



## Prevalence of Temporomandibular Joints Disorders in Egyptian Undergraduate Dental Students and The Association Between The Clinical and Radiographic Findings

Esraa A. Gomaa<sup>1\*</sup>, Naglaa S. El-Kilani<sup>2</sup>, Mostafa M. Abdel-Ghany<sup>3</sup>, Noura Abd El-Gawad<sup>4</sup>

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azhardentj@azhar.edu.eg

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### ABSTRACT

**Purpose:** to assess the prevalence of temporomandibular disorders among dental undergraduate Egyptian students and the association between the clinical features and radiographic findings. **Material and Methods:** 281 female dental undergraduate students were randomly selected to participate in the primary screening. In the study screening examination and final diagnosis were done according to a new modified Diagnostic Criteria for TMD (DC/TMD) Axis I which encompass (medical history, primary pain screening questionnaire, signs and symptoms questionnaire and examination protocol). The examination consisted of 11 criteria (pain location, headache location, incisal relationship, opening pattern, opening movement, lateral and protrusive movements, noises during opening movement, noises during lateral and protrusive movements, TMJ locking, muscle palpation and TMJ, supplemental muscle pain and palpation, occlusion assessment was added to the criteria. **Results:** the prevalence of TMD was 28.5% among female dental students, the most common reported symptom in a percentage of 89% was pain, noises were reported in 59.3% of the subjects. The most common subtype of the TMD was muscular pain (myalgia and myofascial pain) with percentage of 29.2%, 15.4% then arthralgia with 27.7% disc displacement was reported in 13.8 and degenerative reported in 1.5%. **Conclusions:** TMDS is highly prevalent conditions in young population. There is an adequate association between the stress in the university years and the TMDS.

### KEYWORDS

(DC/TMD), prevalence,  
dental students, TMDs

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- 1. Teaching Assistant, Department of Oral and Maxillofacial Radiology, Egyptian Russian University, Cairo, Egypt.
- 2. Professor and Head of Oral Medicine, Periodontology, Diagnosis and Radiology Department, Faculty of Dental Medicine for Girls, Al-Azhar University, Cairo, Egypt.
- 3. Professor of Removable Prosthodontics and Dean of Faculty, Faculty of Dental Medicine, Al-Azhar University, Cairo, Egypt.
- 4. Lecturer, Department of Oral medicine, Periodontology, Diagnosis and Radiology Department, Faculty of Dental Medicine for Girls, Al Azhar University, Cairo, Egypt.

\* Corresponding author email: esraagomaa767@gmail.com

## INTRODUCTION

Temporomandibular disorders (TMDs) are a group of pathologies that affect the temporomandibular joints and its associated structures. Researchers mostly agree that the conditions fall under three main categories; Myofascial pain involves discomfort or pain within the muscles that control jaw function, internal derangement of the joint involves a displaced disc, dislocated jaw, or injury to the condyle and arthritis, which refers to a gaggle of degenerative inflammatory joint disorders which will affect the diarthrosis, one patient may have one or more of those conditions at the identical time<sup>(1)</sup>. TMDs are common conditions among the population, with approximately 60-70% of all adults reporting one or more signs of TMDs throughout their life<sup>(2)</sup>.

In broad terms, TMDs epidemiology discussed mainly in relation to many factors for example, age, gender and severity of the symptoms. The prevalence varies from study to a different, Subjects with TMD symptoms present with a broad age range; however, the highest occurrence was observed between 20 and 40 years of age<sup>(3)</sup>. Number of the researchers suggested that university students (18–25 years old) had higher prevalence of temporomandibular joints symptoms than older people and rural areas populations<sup>(4)</sup>.

For example, in Asia, consistent with the United Nations, Asian population was divided into east, South-central, Southeast and west Asians. A study was conducted on 400 (Arabian) west Asian university students reported a TMD prevalence of 46.8% and during this study psychological stress was linked as a risk factor in 30.5% of participants<sup>(5)</sup>.

The newly recommended Diagnostic Criteria for TMD (DC/TMD) Axis I protocol includes a two steps assessment, sound screener method for detecting any pain-related TMD and also a sound diagnostic criterion for differentiating the foremost common pain related conditions with (sensitivity  $\geq$  0.86, specificity  $\geq$  0.98). That's why Axis I proto-

col provides standardized assessment of subjective symptoms, contains undoubtedly defined examination approaches, and develops specific diagnostic criteria supporting the clinical findings<sup>(6)</sup>.

To conclude it, most of studies suggested the prevalence of the TMD among students and dental students mentioned specifically, most of hypothesis support that the affected populations mostly females, on the other hand the age varies from the first decade to late thirties, even though a clear suggestion for adolescents was detected in many reviews, risk factors and the most obvious signs and symptoms varies from population to another and according to the conducted studies.

## MATERIAL AND METHODS

A total of 281 Egyptian under graduate dental female students participated in this study from March 2019 to January 2020. After obtaining ethical approval from the research ethic committee of the faculty of dental medicine for girls, Al-Azhar University OMPDR-102-1a., all selected subjects who met the criteria were informed on the details of the study and requested to sign informed consent prior to the study. The participants were selected according to the following criteria:

### Inclusion criteria<sup>(4)</sup>:

Participants had to be university students in the final academic years.

Age ranges (19-24) years old.

Full permanent dentition.

No medical or mental issues that affected their ability to comprehend or complete the questionnaire.

### Exclusion criteria<sup>(4)</sup>:

Students with any gross pathology of ear.

History of mandibular trauma.

### Sample size calculation:

Assessment of the Prevalence of temporomandibular joints disorders in dental students and the association between the clinical diagnosis using the DC/ TMD and the radiographic findings using the CBCT; Based on data from previous study the expected prevalence ( $p=3\%$ ) and the desired precision ( $d\pm 0.05$ ). A total of number of 278 samples using the following equation with finite population correction:

$$n' = \frac{NZ^2P(1-P)}{d^2(N-1) + Z^2P(1-P)}$$

$n'$  = sample size with finite population correction

$N$  = Population size

$Z$  = Z statistic for a level of confidence

$P$  = Expected proportion (in proportion of one)

$d$  = Precision (in proportion of one)(1) .

### Screening and examination:

The subjects were screened for TMD with the TMD Pain Screener (DC/TMD) diagnostic criteria.

Then after scoring 1 or 2 points of the primary survey, a secondary-detailed signs and symptoms questionnaire was conducted with an addition of detailed medical history(2). The screening procedure encompasses

#### Part 1

- Symptom questionnaire assessing the following criteria:
  - \* Pain
  - \* Headache
  - \* Joint noises
  - \* Closed locking jaw
  - \* Open locking jaw

#### Part 2

- Clinical examination was done using (FDI) examination protocol that will be assessing the following:

1. Pain location
2. Headache location
3. Incisal relationship (occlusion)
4. Opening pattern
5. Opening movement
6. Lateral and Protrusive movements
7. Noises during opening movement
8. Noises during lateral and protrusive movements
9. TMJ locking
10. Muscle palpation and TMJ
11. Supplemental muscle pain and palpation

### Patient Management:

- (a) Patient positioning: The patient was upright in a dental chair.
- (b) Examiner positioning: The examiner was standing to the patient's right and facing the patient.
- (c) Jaw posture: There were three static jaw postures used in this examination: comfort position, where the mouth is closed (i.e., lips touching, for most individuals); maximal intercuspal position (MICP), where the jaw is closed and teeth are fully touching; rest position where the jaw is held at the end of a movement (3) .

### Procedure of examination:

**E-a Pain:** The subjects were asked about pain location and confirmed by the examiner.

**E-b:** The subject was asked about headache location and confirmed by the examiner, opening patterns were examined and classified as follows:

- a. Straight: This is defined as no or minimally perceptible deviation ( $< 2\text{mm}$ ) upon opening.
- b. Corrected Deviation (right, left, or both): The mandible exhibits a perceptible deviation  $> 2\text{ mm}$  to the right and/or left but returns to the midline before or upon reaching the maximum unassisted opening.
- c. Uncorrected deviation (right or left): This is defined as deviation of the mandible of  $> 2\text{ mm}$  to either the right or the left from the midline

with maximum unassisted opening(4),the range of opening was also assessed.

#### ***TMJ noises during open and close movements:***

Using palpation, the joint noises were examined bilaterally, any joint noise present during opening and closing was reported.

#### ***Noises were detected and recorded as follows:***

- (a) Click: Referred to as a snap or pop.
- (b) Crepitus: A noise that is continuous, over a longer period of jaw movement than a click.

#### ***Muscle and TMJ Pain with Palpation:***

Palpating the muscles and joint capsules by pressing on a specific site using the spade-like pad of one finger (the second or third digits; or index finger or middle finger) with standardized pressure. (Fig. 1)



Figure (1) Muscle palpation, Insertion of the Masseter – Start at the posterior boundary of the muscle, just superior to the inferior mandibular border; the area for palpation is directly anterior

#### **Description of Specific Joint Palpation Sites:**

- (a) Lateral Pole anterior to the tragus of the ear and on the skin overlying the patient's TMJ.

- (b) Around the Lateral Pole while the mandible is in the comfort position or in a slightly protruded position, index finger was placed anterior to the tragus of the ear and dorsal to the TMJ while the mandible is supported from the other side, the index finger presses while orbiting around the lateral pole in a circular movement over the superior aspect of the condyle and then anteriorly – i.e., from the 9:00 to the 3:00 position, and then continuing fully around the condyle

#### **Supplemental muscles:**

Posterior mandibular region, Submandibular region, Lateral pterygoid area and Tendon of the temporalis were palpated.

#### **Radiographic assessment**

After the clinical assessment, a patient diagnosed with any degenerative disease will be assessed radiographically using CBCT scan using Planmeca Promax. Exposure parameters for imaging temporomandibular joint protocol. Kv 90, mA 8, exposure time 12.3 (s), field of view 99.20 x 99.20 (mm), voxel size 0.2 (mm). according to the DC/TMD diagnostic criteria, degenerative disease was confirmed, if the TMJ CT criteria are positive for at least one of the following, Subchondral cyst(s), erosion(s), generalized sclerosis, or osteophyte(s). Flattening and/or cortical sclerosis are considered indeterminate findings for degenerative joint disease (3).

#### **Statistical Analysis**

In the analysis, the sample was categorized as no TMD, pain related TMD and any TMD. Pain-related TMD was defined by either qualifying for myalgia (local myalgia or myofascial pain with referral) or arthralgia, whilst any TMD was defined by any TMD diagnosis according to the DC/TMD. Statistical analysis was performed with R statistical analysis software version 4.0.3 for Windows

## RESULTS

In this primary screening 281 students participated in this stage, most of the participants were in the last two academic years in percentage of 92.2%, pain in temple or jaw area was reported in 28.5%.

In the secondary signs and symptoms questionnaire pain was reported in 89.7% while headache was reported in 51.7% of the population .84.6% of the population reported that the pain duration was within the last 3 years while 73.3% reported that headache started within the last three years, joint noises were reported in 55.2% of the population, on

the other hand 22.4% of the symptomatic population reported that they have parafunctional habits (Table 1)

In the Final diagnosis after clinical examination according to the diagnostic tree, the most common diagnosis was myalgia in 29.2%, while 5.4% of the population were diagnosed with myofascial pain, disc displacement with reduction 12.5%. The least common diagnosis was degenerative disease and disc displacement with reduction associated with limited mouth opening in a percentage of 1.5%, headache was confirmed in 12.3%. Arthralgia was confirmed in 27.7% of the population. (Table 2)

**Table (1)** Secondary signs and symptoms questionnaire showing the significant signs and symptoms in the symptomatic subjects (pain presence, pain duration, headache presence, headache duration, joint noises and teeth grinding).

Signs and symptoms		(n) number of subjects	% Percentage
<b>Pain presence</b> (n=29)	No	3	10.3%
	Yes	26	89.7%
<b>Pain duration</b> (n=26)	≤3 years	22	84.6%
	> 3 years	4	15.4%
<b>Headache</b> (n=29)	No	14	48.3%
	Yes	15	51.7%
<b>Headache duration</b> (n=15)	≤3 years	11	73.3%
	> 3 years	4	26.7%
<b>Joint noise</b> (n=29)	No	16	55.2%
	Yes	11	37.9%
	Don't know	2	6.9%
<b>[Holding your teeth together, clenching, grinding or chewing a gum]</b>	No	218	77.6%
	Yes	63	22.4%

**Table (2)** Final diagnosis after clinical examination according to the diagnostic tree, myalgia 29.2%, myofascial pain 15.4%, disc displacement with reduction 1.5%, degenerative disease 1.5%, as disc displacement with reduction with limited mouth opening 1.5%, headache was reported in 12.3%. while arthralgia was reported in 27.7%.

Myalgia, n (%)	Myofascial pain with referral, n (%)	Arthralgia, n (%)	Headache Attributed to TMD, n (%)	DD with reduction, n (%)	DD without reduction without limited opening, n (%)	Degenerative joint disease, n (%)	total
19(29.2)	10(15.4)	18(27.7)	8(12.3)	8(12.3)	1(1.5)	1(1.5)	(n=65)

### Radiographic assessment

The radiographic assessment shows signs of bone resorption at the condylar head, severe thinning of the cortical boundaries at the condylar head and decreased joint space. The glenoid fossa and articular eminence had clear irregular surfaces.

### DISCUSSION

Temporomandibular disorder (TMD) is a term that describes a heterogeneous collection of musculoskeletal diseases and conditions that affects the jaw system. The Diagnostic Criteria for Temporomandibular Disorders (DC/TMD) was developed by the International Network for Orofacial Pain and Related Disorders Methodology<sup>(11-12)</sup>.

The screening system encompasses two axes: axis I for clinical conditions and axis II for psychosocial factors. Axis I covers the foremost common TMD diagnoses: myofascial pain, myalgia, arthralgia, headache attributed to TMD, disc displacements and degenerative joint disease. The clinical diagnosis is derived from a mixture of patient-reported data and data from the clinical examination<sup>(13)</sup>.

In the current study, in the primary screening, 281 subjects participated in the primary screening, 28.5% of the participants reported that they have one or more of TMD symptoms which was higher than the prevalence of TMDs in Peruvian dental students with a percentage of 19.4%. The prevalence of painful TMD conditions (5) and also slightly higher

than the detection rates of TMDs in Poland students which was 26.5% and in Italian students with a percentage of 22.58%. Another study clarified that the prevalence of TMD in university student population was 17%(4), also Egyptian students showing very significant prevalence than students in Norway, as the prevalence of TMD among the study participants was 11.9%, with a peak at 16 years of age<sup>(6)</sup>.

In contrast, this result was slightly less than the rate observed in China with overall prevalence of temporomandibular disorders in Chinese students approximately 29.1%, and also in both Brazilian and Iranian students with a percentage of 34.9% and 34.7% respectively<sup>(2)</sup>. While in Saudi Arabia, the prevalence of TMPDS was significantly higher than this study as a total of 49.7% of participants had at least one sign or symptom of TMD<sup>(7)</sup>. However, the prevalence of TMDs in students reported from different countries varies substantially. This discrepancy may be related to race, economy, war and dietary habits<sup>(8)</sup>.

In regard to the signs and symptoms, the most common reported symptom in a percentage of 89% was the pain. Pain in this study was significantly higher than the Australian populations as pain was reported only in 48.5% of the population<sup>(18)</sup>, while pain only reported in Italian students in 16.3%. Within the current study only 12.3% reported headache this was slightly lower than the reported symptoms in Norwegian students as only 19.7% of the participants reported headache<sup>(15)</sup>.

It was obviously significant that pain and headache duration was confined to the faculty years as 84.6% of the population reported that the pain duration was within the last 3 years while 73.3% reported that headache started with the last three years, these results could be explained as dental students are in a highly demanding environment which is full of high degree of stress, this might be encountered within the high prevalence of pain and headache in their college years specifically<sup>(19)</sup> this information suggests a strong relationship between psychological factors and TMPDS<sup>(20)</sup>.

Conversely, in Chinese population the foremost prevalent sign was temporomandibular joint noises followed by abnormal jaw movement (12.3 %) and pain was only reported in (9.9 %)<sup>(16)</sup>, similarly in Iranian population The prevalence of the foremost common signs of TMDs were clicking, muscle tenderness and TMJ tenderness<sup>(21)</sup>.

Joint noises were reported in 37.9% of the subjects, this was more than Italian population, where TMJ clicking was reported in (30.7%)<sup>(7)</sup>. Similarly this study showed that Egyptian population have higher percentage than Chinese population as only (17.4%) reported joint noises<sup>(16)</sup>, in contrast, this was not up to the Australian population which reported that 48,5% of the symptomatic subjects were having noises<sup>(18)</sup>.

In the primary screening 22.4% of the Symptomatic subjects reported that they have clenching or grinding, this was reported also in young Japanese population, in an exceedingly 3 year cohort study on university students Bruxism is present in 26% to 66% of patients diagnosed with TMD<sup>(22)</sup>. This finding is according to the idea that the masticatory muscle pain is a kind of delayed muscle soreness, as a result of the bruxism activities. However, the current study didn't intend to study cause and effect relationships, and it cannot determine which of the two conditions occurred first<sup>(19)</sup>.

On the other hand, a cross sectional study aimed to spot correlations between sleep bruxism (SB) and

temporomandibular disorders (TMD) as diagnosed by means of the research diagnostic criteria for temporomandibular disorders (RDC/TMD) had the belief that myofascial pain can't be explained solely by an easy cause-and-effect relationship. That's why it has been suggested that longitudinal studies are needed to research these relations<sup>(23)</sup>.

The most common subtype of TMDs in the Egyptian population was muscular pain (myalgia with percentage of 29.2% and myofascial pain 15.4%, then arthralgia with 27.7% disc displacement reported in 13,8 and degenerative reported in 1.5%. These results were comparable in other young population (Brazilian and Polish population) as the majority of these had painful TMD of muscular origin (13.1%) of the Brazilian population (9), while (20% in Italian population<sup>(10)</sup>. In contrast In Norway, the most common TMD diagnosis was disc displacement with reduction, with a prevalence of 5.4% (9/167), followed by myalgia, 3.0 % (5/167). While in adult studies The most common TMD diagnosis were degenerative joint disease (33.0%) and disc displacement with reduction (33.0%)<sup>(11)</sup>.

In the final step, only one case was diagnosed clinically with degenerative disease. Clinically this patient had a crepitus, TMJ pain and no muscle pain or limitation of opening. CBCT show signs of bone resorption at the condylar head, severe thinning of the cortical boundaries at the condylar head and decreased joint space. The glenoid fossa and articular eminence had clear irregular surfaced. According to the diagnostic criteria (DC/TMD), when this diagnosis needs to be confirmed, then TMJ CT criteria are positive for at least one of the following: Subchondral cyst(s), erosion(s), generalized sclerosis, or osteophyte(s). Flattening thinning and/or cortical sclerosis are considered indeterminate findings for degenerative disease<sup>(13)</sup>. In this study and according to the predetermined criteria findings were not definitive and there was poor relation between the clinical findings as pain and noises and the bony changes in the radiographic findings. These findings could be a cursor for degenerative disease.

This poor correlation could be explained as this study were conducted in young population as degenerative disease increase with aging. Prediction of radiographic findings from clinical signs and symptoms is typically challenging. Patients may experience symptoms for months before bony changes are evident on radiographs. In the early stages of TMJ osteoarthritis, radiographs may appear normal and may not be helpful in validating the diagnosis<sup>(27)</sup>.

Wiese et al., did not find any association between degenerative bony changes in TMJ tomograms and any pain-related variables. They explained that this non-association may be due to the difference in the onset of pain and detectable radiographic bony changes, because radiographs do not represent ongoing processes but the effect of a previous process. This is highly applicable to this cross-sectional study. Longitudinal cohorts will be able to capture pain intensity levels and radiographic records of the disease process at different time points instead of a single measure<sup>(28)</sup>.

## CONCLUSION

TMDS are highly prevalent conditions in young population. There is an adequate association between the stress in the university years and the TMDS. There is a poor relation between the clinical and radiographic findings in temporomandibular joint disorders.

## CONFLICT OF INTEREST

None declared.

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