and females with their level of significance 'statistics.

ITEMS	MALE		FEMALE		COMPARISON		
	YES	YES/TOT	YES	YES/TOT	M-F	Z	P_VALUE
1	171	0,526	170	0,741	0,215	4,117	0,001
2	168	0,548	166	0,482	-0,066	-1,201	n.s.
3	171	0,737	169	0,852	0,115	2,627	0,004
4	173	0,514	168	0,583	0,069	1,278	n.s.
5	173	0,561	172	0,767	0,207	4,064	0,001
6	173	0,491	168	0,756	0,265	5,038	0,001
7	174	0,655	170	0,788	0,133	2,751	0,003
8	167	0,617	171	0,784	0,167	3,351	0,001
9	173	0,353	171	0,415	0,063	1,194	n.s.
10	171	0,292	172	0,552	0,260	4,872	0,001
11	173	0,324	166	0,410	0,086	1,642	n.s.
12	171	0,520	167	0,754	0,234	4,471	0,001
13	173	0,543	162	0,716	0,173	3,266	0,001
14	170	0,129	157	0,293	0,164	3,642	0,001
15	166	0,349	155	0,387	0,038	0,700	n.s.
16	171	0,444	164	0,335	-0,109	-2,045	0,2
17	171	0,251	168	0,429	0,177	3,444	0,001

- b) postural disorders and difficulty finding the exact mating between teeth closing
- c) difficulty in finding the exact mating between teeth closing and headaches
- d) pain at the back and lateral mandibular deviation opening/closing
- e) pain in the cervical and lateral mandibular deviation opening/closing.

Results

The sample consisted of 626 patients, of which 175 males and 451 females, for a M / F ratio equal to 1: 2.58. Patients younger than 20 years were 66 females and 19 males; between 20 and 30 years: 75 females and 41 males; between 30 and 40 years: 87 females and 49 males; between 40 and 50 years: 98 females and 34 males; between 50 and 60 years: 75 females and 12 males; between 60 and 70 years: 39 women and 11 men, while more than 70 years were not present no women and 6 men. The average age of females was 39.91 with a standard deviation of 15.39, while the average age of the males was 37.35 with a standard deviation of 15.51. The absolute and relative frequencies of

positive answers to the questions asked patients about the symptoms are shown in Table 1. Figure 1 shows the relative frequencies of the positive responses to the symptoms.

The absolute and relative frequencies of tenderness on palpation of the muscles with the relative comparisons between males and females are shown in Table 2. Figure 2 shows the differences in tenderness between males and females.

The frequencies of the signs detected by clinical, such as lateral deviation (a) of the jaw opening, missing teeth (b), deep bite (c), open bite (d) and cross bite (s) are shown in Table 3.

Figure 3 illustrates the relative frequency differences of these signs in males and females.

The absolute and relative frequencies regarding dental classes molars and canine right and left are shown in Table 4.

The frequency differences between males and females are shown in Figure 4.

The results of the comparisons between the different signs and symptoms have been calculated through the cross-tabulated and through the Mantel-Haenszel estimate of the common odds ratio, which is distributed asymptotically normal mode according to the common odds ratio hiring 1,000, similar to the natural log of the estimate. In order

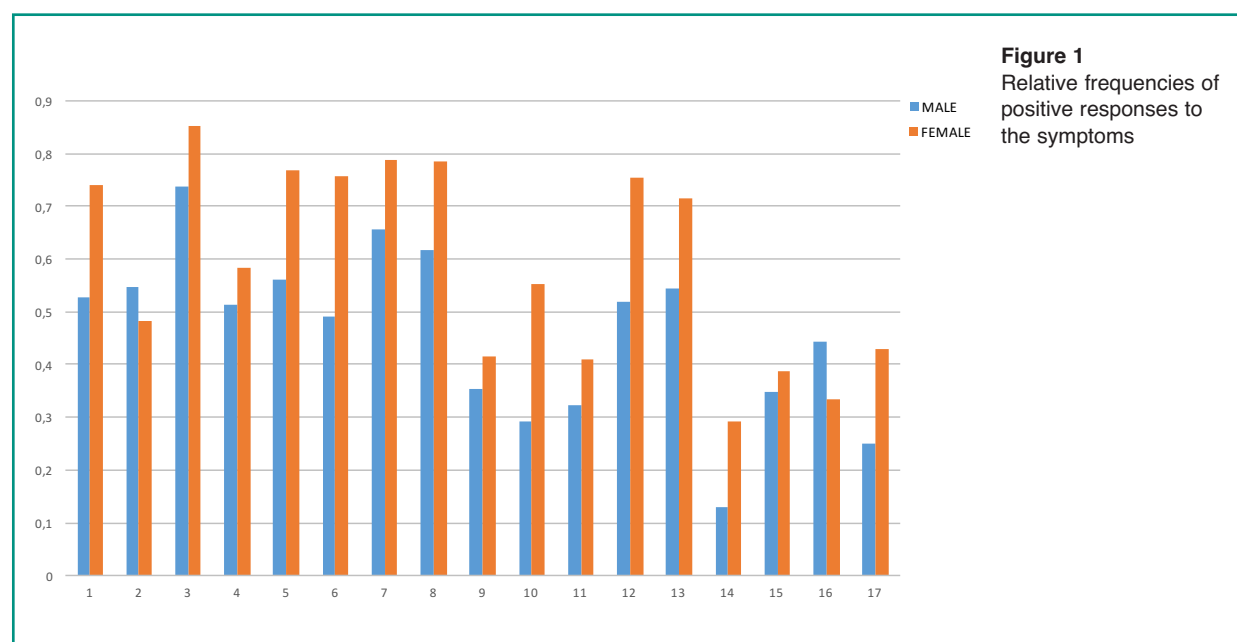
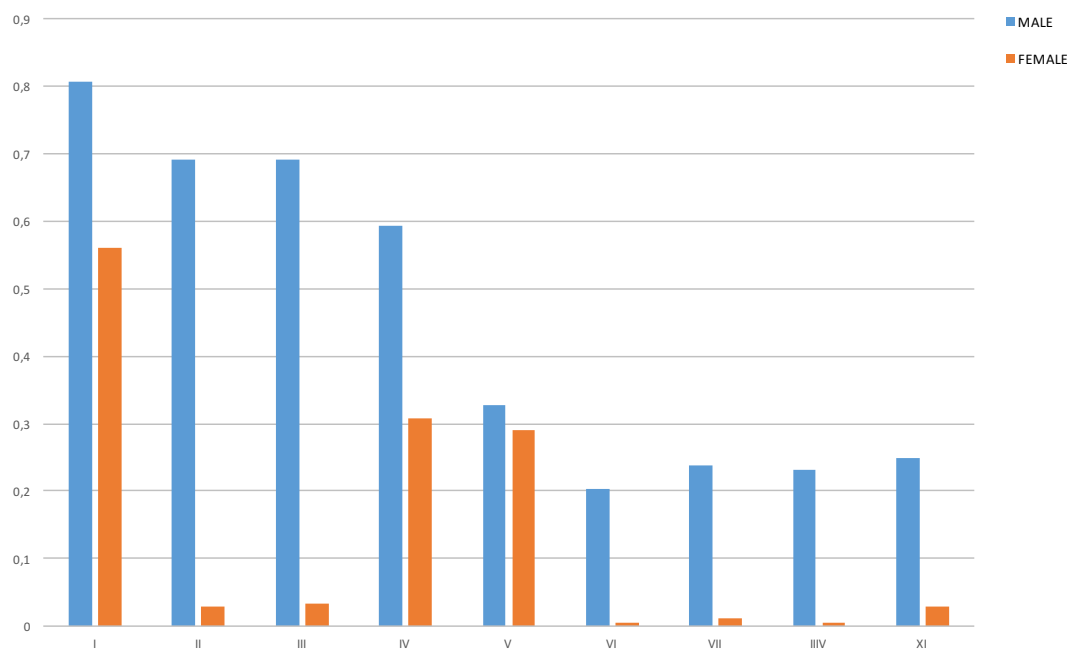


Figure 1
Relative frequencies of positive responses to the symptoms

Table 2 - Absolute and relative frequency of tenderness' palpation to muscle with related to between males and females.

ITEMS	MALE		FEMALE		COMPARISON		
	YES	YES/TOT	YES	YES/TOT	M-F	Z	P_VALUE
I	139	0,806	171	0,561	-0,245	-4,55	0,001
II	104	0,692	172	0,029	-0,663	-11,91	0,001
III	105	0,692	174	0,034	-0,658	-10,99	0,001
IV	113	0,593	169	0,308	-0,285	-4,75	0,001
V	113	0,327	169	0,290	-0,037	-0,67	N.S.
VI	103	0,204	172	0,006	-0,198	-5,87	0,001
VII	105	0,238	172	0,012	-0,226	-6,17	0,001
IIIV	104	0,231	175	0,006	-0,225	-6,37	0,001
XI	104	0,250	174	0,029	-0,221	-5,68	0,001

**Figure 2**
Relative frequency of tenderness muscle.

that data may be estimated statistically related it is necessary that the asymptotic significance is less than 0,005.

The correlation between TMJ disorders and opening his mouth, chewing or talking was calculated using the contingency Table (Table 5).

Table 3 - Absolute frequency and their signs recorded.

ITEMS	MALE		FEMALE		COMPARISON		
	YES	YES/TOT	YES	YES/TOT	M-F	Z	P_VALUE
a	134	0,672	130	0,554	-0,118	-1,965	0,024
b	129	0,605	169	0,254	-0,351	-6,100	0,001
c	109	0,193	173	0,064	-0,129	-3,33	0,001
d	104	0,048	174	0,017	-0,031	-1,49	N.S
e	113	0,239	172	0,093	-0,146	-3,37	0,001

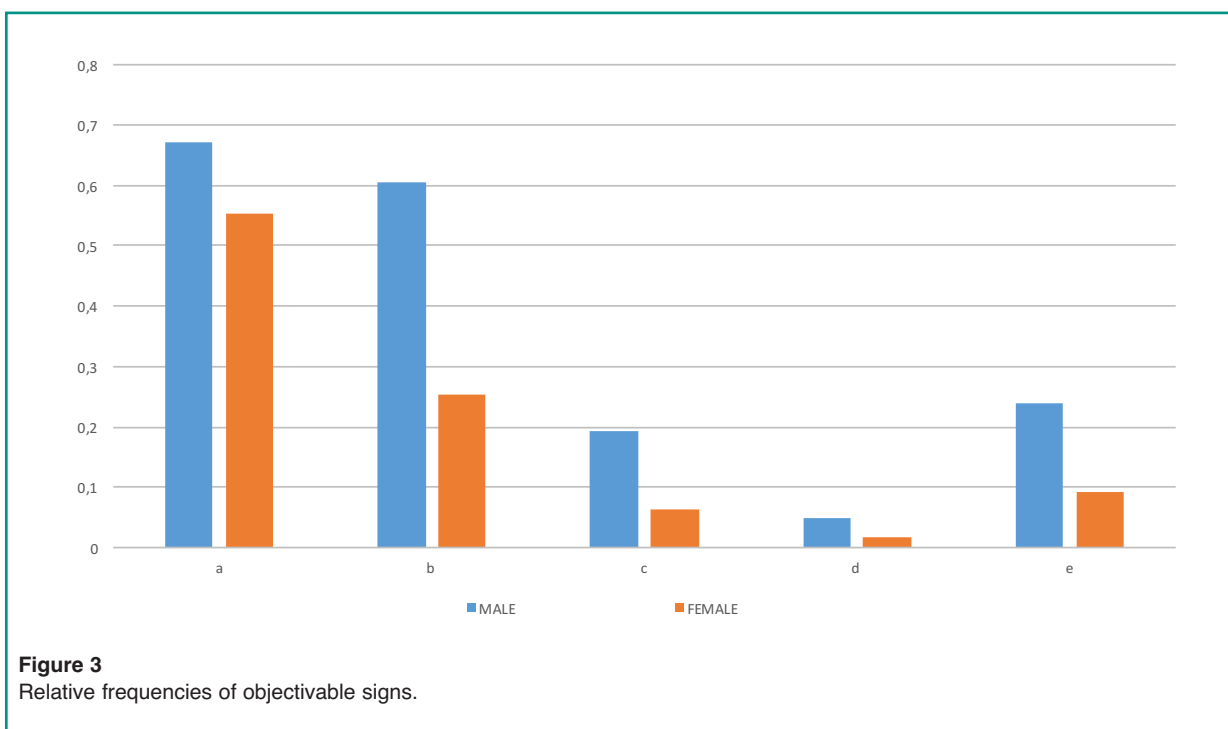


Figure 3
Relative frequencies of objectivable signs.

The Mantel-Haenszel estimate was represented in Table 6.

Being the asymptotic significance of 0.000, not exists a statistical correlation between TMJ disorders and opening his mouth, chewing or talking.. The correlation between back pain and lateral deviation of the jaw opening/closing was calculated using the following contingency Table (Table 7). The Mantel-Haenszel estimate was represented in

Table 8.

Since the asymptotic significance of 0.828 not exists a statistical correlation between joint sounds and lateral deviation of the mandible.

The correlation between postural disorders and lateral-deviation of the jaw opening and closing was calculated according to the contingency Table (Table 9).

The Mantel-Haenszel estimate was represented in

Table 4 - Absolute frequency and their class and canine dental molars right and left.

ITEMS	MALE		FEMALE		COMPARISON		
	YES	YES/TOT	YES	YES/TOT	M-F	Z	P_VALUE
1° CAN RIGHT	175	0,663	175	0,531	-0,132	-2,51	0,006
2° CAN RIGHT	175	0,211	175	0,354	0,143	2,98	0,001
3° CAN RIGHT	175	0,109	175	0,114	0,005	0,17	n.s.
1° CAN LEFT	175	0,669	175	0,571	-0,098	-1,87	0,03
2° CAN LEFT	175	0,211	175	0,291	0,08	1,73	0,042
3° CAN LEFT	175	0,103	175	0,131	0,028	0,83	n.s.
1° MOL RIGHT	175	0,640	175	0,543	-0,097	-1,85	0,032
2° MOL RIGHT	175	0,217	175	0,349	0,132	2,73	0,03
3° MOL RIGHT	175	0,126	175	0,109	-0,017	-0,50	n.s.
1° MOL LEFT	175	0,623	175	0,577	-0,046	-0,87	n.s.
2° MOL LEFT	175	0,217	175	0,291	0,074	1,60	n.s.
3° MOL LEFT	175	0,143	175	0,131	-0,012	-0,31	n.s.

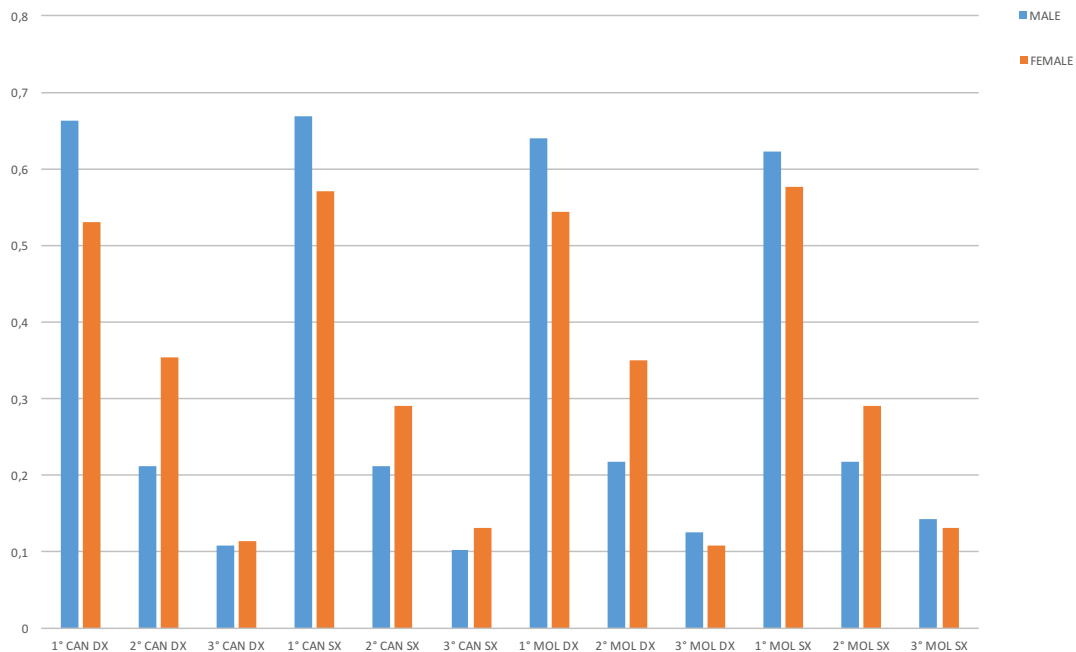


Figure 4
Relative frequencies of dental class.

Table 5 - Correlation between pain TMJ and opening mouth.

PAIN OPENING MOUTH, CHEWING.				
		NO	YES	Total
PAIN ATM	NO	79	33	112
	YES	103	401	504
TOTAL		182	434	616

The correlation between postural disorders and difficulty finding the exact mating between teeth closure was calculated using the contingency Table (Table 11).

The Mantel-Haenszel estimate was represented in Table 12.

Being the asymptotic significance of 0.279, not exists a statistical correlation between postural disorders and difficulty to find the exact mating between teeth closing.

The correlation between difficulty finding the ex-

Table 6 - Mantel-Haenszel estimate.

Estimate			9,320
ln(estimate)			2,234
Standard error of ln(estimate)			0,235
Asymptotic significance (2sense)			0,000
Confidence interval	relationship odds common	Limit low	5,882
95% asymptotic		Limit high	14,769
	ln(relationship odds common)	Limit low	1,772
		Limit sup	2,693

Table 7 - Correlation between back pain and lateral deviation of the jaw opening/closing.

LATERO-DEVIATION OF JAW				
		NO	YES	Total
BACK PAIN	NO	106	106	212
	YES	223	180	403
TOTAL		329	286	615

Table 10.

Since the asymptotic significance of 0.985, not exists a statistical correlation between postural disorders and lateral deviation of the mandible.

act mating closing and headaches was calculated using the Table 13.

The Mantel-Haenszel estimate was represented in Table 14.

Being the asymptotic significance of 0.264, not exists a statistical correlation between difficulty finding the exact mating between teeth and headaches.

The correlation between back pain and lateral deviation of the jaw opening/closing was calculated using the contingency Table (Table 15).

The Mantel-Haenszel estimate was represented in Table 16.

Since the asymptotic significance of 0.208, not exists a statistical correlation between back pain and lateral deviation of the mandible.

The correlation between pain disorders in the cer-

Table 8 - Mantel-Haenszel estimate.

Estimate			1,040
ln(estimate)			0,039
Standard error of ln(estimate)			0,179
Asymptotic significance (2sense)			0,828
Confidence interval	relationship odds common	Limit low	0,731
95% asymptotic		Limit high	1,478
	ln(relationship odds common)	Limit low	-0,313
		Limit high	0,391

vical and lateral deviation of the jaw opening/closing was calculated using the contingency Table (Table 17).

Table 9 - Correlation between postural disorders and lateral-deviation of the jaw opening and closing.

LATERAL DEVIATION OF THE JAW OPENING AND CLOSING				
		NO	YES	Total
Postural disease	NO	114	99	213
	YES	216	187	403
TOTAL		330	286	616

The Mantel-Haenszel estimate was represented in Table 18.

Since the significance of asymptotic 0,800, not exists a statistical correlation between cervical pain and lateral deviation.

Conclusions

The temporomandibular disorders are a pathological condition characterized by different symptoms and signs, which manifest themselves in different frequency in males and females. Females with a ratio of 2.58: 1 are most affected than

Table 10 - Mantel-Haenszel estimate.

Estimate			0,997
ln(estimate)			-0,03
Standard error of ln(estimate)			0,170
Asymptotic significance (2sense)			0,985
Confidence interval	relationship odds common	Limit low	0,715
95% asymptotic		Limit high	1,391
	ln(relationship odds common)	Limit low	-0,336
		Limite high	0,330

Table 11 - Postural disease and difficulty finding the exact mating.

FIND THE EXACT MATING				
		NO	YES	Total
Postural disease	NO	107	106	213
	YES	184	219	403
TOTAL		291	325	616

than in males. The most frequent symptoms in females are: TMJ disorders (85.2%), neck pain (78.8%), joint sounds (78.4%), headache (76.7%), back pain (75.6%), parafunctional activities (75.4%) and disorders opening his mouth, chewing or speaking (74.1%). The most frequent symptoms in males are: TMJ disorders (73.7%), neck pain (65.5%), joint sounds (61.7%) and parafunctional activities (52.0%). 71.6% of females and 54.3% of males report having undergone dental procedures (orthodontics, prosthetic restorations,

Table 12 - Mantel-Haenszel estimate.

Estimate			1,201
ln(estimate)			0,184
Standard error of ln(estimate)			0,170
Asymptotic confidence (2sense)			0,279
Confidence interval	relationship odds common	Limit low	0,862
95% asymptotic		Limit high	1,675
	ln(relationship odds common)	Limit low	-1,149
		Limite high	0,516

Table 13 - Difficulty finding the exact mating closing and headaches.

HEADACHE				
		NO	YES	Total
Difficult to find exact mating	NO	100	191	291
	YES	98	227	325
TOTAL		198	418	616

males. The age of onset of the disease is represented by a gaussian curve with a peak in females between 40 and 50 years and in males between 30 and 40 years (Graph 1). The symptoms reported by the patient are more pronounced in females

extractions or fillings occlusal) that relate to the onset of the disorder of the temporomandibular joint. While the reported symptoms are more pronounced in females, there was a more exaggerated muscle tenderness on palpation in males. The most frequently contracted muscles in males are: lateral pterygoid (80.6%), internal pterygoid (69.2%), sternocleidomastoid (69.2%) and time (59.3%). The most frequently contracted muscles in females are: lateral pterygoid (56.1%), temporal (30.8%) and masseter (29.0%) (6).

Other clinically important signs to be evaluated are the latero-mandibular deviation during opening / closing movements (present in 67.2% of the males and in 55.4% of females) and the lack of one or more teeth in the dental arch (60, 5% of males and 25.4% females). Malocclusions on the vertical and transverse plane did not seem to be

Table 14 - Mantel-Haenszel estimate.

Estimate			1,213
ln(estimate)			0,193
Standard error of ln(estimate)			0,173
Asymptotic confidence (2sense)			0,264
Confidence interval	relationship odds common	Limit low	0,864
95% asymptotic		Limit high	1,701
	ln(relationship odds common)	Limit low	-0,146
		Limit high	0,531

Table 15 - Back pain and lateral deviation of the jaw opening/closing.

		LATERO DEVIATION		
		NO	YES	Total
Backache	NO	106	106	212
	YES	223	180	403
TOTAL		329	286	615

the main cause of the onset of TMD, as the frequency in patients affected is very low. However, it is interesting to note that these malocclusions are more frequent in males than in females: deep bite (19.3% of males and 6.4% of females), open bite (4.8% of males and 1.7% of females) and cross-bite (23.9% of males and 9.3% of females). The predominant class in patients with TMD is the first class canine and molar, followed by the second class and to a lesser extent the third class (Table 4). Although this study provides very precise information about the frequency of symptoms and signs in patients with TMD, it is critical that the clinician keep in mind that this disease is mani-

Table 16 - Mantel-Haenszel estimate.

Estimate			0,807
ln(estimate)			-0,214
Standard error of ln(estimate)			0,170
Asymptotic confidence (2sense)			0,208
Confidence interval	relationship odds common	Limit low	0,578
95% asymptotic		Limit high	1,126
	ln(relationship odds common)	Limit low	-0,547
		Limit high	0,119

Table 17 - Pain disorders in the cervical and lateral deviation of the jaw.

LATERO DEVIATION				
		NO	YES	Total
Neck pain	NO	95	85	180
	YES	235	201	436
TOTAL		330	286	616

festated by a complex symptomatic variability. So much so that the statistical analysis of Mantel-Haenszel present in this study shows that there is a clear correlation between certain signs and symptoms. There is no statistical correlation between fact lateral deviation of the mandible during opening and closing, and the following symptoms: postural disorders, back pain and pain in the cervical area. Furthermore, there is statistical correlation between difficulty finding the exact mating between teeth and closing the symptoms: postural disorders and headaches.

For these reasons, it is necessary for the clinician, whenever you are in one or more patients visit Referrals these disorders, assess the case in detail, starting from the history to get physical examination, bearing in mind what are the signs and symptoms more frequent to arrive at an accurate diagnosis (7).

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Table 18 - Mantel-Haenszel estimate.

Estimate			0,956
ln(estimate)			-0,045
Standard error of ln(estimate)			0,178
Asymptotic confidence (2sense)			0,800
Confidence interval	relationship odds common	Limit low	0,675
95% asymptotic		Limit high	1,354
	ln(relationship odds common)	Limit low	-0,393
		Limit high	0,303