

# The Incidence of Tinnitus in People with Disorders of the Temporomandibular Joint

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**Abstract:** This study was conducted to compare the prevalence of tinnitus in the general population with its incidence in people with dysfunction of the temporomandibular joint (TMJD) within the temporomandibular disorder (TMD) population. Earlier studies had indicated the prevalence of tinnitus in the general population to be in the range of 10–14%. Between 1981 and 1990, analysis of 989 consecutive TMJD patients from a TMD database found the incidence of tinnitus to be 7.28% (72 patients). In addition, no statistical difference was found between the occurrence of tinnitus in men and women. Thirty-nine patients of the tinnitus group (54.17%) claimed to have pain in the ear as compared to 318 patients (32.15%) in the total population. No patient with tinnitus claimed to have decreased hearing, whereas three patients (0.30% of the total population) complained of a decrease in hearing.

**Key Words:** epidemiology; masticatory muscles; temporomandibular joint; tinnitus; TMJ disorders

Tinnitus is a medical condition in which affected patients hear sounds that are not audible to others and lack an external source. Such sounds may include ringing, buzzing, or hissing. To such patients, tinnitus can seem to be continuous or intermittent with silence between the episodes. The origin of this condition is a malfunction in the method whereby auditory signals are processed. The causes of tinnitus include aging or exposure to loud noise [1,2]. Tinnitus is clearly distinct from auditory hallucinations (which are a characteristic of psychotic mental disorders) [3,4].

## EPIDEMIOLOGY

A study conducted in the United Kingdom reported a 10% prevalence of tinnitus in the adult population. Such patients claimed that their tinnitus lasts for longer than 5 minutes [5]. Another study conducted in Sweden noted the occurrence of severe tinnitus to be 2.4%.

These patients stated that “tinnitus plagues me all day,” and 14.2% of patients said that they suffered from tinnitus “always” or “often” [6].

The national study of hearing conducted in the United Kingdom investigated numerous pathologies of hearing in the normal population, including tinnitus. The results from this study indicated that roughly 35% of the adult population (defined as people older than 17) have experienced tinnitus at some point in their lives. It also found that 15% of the adult population have had spontaneous tinnitus (tinnitus lasting more than 5 minutes). In addition to this, some 8% of adults have had tinnitus that has disrupted sleep or has been an “intermediate or severe annoyance” [7].

Given these figures for the prevalence of tinnitus in the general population, we sought to determine whether similar occurrence rates are present for patients with disorders of the temporomandibular joint (TMJD population).

## TEMPOROMANDIBULAR JOINT DISORDERS

TMJDs include a wide variety of disorders, such as pain or limitation in opening, clicking, catching, popping, and locking of the TMJ. The occurrence of TMJD

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**Table 1.** Occurrence of Tinnitus in the Temporomandibular Joint Disorder Population, by Gender

Gender	No. (%) of Patients	No. (%) in Total Population
Female	59 (81.94)	846 (85.54)
Male	13 (18.06)	143 (14.46)
Total	72* (100.00)	989 (100.00)

\*7.28% of the total population.

is estimated to be approximately 60–70% in the general population. Even though the occurrence of TMJD is quite high, only 5% of people with the symptoms of TMJD will seek treatment. Of those TMJD patients who seek treatment, women outnumber men by a ratio of 4:1. Table 1 shows that more than 80% of TMJD patients who reported tinnitus were female. TMJD may manifest in numerous ways and is frequently associated with muscle complaints [8]. Myofascial pain is one of the most prevalent causes of masticatory dysfunction and has as its underlying cause muscular dysfunction, which renders the masticatory muscles painful and tender.

The etiology of TMJD has been attributed to numerous causes, many of which may be unknown at this point. However, bruxism, microtrauma, macrotrauma, and dental irritations are considered by many to be possible causes of this disorder. They may be capable of aggravating the condition if it already exists. TMJD can also be triggered by psychological factors, such as stress, although some authors feel that these factors may play a greater role in aggravation of the existing condition than in the primary onset of the disorder [8].

Within the TMD population, the subgroup with TMJD predominates. TMJ pain is well-known to refer frequently into the ear, with many affected patients initially presenting to an otolaryngologist with complaint of earache. Other TMJ symptoms include audible noises, such as clicking and popping, and limitations in condylar mobility secondary to interference by the displaced articular disc. Other nonspecific symptoms that are attributed to TMJD include tinnitus, ear and shoulder pain, and headaches. It is important to remember that as these conditions are nonspecific to TMJD, they should not be considered as a primary cause of the disorder [9] or even as necessarily related.

Dysfunctions of the TMJ have been postulated to cause such disorders as tinnitus through dysfunction of the tensor tympani and tensor veli palatini muscles. These two accessory muscles of the masticatory muscle group have been postulated to play a role in tinnitus. The trigeminal pharyngoplasty procedure has been reported to be successful in alleviating tinnitus and

other complaints associated with dysfunction of these muscles [10].

## SPECIFIC AIMS AND HYPOTHESIS OF THE STUDY

In this study, we were interested in determining whether the incidence of tinnitus in the TMJD population is similar to its occurrence in the general population. Our hypothesis was that the incidence of tinnitus between these two groups would be dissimilar. We would expect the rate of tinnitus in the TMJD population with associated TMJ symptoms to be higher than its prevalence in the general population, because of the intimate anatomical and neurological relationship of the TMJ to the ear.

## PATIENTS AND METHODS

### Patients

The patients for this study were chosen from a database of 1,001 consecutive TMD patients who were seen by the author (LGU). They were first seen between 1981 and 1991. Patients who did not claim to have TMJ symptoms were excluded from the study, which left 929 TMJD patients available for evaluation. Patients with presenting complaints of TMJ pain, ear pain, tinnitus, and decreased hearing were identified.

### Methods

During the examination, we asked patients to report any problems with the jaw and ear region. We noted as cases of tinnitus those instances in which the patients complained of hearing “noises in the ear” or “ringing in the ear” independent of noises generated within the TMJ. We also recorded the side on which tinnitus was present. Further, we counted the number of bilateral and unilateral cases of tinnitus and the number of males and females in the group of patients who complained of tinnitus. The confounding effects of socioeconomic status were ruled out, because patients who received treatment in the University of Michigan Health System had no access restrictions because of inability to pay.

The incidence of tinnitus was obtained by dividing the total number of tinnitus cases (72) by the total number of cases analyzed (929), resulting in a 7.28% incidence. This figure was compared to the incidence of tinnitus in the general population to establish whether a statistically significant difference existed in these figures. The Z-test for proportions was used to identify significant differences between groups.

**Table 2.** Frequency of Complaints in the Total Population (N = 989)

Complaint	No. (%) of Cases
TMJ pain	668 (67.54)
Clicking and popping	677 (68.45)
Catching	448 (45.30)
Locking	352 (35.59)
Limited opening	357 (36.10)
Ear pain	318 (32.15)
Tinnitus	72 (7.28)
Ear stuffiness	65 (6.57)

TMJ = temporomandibular joint.

## RESULTS AND DISCUSSION

We found that, on average, the duration of a chief complaint was 33.2 months for the nontinnitus TMJD population and 42.7 months for the TMJD population that complained of tinnitus. We also found that the incidence of tinnitus in the sample TMJ population was 7.28%. This figure is significantly lower than the 14.2% ( $p < .05$ ) reported by Axelsson and Ringdahl [6] but not significantly different from the 10% as reported by Vesterager [5] earlier regarding the prevalence of tinnitus in the general population.

Our figure for the incidence of tinnitus (7.28%) is not significantly different from the 8% figure obtained by Coles [7] for the prevalence of severe tinnitus in the general population, but it is significantly smaller ( $p > .05$ ) than the 35% value he found for the prevalence of tinnitus in the general population ( $p < .05$ ).

Table 2 shows the incidence of various complaints reported in association with the TMJ. These include TMJ pain, clicking, popping, locking, and catching. A total of 39 (54.17%) of the tinnitus patients reported pain in the ear, whereas 32.15% of the total TMJD population ( $n = 318$ ) reported such pain. In addition to this, 6.57% of the total group of patients ( $n = 65$ ) complained of experiencing ear stuffiness, whereas 19.44% ( $n = 14$ ) of the tinnitus group reported such a manifestation. As can be seen in this study, 67.54% (668 patients) of the total number of TMJD patients reviewed reported experiencing pain in the TMJ, whereas 66.67% (48 patients) of those who claimed to have tinnitus ex-

perienced TMJ pain. We therefore concluded that the occurrence of TMJ pain in those with tinnitus was not significantly different from its occurrence in the TMJD population as a whole ( $p > .05$ ).

These results fail to support the concept that the incidence of tinnitus in the TMJD population is higher than that in the general population. However, an explanation of the lower incidence of tinnitus in the TMJD population must be developed. We note that the incidence of tinnitus in this population is based on the patients' voluntary complaints on presentation. Earlier studies with higher incidences may reflect how the presence of tinnitus was elicited. In these studies, the history or presence of tinnitus was elicited directly from patients by asking them specifically about the presence of tinnitus.

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