RESEARCH ARTICLE

Temporomandibular joint disorders prevalence and awareness of appropriate clinical practices, among Al-Madinah community: A prospective cross sectional study

[version 3; peer review: 1 approved with reservations]

Previously titled: Temporomandibular joint (TMJ) disorders prevalence and awareness of appropriate clinical practices, among Al-Madinah community in Saudi Arabia

Albraa Alolayan1, Shayma S. Alsayed1, Ruwaa M. Salamah1,2, Khadija M. Ali1, Mashael Alsousi1,2, Shadia Elsayed1,3

1Department of Oral and Maxillofacial Surgery, College of Dentistry, Taibah University, Almadinah Almunawwarah, Madinah, Saudi Arabia
2Dentistry, Ministry of Health, Al Madinah Al Munawwarah, Madianh, Saudi Arabia
3Department of Oral and Maxillofacial Surgery, Faculty of Dental Medicine for Girls, Al Azhar University, Cairo, Egypt

Abstract

Background: Painful temporomandibular joint disorders (TMDs) are of musculoskeletal origin and are considered the most common cause of non-odontogenic pain in the orofacial region. The purpose of this study was to investigate the prevalence and awareness of temporomandibular joint (TMJ) disorders in Almadinah Almunawwarah community.

Methods: A prospective observational cross-sectional study with convenience sampling was conducted. A translated Arabic version of Fonseca's questionnaire was employed. The questionnaire asked about the participant's personal information, if they thought they had TMDs, and who to visit for therapy if necessary. These were followed by 10 items from Fonseca's questionnaire, each with a three-point scale.

Results: The questionnaire was completed by 598 people. Females made up 57.1% of the participants. TMDs were present in 61% of the population, with varying degrees of severity. Males (44.3%) were less affected than females (55.7%). The difference, however, was not statistically significant (P = 0.354). Out of the 61% TMDs Positive patients, 74.1% had mild TMDs symptoms, while 20.8% and 5.1%, respectively, had moderate and severe TMDs symptoms (P = 0.05). The
severity of the symptoms was unaffected by demographic data (P > 0.05). Only 40% seek care, with 64.6% selecting for a dentist and 24.6% preferring for an orthopaedic specialist (P= 0.008).

**Conclusions:** Participants from Al-Madinah had a greater prevalence of mild TMDs. The majority of the participants had no idea who to go to for treatment. The findings of this study highlight the importance of educational activities to enhance public awareness

**Keywords**
TMJ, prevalence, awareness, severity, Almadinah Almunawwarrah
Introduction

Temporomandibular disorders (TMDs) is a term used to describe a set of musculoskeletal and neuromuscular diseases characterized by localized discomfort in the pre-auricular and face regions, as well as deviations or restrictions in mandibular joint movement, in addition to joint noises.\(^1\) TMDs are multifactorial, caused by stress, trauma and malocclusion.\(^2\) Painful TMDs are of musculoskeletal origin and are considered the most common cause of non-odontogenic pain in the orofacial region.\(^3\)\(^-\)\(^5\) The most prevalent symptom of TMD is tenderness of the masticatory muscles when palpated.\(^6\)\(^,\)\(^7\)

The prevalence of TMDs was twice higher in women compared to men,\(^8\) also pain intensity was greater in women.\(^9\) According to a previous report, 75% of the participants exhibited one TMD sign and 33% had one TMD symptom.\(^10\) Another study concluded that 50–75% of the population had TMD signs at some moment in their lives.\(^11\) One study showed that only 39% participants had sought treatment for pain related to TMDs.\(^12\) Patients with TMDs symptoms tend to consult first with general medical practitioners due to the availability and financial feasibility in nearly six countries. 27% of children and adolescents in Saudi Arabia were found to have TMDs.

For our patients, temporomandibular joint (TMJ) disorders still cause difficulty in diagnosis and conflicts between different specialties. Some individuals seek treatment from different specialized clinics such as ENT (ear, nose and throat) or neurosurgery clinics, and the rationale for the current study was that there is a rise in oral health awareness in Saudi Arabia. However examination and diagnosis of TMJ disorders continue to require emphasis and increased knowledge among dentists, therefore it is critical to focus on epidemiological data to estimate the prevalence of these conditions among our populations, particularly given the increasing in stressful environments that induce TMDs. as a result, the study’s aim was to determine the prevalence and severity of distribution of TMDs among Almadinah Almunawwarah community population and to focus on the population’s awareness towards the appropriate clinical practice of the disorders using the Fonseca questionnaire, which hasn’t been used in our population before.

Methods

Study design and setting

This study was designed to be a prospective observational cross-sectional study with convenience sampling technique. The Taibah University Dental College Ethical Committee approved the study protocol (TUCDREC/20200219/MIAL-sousi), and all participants’ identities were kept anonymous. The study followed the Helsinki Declaration on Human Research Studies. The patients were selected from the dental college and the hospital at Taibah University in Al-Madinah, Saudi Arabia, who came to the TUDC for routine dental screening. The study was conducted during the last two years, and the sample was drawn from clinic visitors on a daily basis.

Following an explanation of the study’s aims and objectives, patients who agreed to participate in the study signed an informed consent form.

Inclusion and exclusion criteria

All adult males and females who visited Taibah University’s Oral and Maxillofacial Surgery clinics in Almadinah Almunawwarah, Saudi Arabia, in the previous two years were included in the study.

All patients with systemic disease associated with TMJ like rheumatoid arthritis, regular use of medication such as anti-anxiety or antidepressants, history of TMJ surgery, wearing removable denture or splints (which could be a contributing confounding cause of TMJ adaptive modifications), psychological problems and/or with incomplete questionnaire form were excluded from the study.

Response bias was reduced by keeping the questions simple and short, as in the verified Fonseca questionnaire, which has structured proper length and understandable language, and by limiting the patient experience to the previous three months.
Sample size
1. The study sample calculation was determined using the OpenEpi tool kit application with a confidence level of 99 percent and estimated the entire Madinah population to be above one million and estimated prevalence indicator of 27%. The sample size was calculated to be 523 participants. To avoid missing or insufficient data, we extend the total to 598.

Patients seeking dental treatment were recruited through the Oral and Maxillofacial Surgery clinics at Taibah University, Almadinah Almunawwarah, in Saudi Arabia.

Instrument for data collection
In order to estimate Fonseca’s Anamnestic Index (FAI), a translated Arabic version of Fonseca’s questionnaire was utilized. The original Fonseca’s questionnaire was proposed by Fonseca et al. in Brazilian Portuguese. The questionnaires were filled out by well-trained two investigators who collect data conducted face-to-face questionnaire assessments and contribute to the current study’s authorship.

The questionnaire included questions about participant’s demographic data, if the participant thought he/she is suffering from TMDs, and whom to seek for a treatment if he/she needed to. These questions were followed by 10 questions of Fonseca’s questionnaire with three points scale, and it was distributed to patients in an Arabic version. For each question, the participants were instructed that just one answer should be marked: “yes” (10 points), “no” (0 points), and “maybe” (5 points). Based on the sum of their points, the individuals were classified as TMD free (0–15), mild TMD (20–40), moderate TMD (45–60), and severe TMD (70–100). The FAI has been usually applied in Brazilian studies to measure the severity of TMDs. A copy of the original and translated questionnaire can be found in the Extended data.

Statistical analysis
The data was evaluated using a social science statistical software (SPSS version 25). Means, standard deviation, and percentages were used to show descriptive data. It was followed by Chi-square test for nominal outcomes and Student’s t-test for continuous study variables. Significance level was set at P value of 0.05.

Results
A total of 598 participants answered the questionnaire, based on the above-mentioned exclusion criteria, 80 (13.4 %) participants were removed from the study. Thus, leving a total of 518 (86.6%) recruited participants, females made up 57.1% of the participants. The age group distribution of participants and the level of education are presented in Figure 1 and Figure 2, respectively.

Based on the participants’ answers on Fonseca’s questionnaire, 61% had TMDs with variable degree of severity. Male group (44.3%) was less than female group (55.7%). The difference, however, was not statistically significant (P = 0.354). On the other hand, there was a significant difference in the positive responses to the questions of whether or not the participants had TMDs (12.5 %), and the participants whom actually suffering from TMDs according to Fonseca’s questionnaire (P < 0.05). The level of TMDs in regard to gender distribution is presented in Figure 3.

Figure 1. Age group distribution.
Out of the 61% TMDs positive patients, 74.1% had symptoms of mild TMDs, while the moderate and severe symptoms were 20.8% and 5.1%, respectively ($P < 0.05$). However, the demographic data showed no effect on the severity of the symptoms ($P > 0.05$).
In regards whom to seek for treatment, 51.6% of the sample chose a dentist while 41.8% chose an orthopedic specialist ($P > 0.05$). Based on participants who suffered or suffering from TMDs, only 40% sought out treatment, 64.6% of them chose a dentist while 24.6% chose orthopaedic specialist ($P \leq 0.008$).

The symptoms mostly associated with TMDs ranged from behavioral changes and quick fatigue of the mastication muscles, to frequent headache or pain related to the TMJ or the neck, reaching to TMJ stiffness and clicking or even limitation in mouth opening. Table 1 summarizes the frequencies of the most common symptoms.

**Discussion**

The study evaluates the prevalence and awareness of TMD amongst the population of Al-Madinah to produce sufficient data on TMD, helps to find crucial part of planning programs to educate and raise awareness through the population. The study showed that TMDs were present in 61% of the population. Many studies employed the Fonseca questionnaire to diagnose and grade the severity of TMDs. TMD is divided into four categories: minor, moderate, severe, and non-TMD. It has a number of advantages, including quick application, low cost, minimal inconsistency, and self-administration.

The Fonseca questionnaire was used in this study to assess the prevalence of TMD symptoms and manifestations in the Almadianh region of Saudi Arabia. It is used to gather data from a wider number of people in a short period. The most significant advantage of employing this questionnaire is that it has no bearing on the investigator and is straightforward.

More than half of the participants had some level of TMDs, which has been associated with headache. In regard, frequent headaches were associated with 40% of the participant, patients with TMD are five times more likely to report headaches. The results are related to a study done in Brazil in 2018 which over two third of the adolescents had headache/migraine and 36 percent of them connected it with TMD.

Although more than 70% of the TMD positive participants have mild TMD, only 51.6% of the sample knows who to see for TMD therapy, and 40% of TMD patients seek treatment. TMD treatment varies from one physician to another. It ranges from patient education and the development of new habits such as self-massage, hot and cold packs, diet and nutrition instruction, and muscle exercises, which have been shown to have a high level of success and improvement, to the need for invasive and high-technical or invasive surgical treatments. According to Reynaldo, 91.7% of patients responded well to conservative treatment. There was no TMD recurrence in the majority of patients who could be examined four to six years after treatment completion. The current study’s findings highlight the importance of public oral health education and assessment of TMDs using Fonseca questionnaire. The present survey collected data had limitations in terms of measuring patients’ reporting outcomes and also had limitations in evaluating specific differential diagnostic criteria in the analysis of the type of TMDs, whether myogenous or arthrogenous, and another limitation was that it was a one-center study, though it is the largest and only university centre in the Al Madinah region, and so other multicenter studies of the health clusters in our community’s population are still needed.

**Conclusion**

Based on this study, participants from Al-Madinah showed higher prevalence in mild degree of TMDs. Most of the participants were lacking the knowledge of TMDs and whom to seek for a treatment. The results from this study emphasize the need for educating programs to raise awareness through the population.

**Data availability**

**Underlying data**

Figsshare: Data for TMJ disorders prevalence and awareness of appropriate clinical practices, among Al-Madinah community in Saudi Arabia.sav [https://doi.org/10.6084/m9.figshare.17215940](https://doi.org/10.6084/m9.figshare.17215940)

This project contains the following underlying data

- Data for TMJ disorders prevalence and awareness of appropriate clinical practices, among Al-Madinah community in Saudi Arabia.sav (raw data in Arabic)

Data are available under the terms of the Creative Commons Attribution 4.0 International license (CC-BY 4.0).
This project contains the following underlying data

- Data for TMJ disorders prevalence and awareness of appropriate clinical practices, among Al-Madinah community in Saudi Arabia.sav (raw data in English)

Data are available under the terms of the Creative Commons Attribution 4.0 International license (CC-BY 4.0).

Extended data

Figshare: Questionnaire. https://doi.org/10.6084/m9.figshare.1929247428

This project contains the following extended data

A copy of the questionnaire (in Arabic and the English version).

Data are available under the terms of the Creative Commons Attribution 4.0 International license (CC-BY 4.0).

References

PubMed Abstract | Publisher Full Text

PubMed Abstract | Publisher Full Text

Publisher Full Text

Publisher Full Text

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Thank you for your revised version of your manuscript. However, before considering the paper for indexing, I have the following concerns:

1. Authors stated in the inclusion criteria that "All adult males and females who visited Taibah University's Oral and Maxillofacial Surgery clinics in Almadinah Almunawwarah, Saudi Arabia, in the previous two years were included in the study."

   My question is what are the purposes of visiting participants? What did they seek treatments for? Were they asked about treatments for TMDs?

2. Since this is an observational cross-sectional study, authors should clarify if this study was performed retrospectively or prospectively and should state this information in the methods and abstract.

3. It's clear that sample size calculation was not reliable and convincing because sample size calculation for cross-sectional study requires statistical formula, the prevalence of an indicator (which should be estimated from the previous published similar studies), level of significance, correlation coefficient, etc.

   Based on methods authors stated clearly that "All adult males and females who visited Taibah University's Oral and Maxillofacial Surgery clinics in Almadinah Almunawwarah, Saudi Arabia, in the previous two years were included in the study."

   So, all patients that visited the clinic within 2 years have been included, is this means no actual sample size calculation was performed? Please clarify. Otherwise, the authors should address these points as a study limitation.

4. Based on the methodology, the authors included all patients who visited the Department at
a specific time. Also, based on the Arabic Questionnaire, and the author's exclusion criteria, they excluded some patients. So, it's mandatory to clarify the total number of participants who were initially recruited (based on sample size calculation, in the case this has been done prospectively) and agreed to participate, then the number of patients who were excluded with reasons using flow diagram.

5. In Conclusion, the authors should address the primary aim of the study which estimated the prevalence of TMDs in the City. As this study is a cross-section study, the causation between the risk factor and outcome is impossible to assess. Then I think, some part of the conclusion is not supported by the findings (Fonseca's Anamnestic Index could also be considered a useful instrument for early identification and measuring the severity of TMDs in the general population.)

6. The authors stated in the exclusion criteria those patients who wear removable dentures or splints were excluded, please give an explanation

7. Another problem could be introducing a bias within the study, and difficulties for patients to fill and complete the questionnaire.

8. Title: abbreviation of (TMJ) should be removed from the title. The title should be short more focused and mention the study design

**Competing Interests:** No competing interests were disclosed.

**Reviewer Expertise:** Oral and Maxillofacial Surgery

_I confirm that I have read this submission and believe that I have an appropriate level of expertise to confirm that it is of an acceptable scientific standard, however I have significant reservations, as outlined above._

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**Author Response 30 Jun 2022**

**Shadia Elsayed**, College of Dentistry, Taibah University, Almadinah Almunawwarrah, Saudi Arabia

Thank you for your feedback, which provided us with another opportunity to edit the article.  
1. Authors stated in the inclusion criteria that "All adult males and females who visited Taibah University's Oral and Maxillofacial Surgery clinics in Almadinah Almunawwarrah, Saudi Arabia, in the previous two years were included in the study." My question is what are the purposes of visiting participants? What did they seek treatments for? Were they asked about treatments for TMDs?

**Answer:** Thank you for your input. The study included individuals who came to the TUDC for routine dental screening, with the goal of determining the prevalence of TMJ problems in this specific demographic.

2. Since this is an observational cross-sectional study, authors should clarify if this study
was performed retrospectively or prospectively and should state this information in the methods and abstract.

**Answer:** Thank you for your input. The study was conducted as a prospective observational study, and this is now addressed in the methodology and abstract.

3. It's clear that sample size calculation was not reliable and convincing because sample size calculation for cross-sectional study requires statistical formula, the prevalence of an indicator (which should be estimated from the previous published similar studies), level of significance, correlation coefficient, etc.

**Answer:** I appreciate your input. The study sample calculation was determined using the OpenEpi tool kit application with a confidence level of 99 percent and estimated the entire Madinah population to be above one million and estimated prevalence indicator of 27% (Al-Khotani, A., Naimi-Akbar, A., Albadawi, E. *et al*. Prevalence of diagnosed temporomandibular disorders among Saudi Arabian children and adolescents. J Headache Pain 17, 41 (2016). [https://doi.org/10.1186/s10194-016-0642-9](https://doi.org/10.1186/s10194-016-0642-9)) and the sample size was calculated to be 523 participants. To avoid missing or insufficient data, we extend the total to 598.

Based on methods authors stated clearly that "All adult males and females who visited Taibah University's Oral and Maxillofacial Surgery clinics in Almadinah Almunawwarah, Saudi Arabia, in the previous two years were included in the study." So, all patients that visited the clinic within 2 years have been included, is this means no actual sample size calculation was performed? Please clarify. Otherwise, the authors should address these points as a study limitation.

**Answer:** Thank you for your comment. The study was conducted during the last two years, and the sample was drawn from clinic visitors on a daily basis.

4. Based on the methodology, the authors included all patients who visited the Department at a specific time. Also, based on the Arabic Questionnaire, and the author's exclusion criteria, they excluded some patients. So, it's mandatory to clarify the total number of participants who were initially recruited (based on sample size calculation, in the case this has been done prospectively) and agreed to participate, then the number of patients who were excluded with reasons using flow diagram.

**Answer:** Thank you for your comment. The study included a total of 598 participants answered the questionnaire, based on the mentioned exclusion criteria, 80 (13.4 %) participants were removed from the study. Thus, levelling a total of 518 (86.6%) recruited participants

5. In Conclusion, the authors should address the primary aim of the study which estimated the prevalence of TMDs in the City. As this study is a cross-section study, the causation between the risk factor and outcome is impossible to assess. Then I think, some part of the conclusion is not supported by the findings (Fonseca's Anamnestic Index could also be considered a useful instrument for early
identification and measuring the severity of TMDs in the general population.)

**Answer:** Thank you for your comment. Conclusion section has been updated in accordance with your thoughtful advice.

6. The authors stated in the exclusion criteria those patients who wear removable dentures or splints were excluded, please give an explanation.

**Answer:** In order to assess the actual prevalence among the population that did not get prosthodontic devices like splints, we eliminated patients receiving splint therapy and removable prosthodontics, which could be a contributing confounding cause of TMJ adaptive modifications.

7. Another problem could be introducing a bias within the study, and difficulties for patients to fill and complete the questionnaire.

**Answer:** thank you for your comment. The questionnaires were filled out by well-trained two investigators who collect data from patients and contribute to the current study’s authorship.

8. Title: abbreviation of (TMJ) should be removed from the title. The title should be short more focused and mention the study design

**Answer:** Thank you for your comment. The title has been updated in response to your helpful suggestion.

**Competing Interests:** I declare no conflict of interest.
1. Authors completely failed to state the rationale of the study (why it's important to do this study) or show the size of the gap in the literature. Unfortunately, the indexing of this study will not add any new material to the existing literature.

2. Authors did not state the inclusion criteria completely, only mentioned the exclusion criteria. So authors should state inclusion criteria based on PICOS criteria.

3. Authors did not present adequately information about how they calculated the sample size.

4. Authors should explain why they chose a modified version of Fonseca’s questionnaire.

5. The generalizability of this study is not applicable.

6. Authors should include others predictors variables to be analysed type of TMDs if myogenous or arthrogenous, chronicity, signs and symptoms of TMDs such as clicking, muscles tenderness, headache, limited mouth opening etc.

7. Authors did not clarify who performed the assessment.

8. This study is based on a survey so its mandatory to clarify the limitations of this study.

**Is the work clearly and accurately presented and does it cite the current literature?**
Yes

**Is the study design appropriate and is the work technically sound?**
No

**Are sufficient details of methods and analysis provided to allow replication by others?**
No

**If applicable, is the statistical analysis and its interpretation appropriate?**
Partly

**Are all the source data underlying the results available to ensure full reproducibility?**
No

**Are the conclusions drawn adequately supported by the results?**
Partly

**Competing Interests:** No competing interests were disclosed.

**Reviewer Expertise:** Oral and Maxillofacial Surgery

I confirm that I have read this submission and believe that I have an appropriate level of expertise to state that I do not consider it to be of an acceptable scientific standard, for reasons outlined above.
Thank you very much for your time and effort spent on reviewing our manuscript. We greatly appreciate all comments for giving us the opportunity to improve our manuscript further.

• Authors completely failed to state the rationale of the study (why it’s important to do this study) or show the size of the gap in the literature. Unfortunately, the indexing of this study will not add any new material to the existing literature.

Thank you. The rationale for the current study was that there is a rise in oral health awareness in Saudi Arabia. However examination and diagnosis of TMJ disorders continue to require emphasis and increased knowledge among dentists, therefore it is critical to focus on epidemiological data to estimate the prevalence of these conditions among our populations, particularly given the increasing in stressful environments that induce TMJds. As a result, the study’s aim was to determine the prevalence and severity of distribution of TMJ disorders among the Al Madinah population and to focus on the population’s awareness towards the appropriate clinical practice of the disorders using the Fonseca questionnaire, which hasn’t been used in our population before. This has been added to the introduction section.

• Authors did not state the inclusion criteria completely, only mentioned the exclusion criteria. So authors should state inclusion criteria based on PICOS criteria.

Thank you for your comment. All adult males and females who visited Taibah University's Oral and Maxillofacial Surgery clinics in Almadinah Almunawwarah, Saudi Arabia, in the previous two years were included in the study.

• Authors did not present adequately information about how they calculated the sample size.

Thank you for your comment. Using a sample size calculator with a confidence level of 99 % and estimated the entire Madinah population to be above one million, the sample size was calculated to be 523 participants. To avoid missing or insufficient data, we extend the total to 598.

• Authors should explain why they chose a modified version of Fonseca’s questionnaire.

Thank you. We used the same Fonseca questionnaire, but we used a newly translated Arabic version that is provided.

• Authors should include others predictors variables to be analysed type of TMDs if myogenous or arthrogenous, chronicity, signs and symptoms of TMDs such as clicking, muscles tenderness, headache, limited mouth opening etc.

Thank you. The questionnaire was composed of 10 questions, which include checking for the presence of pain in temporomandibular joint, headache, parafunctional habits, movement
limitations, joint clicking, perception of malocclusion, and sensation of emotional stress. The limitation of the study is now reported as it had limitations in terms of evaluating specific differential diagnostic criteria in the analysis of the type of TMDs, whether myogenous or arthrogenous, which need future studies.

- Authors did not clarify who performed the assessment.

Thank you. Two investigators who collect data conducted face-to-face questionnaire assessments.

- This study is based on a survey so it’s mandatory to clarify the limitations of this study.

Thank you for your comment. The survey data collected had limitations in terms of measuring patients’ reporting outcomes and also had limitations in terms of evaluating specific differential diagnostic criteria in the analysis of the type of TMDs, whether myogenous or arthrogenous, and another limitation was that it was a one-center study, though it is the largest and only university centre in the Al Madinah region, and more multicenter studies are still needed.

**Competing Interests:** No conflict of interest.