

# Analysis of Helkimo index for temporomandibular disorder diagnosis in the dental students of Faridabad city: A cross-sectional study

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## Abstract

**Aim and Objectives:** The aim of the study was to evaluate the prevalence of temporomandibular disorder (TMD) by the use of Helkimo's index (anamnesic [Ai] and clinical dysfunction [Di] component) in the nonpatient population (dental students) of Faridabad college.

**Settings and Design:** A questionnaire-based survey was carried out among students of dental college for signs and symptoms of TMD and also clinical examination was done. The results were scored and according to scoring severity of TMD were assessed in the specified population.

**Materials and Methods:** About 580 students were assessed for TMD by the use of Helkimo's index (Ai and Di component). Descriptive statistical analysis was done.

**Results:** Among the study group, 15% were found to have TMDs. Out of the affected students, 79% females and 21% males were having symptoms. Out of the signs and symptoms present, 7% students were found to have sound in temporomandibular joint followed by pain in 3% and fatigue in 2% of students. On clinical examination, limited mouth opening was found in 6% students followed by locked mandible in 1%, deviation of jaw in 0.6%, and jaw rigidity of mandible in 0.6% of individual.

**Conclusion:** To summarize, Helkimo index is a well-founded index to assess TMD in a specified population. Signs and symptoms of TMD were present among students although low prevalence of TMD was found in the students.

**Key Words:** Helkimo index, temporomandibular disorder, temporomandibular joint

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## INTRODUCTION

Temporomandibular disorder (TMD) is a wide-ranging term used to describe a number of related disorders involving the

temporomandibular joint (TMJ), masticatory muscles, and occlusion, with common symptoms such as pain, restricted movement, muscle tenderness, and intermittent joint sounds.<sup>[1]</sup>

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TMDs can also be defined as a collective term for conditions that involve pain and/or dysfunction of the TMJ and the related structures.<sup>[2,3]</sup>

The most frequent symptoms of TMD are sound in the area of the TMJ,<sup>[4]</sup> a sensation of fatigue in the jaw area, a sensation of stiffness of the jaw upon waking up or when opening the mouth, luxation or locking of the mandible when opening the mouth, pain when opening the mouth, and pain in the region of the TMJ or in the area of the masticatory muscles. The most frequent signs of TMD include restricted mandibular movement, lower TMJ function, painful mandibular movement, muscle pain, and pain in the TMJ.<sup>[5]</sup>

Etiology of TMD has been a conflicting topic for discussion. Earlier it was suggested that occlusal discrepancies are the major culprit for TMD patients, but later on, in the 1960s and 1970s, emotional stress and occlusal discrepancy were considered as etiology. Further with an increase in research work in TMD patients, it was found that the etiology may include psychosocial, psychological, and physical factors. Dahlström and Carlsson conducted a systematic review on TMDs, and oral health-related quality of life (OHRQoL) and they observed a high impact on OHRQoL in TMD patients.<sup>[6]</sup>

TMD is a multifactorial complex disorder and the etiology is related to emotional tension, teeth loss, occlusal interferences, masticatory muscular dysfunction, postural deviation, internal and external changes in TMJ structure, and the various associations of these factors.<sup>[7]</sup> Sound in TMJ area (clicking or crepitus) is most frequent sign in TMD patients. Clicks are brief sound in TMJ area associated with disc displacement with reduction; though click-like sounds can also be produced by joint remodeling and hypermobility. The absence of click does not necessarily imply healthy TMJ. Therapy is indicated when clicking is associated with pain and deviation of mandible. Deviation is caused by disc displacement with reduction.<sup>[1]</sup> Deflection of mandible is caused in case of disc displacement without reduction where the translation of mandible is affected. Nerve endings are found in disc and capsular ligaments and retrodiscal tissue. When condyle articulates with retrodiscal tissue, entrapment of retrodiscal tissue is considered as stimulus for pain in TMJ.<sup>[8]</sup>

As there are no criteria to attain a numeric value to decide the severity of TMD, indices play an important role to determine the prevalence of this disorder in a specified population. Helkimo was considered as a pioneer in developing index to measure the severity and pain in TMD patients. Helkimo's index was further broken down into anamnesis, clinical, and occlusal dysfunction.<sup>[9]</sup>

As there is an increase in awareness toward oral health, there is an increase in demand for TMD. It is therefore important and valuable to have epidemiological data to estimate the proportion and distribution of these disorders in the population. Due to variability of the complaints, TMD is diagnosed mainly by signs and symptoms. People should know initial signs and symptoms of TMD that may worsen with time even in nonpatient population (dental students).

The rationale of this study was to pay deeper attention to TMD, especially in students as the stress level is high in the students and stress is a contributing factor in TMD, and also it is found in the literature, a high prevalence of TMD in dental students.<sup>[10]</sup> The present investigation aims at cross-sectional epidemiological study for TMD signs and symptoms in dental students of Faridabad through clinical examination and self-reported questionnaire.

## MATERIALS AND METHODS

### Study design

This descriptive cross-sectional study was conducted at dental college of Faridabad. A total number of 580 students with the age group of 17–28 years were randomly selected for the study. Data were collected from February 2016 to April 2016. Participants were given no time limit to fill questionnaire (in days) so as to reduce induced error. Clinical examination was done only by one expert investigator to minimize error. Ethical Committee clearance was obtained from the Institutional Review Board.

### Inclusion and exclusion criteria

Students with all permanent dentition and no history of orthodontic treatment were included in the study. The patients diagnosed as having stomatognathic system impairment, clinically diagnosed TMD with treatment and students with any gross pathology of ear were excluded from the study. Initially, proper instructions were given to the participants about the goals and benefits of the study and informed consent was signed. Then, the participants were asked to answer the questionnaire, to evaluate the TMD in undiagnosed cases.

### Sample size estimation

The sample size was decided on the basis of the results of the other previous studies in which the prevalence was found to be 42%.

$$\text{Sample size} = (Z^2 \times [p] \times [1 - p]) / C^2.$$

Where  $Z = Z$  value for the confidence level chosen (e.g., 1.96 for 95% confidence level).

$p$  = Percentage having a particular disease/problem etc., and it is expressed as a percentage (generally it is taken as 0.5).

$C$  = Confidence interval (CI) expressed, expressed as a decimal (generally 0.05).

The minimum sample size required for the study was found to be 374 to obtain CI level of 0.95, at least 80% power for analysis and minimal error. Sample size was kept to be 580 as the students volunteered for the research.

### Questionnaire

Registration of subjective symptoms applying for the Helkimo Index required a questionnaire-based survey. Questionnaire comprised two parts: Anamnestic component which includes answers to questions in “yes” or “no” [Table 1]. Clinical dysfunction part comprised clinical examination such as extraoral examination, palpation, and observation of palpebral reflex in all the students [Table 2].

### Data collection and analysis

The data were collected and analyzed for demographic variables such as gender has been mentioned. Questionnaire was received, and it was analyzed according to anamnestic scale as follows:

- 0: No symptoms
- I: Mild symptoms included sensation of the jaw fatigue, jaw stiffness, and TMJ sounds (clicking or crepitus)
- II: Severe symptoms included one or more of the following: (a) Difficulty in the mouth opening, (b) jaw locking, (c) mandible dislocation and its painful movement, and (d) painful TMJ region and/or masticatory muscles.<sup>[11]</sup>

To accomplish the examination of the clinical dysfunction, a modified version of Helkimo's dysfunction index (Di) was calculated. Clinical examination included opening of mandible, deviation during opening, dysfunction of TMJ, pain in the TMJ and preauricular region, and also masticatory muscles were palpated for pain. The clinical assessment was done as follows:

- a. Opening range: Opening range was determined by asking the patient to gently open mouth and with the help of ruler measure the distance between upper and lower central incisor, score 0 – if >40 mm, score 1 – if 30–39 mm, and score 5 – if <30 mm
- b. Mandibular deviation during lowering: Patient was asked to open mouth gently and deviation is noted between maxillary and mandibular midline, score 0 – if <2 mm, score 1 – if 2–5 mm, and score 5 – if >5 mm
- c. TMJ dysfunction: TMJ was examined for clicking, locking, and luxation without using stethoscope, score 0 – no impairment, score 1 – palpable clicking, and score 5 – evident clicking, locking, and luxation

**Table 1: Questionnaire for anamnestic component**

Name:	_____	
Age:	_____	
Gender:	_____	
1	Do you have a sound (clicking or crepitation) in the area of TMJ?	Yes No
2	Do you have jaw rigidity during awakening or slow movement of mandible?	Yes No
3	Do you feel fatigue in the jaw area?	Yes No
4	Do you have difficulty while opening mouth?	Yes No
5	Do you have locked mandible during opening the mouth?	Yes No
6	Do you have pain in the TMJ in the area of masticatory muscles?	Yes No
7	Do you have pain during movement of mandible?	Yes No
8	Do you have luxation of mandible?	Yes No

TMJ: Temporomandibular joint

**Table 2: Clinical dysfunction component**

Mandibular opening	>40 mm
	30-39 mm
	>30 mm
Mandibular deviation during lowering	<2 mm
	2-5 mm
	>5 mm
TMJ dysfunction	No impairment
	Palpable clicking
	Evident clicking
TMJ pain	No pain
	Palpable pain
	Palpebral reflex
Muscle pain	No pain
	Palpable pain
	Palpebral reflex

TMJ: Temporomandibular joint

- d. TMJ pain: TMJ was palpated for the presence of pain in TMJ, score 0 – no pain, score 1 – palpable pain, and score 5 – palpebral reflex
- e. Muscle pain: Bilateral examination was carried out for muscles of mastication, score 0 – no pain, score 1 – palpable pain, and score 5 – palpebral reflex.

Scores assigned for the five symptoms was summed up. Each individual had a total dysfunction score ranging from 0 to 25 points. Higher the score, the more acute/serious the disorder. Depending on the values obtained, the patients were classified as follows: Di0 – no dysfunction; DiI – mild dysfunction (1–4 points); DiII – moderate dysfunction (5–9 points); DiIII – severe dysfunction (9–25 points).

### Statistical analysis

The Cronbach's alpha was calculated using the SPSS software for the validation of the questionnaire. The Cronbach's alpha value was found to be 0.80 which was satisfactory.

**RESULTS**

Out of 650 questionnaires distributed, 580 students responded to the questionnaire. Among 580 students, 468 (81%) were females and 112 (19%) were males [Graph 1].

Among the study group, 84 students (15%) were found to have signs and symptoms, i.e., pain, sound in the TMJ, deviation, and limited mouth opening. Four hundred and ninety-six students were symptom-free or without any symptoms that account for 85% [Graph 2].

Sixty-six females were affected among symptomatic patients who account for 14% of the female population, whereas only 18 (16%) males were having symptoms [Table 3].

Out of the signs and symptoms present, sound in the TMJ was most common problem (40 students) which accounts for 7% followed by pain in 20 students (3%) and fatigue in 12 students (2%) in TMJ.

On clinical examination, limited mouth opening was found in 34 students which accounts for 6% followed by locked mandible (6 students) 1%, deviation (4 students) 1%, and jaw rigidity of mandible (4 students) 1% during mouth opening [Table 4].

According to anamnestic component of Helkimo's index, 90% students were free from symptoms, 7% students were found to have mild symptoms, and 3% students were having severe symptoms. According to dysfunction component, 94% students were found to have no dysfunction, 5.7% students were having mild dysfunction, and only 0.3% students were having moderate dysfunction, whereas not a single student was having severe dysfunction [Table 5].

**DISCUSSION**

The present study was conducted to assess the prevalence of TMD in the dental students of Faridabad by the use of a self-reported questionnaire-based survey. The response rate of

the questionnaire (89%) was satisfactory as compared to other studies.<sup>[12]</sup> Among the study group, only 15% were found to have signs and symptoms of TMD, whereas 85% students were without any sign or symptom which was in accordance with the study done by Mutlu *et al.*<sup>[12]</sup> but less than the prevalence found by Modi *et al.*<sup>[13]</sup> who showed a prevalence rate of 68.6%.

Females were preceded by males in presenting the TMDs as shown in previous studies<sup>[14]</sup> but judgment could not be made about females at an edge over males because of a unequal number of males and females included in the study. There is a

**Table 3: Number and sex distribution**

	Males	Percentage	Females	Percentage
With signs and symptoms	18	16	66	14
Without signs and symptoms	94	84	402	86
Total	112		468	

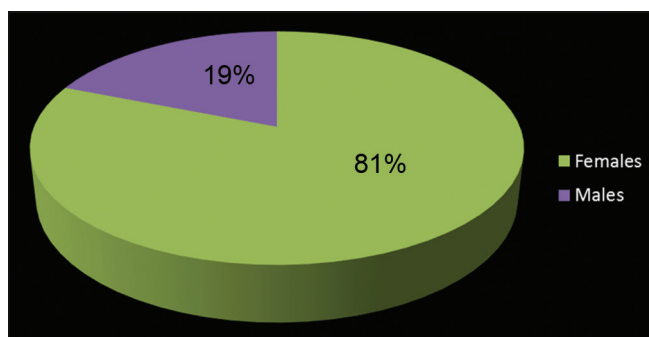
**Table 4: Prevalence of signs and symptoms among students**

Components	n=580	Percentage
Anamnestic component		
Sound in TMJ	40	7
Pain in TMJ	20	3
Fatigue in TMJ	12	2
Clinical dysfunction		
Limited mouth opening	34	6
Locked mandible	06	1
Deviation	04	0.6
Jaw rigidity	04	0.6

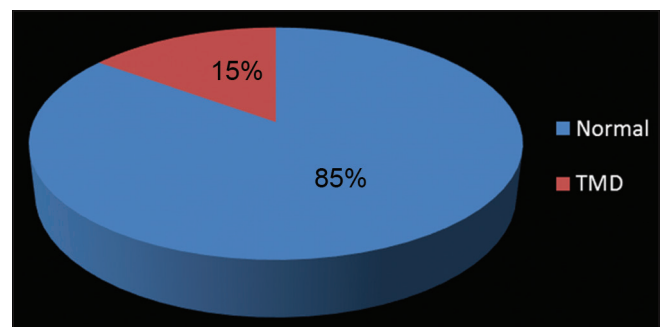
TMJ: Temporomandibular joint

**Table 5: Evaluation of Helkimo index components among students**

Component	n=580	Percentage
Anamnesis index		
Ai0 (free of symptoms)	520	90
AiI (mild symptoms)	40	7
AiII (severe symptoms)	20	3
Dysfunction component		
Di0 (no dysfunction)	546	94
DiI (mild dysfunction)	32	5.7
DiII (moderate dysfunction)	2	0.3
DiIII (severe dysfunction)	0	0



**Graph 1:** Distribution of patients according to gender



**Graph 2:** Prevalence of temporomandibular disorders

discrepancy in the number of males and females participated in the study as the number of female students was more in the college and more female students volunteered for the study. If equal number of male and female population would have been selected, sample would not be representative of actual study population.

It is believed that there is a large psychosocial component of this disease. Increased stress levels are believed to result in poor habits including bruxism, clenching, and even excessive gum chewing. These lead to muscular overuse, fatigue and spasm, and subsequently pain.<sup>[4]</sup> Many symptoms may not have manifestations related to TMJ itself, for example, headache, earache, sounds, etc.,. In the present study, TMJ sound (clicking or crepitus) (7%) was the most common problem which was in accordance with the study done by Gopal *et al.*<sup>[7]</sup> Although the methods and criteria for recording joint sounds differ in the various reports apart from natural fluctuations, they are the possible reasons for the wide range of joint sounds. Sound in TMJ was followed by pain (3%) and fatigue in TMJ (2%). This notion was in accordance with analysis done by Hegde.<sup>[4]</sup>

Clinical examination reveals limited mouth opening in most affected students (6%) followed by locking of mandible (1%), jaw deviation (0.6%), and rigidity (0.6%) of TMJ. Limited mouth opening was found in some patients without any symptom of TMD, which was physiologically normal. Students with TMDs were further treated for the cause. The large frequency ranges for signs and symptoms of TMD previously described in reviews and meta-analysis are apparently based on very different samples (e.g., random vs. nonrandom, patient vs. nonpatient, different ages, age ranges, sample size, and ratio of gender distribution) and different samples (e.g., kind of variable, method of data collection).

In the presented study, prevalence of TMDs in students was found to be low as compared to other studies.<sup>[13]</sup> Different reports on the prevalence of TMDs are due to lack of standardization, different indices used for examination, etc.,. The prevalence of TMD is not still well known and more studies, and comparisons are necessary to allow a better understanding of the pathological aspects so as to address effective and therapeutic measures. Longitudinal studies are needed to see the prevalence in the study population and to meet the health-care need of students.

## CONCLUSION

Results from the aforementioned study analyzed that clinical signs and symptoms were present even in the nonpatient population. Most of the cardinal signs were seen in varying extent in the study population out of which sound in the

TMJ area was ranked higher. Further studies are required at community level to compare TMD with different age groups and different population.

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## Conflicts of interest

There are no conflicts of interest.

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