

# Association between Ear Fullness, Earache, and Temporomandibular Joint Disorders in the Elderly

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## Abstract

**Introduction** An earache (otalgia or ear pain) is pain in one or both ears that may last a short or long time. Earache is prevalent in the population with temporomandibular joint disorders (TMJDs), but there is a dearth of epidemiologic studies regarding the association between TMJD and ear pain and ear fullness in older people.

**Objective** To assess the presence of earache and ear fullness in elderly patients with TMJD.

**Methods** A cross-sectional study was conducted in independently living, elderly individuals. TMJD was assessed by dental evaluation and earache was verified by medical history. Statistical analysis was performed using the chi-square test and relative risk.

**Results** Of the 197 subjects evaluated in this part of the study, 22 had earache, and 35 was verified by ear fullness. Of the 22 subjects with earache, none had conductive or mixed hearing loss in the ears tested. There was a significant association ( $p = 0.036$ ) between the TMJD and earache (odds ratio = 2.3), but there was no significant association between the TMJD and ear fullness.

**Conclusion** These results highlight the importance of identifying risk factors for earache that can be modified through specific interventions, which is essential in the prevention of future episodes, as well as managing the process of treatment of elderly patients in general.

## Keywords

- earache
- elderly
- temporomandibular joint disorders

## Introduction

Aging is a slow and progressive deterioration of bodily functions; an individual's age increases, functional deficiencies become more evident.<sup>1</sup>

An earache (otalgia or ear pain) is pain in one or both ears that may last a short or long time and is said to be common, although specific incidence and prevalence are not known. It has several potential causes. Earache is generally separated into two types. Primary earache arises from ear pathology, the most common of

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which is otitis media, but which also includes external otitis (often referred to as “swimmer’s ear”) and Eustachian tube dysfunction. Less commonly, primary otalgia may be attributed to primary neoplasms and benign tumors. However, up to 50% of earache cases are classified as secondary earache, which involves referred pain from other areas, including chronic infection that spreads to other tissues such as the skull base; dental abnormalities; sinus, pharyngeal, or salivary gland infections; temporal arthritis; or cervical or temporomandibular joint disorders (TMJD). It has also been reported to arise from disorders of the cervical spine. It is not clear how frequently ear pain involves musculoskeletal dysfunction that may be amenable to manual therapy; however, in authors’ experience, a variety of problems in the musculoskeletal system can cause or contribute to ear pain. Very little information about this can be found in the literature.<sup>2</sup>

TMJD involves structural and functional alterations of the stomatognathic system, which are characterized by pain in the temporomandibular joints (TMJ), masticatory muscles, limitations in jaw movements, noises in the TMJ, functional difficulties, and otologic symptoms.<sup>3</sup>

Lam et al<sup>4</sup> agree with the characteristics of TMJD proposed by Felício et al.<sup>3</sup> that the signs and symptoms of TMJD can manifest in areas of the face and neck and temporal, occipital, and frontal areas of the head and auricular areas. In the adult population, 40 to 75% present signs of TMJD and at least 5% have symptoms.<sup>4</sup>

Costen stated the hypothesis that the otologic symptoms could be caused by changes of the TMJ.<sup>5</sup> Over the years this statement came to be supported by others.<sup>3–6</sup>

The risk of otologic symptoms such as ear pain, vertigo, tinnitus, and hearing loss is considered greater in patients with pain on palpation of the TMJ and masticatory and cervical muscles, as well as pain during mouth opening.<sup>7,8</sup> Thus, this study aimed to verify the association between ear fullness, earache, and TMJD in the elderly.

## Methods

The study sample consisted of 197 physically independent elderly (mean age:  $68.89 \pm 5.68$  years) subjects of both sexes (123 women and 74 men), from a population of 43,610 elderly enrolled in 38 Basic Health Units (UBS). The selection of individuals was randomly defined, taking into account

gender and the five regions of the county, as follows: 15% of the central region, 27% in the northern region, 23% in the southern region, 19% of eastern region, and 16% in the western region. It records individuals older than 60 years, of both sexes, living independently, rated at levels 3 and 4 of Functional Status Spirduso,<sup>9</sup> who agreed to participate voluntarily in the study.

The data were only collected after the volunteers were informed the objectives of the study and signed the informed consent before any clinical procedure.

As criteria for inclusion in the study, the elderly had natural teeth or prostheses, with a functional occlusion. Individuals who were toothless and not duly rehabilitated by prostheses were excluded from the study. In addition, patients participated in the anamnesis of the audiological evaluation. Experienced examiners performed all reviews of this research.

The diagnostic evaluation of earache complaint consisted of audiological anamnesis, and information on medical history and general information were obtained. The verification of mixed or conductive hearing loss was made by pure tone audiometry. A routine audiological anamnesis used was applied in the current study. The anamnesis is based on the protocol for anamnesis by Miller,<sup>10</sup> which consists of otoscopy, to examine the external acoustic meatus and the tympanic membrane, and pure tone audiometry, considered the gold standard to evaluate the auditory threshold in adults, at the frequencies 250 to 8,000 kHz with presentation of pure tones, initially using 30-dB hearing loss at 1,000 Hz. The result was noted in a record form of pure tone audiometry used in the routine care of that sector and subsequently entered to the database in the program WinAudio (WinAudio, Curitiba, Brazil) to be stored and printed for the patient.

A self-reported questionnaire about comorbidities was also applied, which included questions about age, gender, tinnitus, and medical history.

The classification used for the determination of hearing loss considered individuals without hearing loss as those with triton average up to 25 dB, and individuals with hearing loss as those with triton average above 26 dB.<sup>11</sup>

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**Table 1** Full distribution of the number of patients with TMJD and earache

TMJD	Earache complaint				Total
	Yes		No		
	<i>n</i>	%	<i>n</i>	%	
Yes	13	4.6	112	56.9	121
No	9	6.6	63	31.9	76
Total	22	11.2	175	88.8	197

Abbreviation: TMJD, temporomandibular joint disorder.

Note:  $\chi^2 = 4.398$  ( $p = 0.036$ ); odds ratio = 2.567; 95% confidence interval 1.039–6.342.

**Table 2** Full distribution of the number of patients with TMJD and ear fullness

TMJD	Ear fullness				Total
	Yes		No		
	<i>n</i>	%	<i>n</i>	%	
Yes	22	11.2	99	50.5	121
No	13	6.7	62	31.6	75
Total	35	17.9	161	82.1	196

Abbreviation: TMJD, temporomandibular joint disorder.

Note:  $\chi^2 = 0.023$  ( $p = 0.887$ ); odds ratio = 0.943; 95% confidence interval 0.443–2.008.

The evaluation of the presence of painful symptoms in the TMJ started with the explanation to the patients of the difference between pressure and discomfort, to obtain reliable answers. This test was performed with bilateral palpation, with the index fingers placed 10 to 20 mm ahead of the external auditory canal. The lateral aspect of the TMJ was palpated with the patient's mouth closed, and the posterior aspect was palpated with the patient's mouth opened. These regions were pressed continuously and delicately, with a force of ~450 to 900 g, according to Austin and Pertes.<sup>12</sup> For muscular palpation, patients received the same orientation regarding the difference between pain and discomfort. The palpation of the masticatory muscles involved anterior, medial, and posterior temporal and origin, body, and insertion of superficial and deep masseter, which were bilaterally palpated, with a constant pressure of 1,500 g.<sup>13</sup> The presence of pain was checked through the eyelid reflex and/or by questioning patients. Cervical muscles (posterior digastrics muscle, sternocleidomastoid, and superior trapezius) were palpated by clipping one's fingers like pincers on both sides.

The presence of joint noises based on right and left TMJ inspection was also evaluated. This evaluation was performed by placing the pointer fingers lightly upon the region corresponding to the lateral pole of the condyle, facing the external acoustic meatus, while the patient open and closed the mandibles.<sup>14</sup>

The study sample consisted of 197 physically independent elderly of both genders, and 123 women with a mean age of 68.16 years (minimum: 60, maximum: 84; standard deviation [SD] = 5.415), and 74 men, mean age 70.11 years (minimum: 60, maximum: 85; SD = 5.939).

Statistical analysis was performed by chi-square tests and odds ratio to determine possible correlations between earache and TMJD. In the univariate analyses,  $p < 0.01$  was considered significant, and  $p < 0.05$  was considered significant for the inclusion in the final model for the chi-square test and the relative risk value, with 95% confidence.

## Results

From the 197 subjects of the study, 196 were verified with ear fullness. From the 196 subjects evaluated in this part of the study, 35 had ear fullness and 22 had earache and none of them presented conductive or mixed hearing loss in the ears tested.

This study showed that there is a significant association between TMJD and otalgia (►Table 1) and no significant association between TMJD and ear fullness (►Table 2).

## Discussion

TMJD is a set of conditions that affect the masticatory muscles and joints and exhibiting pain as its main feature. Historically, symptoms have been attributed to dental-related mechanisms or structural abnormalities, but with considerable controversy and little solid evidence.<sup>15</sup>

D'Antonio et al stated that the symptoms often associated with TMJD are headache, tinnitus, ear pain, TMJ noise perception, and balance disorders and problems of malocclusion and painful palpation of temporomandibular structures.<sup>16</sup> In some movements, the mandibular condyle ends exerting pressure on auricular nerve, close to the capsule of the TMJ, working to trigger the painful process within the temporal region. According to these authors, the jaw and the ossicles of the middle ear have the same embryologic origin, explaining why various malformations of the middle ear are associated with mandibular changes. Furthermore, the anatomy and biomechanics of the TMJ are closely related structures and aural functions. From these studies, it appears that several distinct mechanisms and other comorbidities may be present in the pathophysiology of otologic symptoms in general and, more specifically, the otalgia in relation to TMJD, causing their interaction.

Hearing and vestibular alterations such as hearing loss, vertigo, tinnitus, earache and other auditory symptoms found in this elderly population are commonly reported by patients with temporomandibular dysfunction.<sup>17–20</sup>

The objective of a study was to investigate the association of otologic symptoms with otologic findings and the others TMJD signs and symptoms. The 27 patients with temporomandibular symptoms answered a questionnaire that included questions about signs and symptoms of TMJD, and these subjects were submitted to otorhinolaryngologic and audiologic examination. The data obtained were analyzed through binomial test, Fisher exact test, and Pearson correlation, with  $p < 0.05$  considered significant. Otologic symptoms were presented in 88.88% of the patients (59.26% presented otalgia). The results provide additional support for the notion that a relationship between temporomandibular disorder and otologic symptoms does exist. But more studies are needed to elucidate the involved mechanisms.<sup>20</sup>

The significant association (chi-square = 4.398,  $p = 0.036$ ) between the TMD (temporomandibular disorder) and earache in this study population highlights the importance of identifying risk factors for ear pain that can be modified through specific interventions. The results of this study will be a basis for health care professionals involved with both symptoms of earache and TMJD. Marchiori et al found in a study with the same population of elderly that 27.14% of the elderly population with vertigo complaints had TMJD.<sup>8</sup>

Clinical characteristics might be associated with TMJD because they are antecedent risk factors that increase the likelihood of a healthy person developing the condition or because they represent signs or symptoms of either subclinical or overt TMJD. In baseline case-control study of multisite orofacial pain, 1,633 controls and 185 cases with chronic, painful TMJD completed questionnaires and received clinical examinations. Odds ratios measuring association between each clinical factor and TMJD were computed, with adjustment for study site as well as age, sex, and race/ethnicity. Compared with controls, subjects with TMJD reported more trauma, greater parafunction, more headaches and other pain disorders, more functional limitation in using the jaw, more nonpain symptoms in the facial area, more TMJ noises and jaw locking, more neural or sensory medical conditions, and worse overall medical status. They also exhibited on examination reduced jaw mobility, more joint noises, and a greater number of painful masticatory, cervical, and body muscles upon palpation.<sup>15</sup>

Earache complaint may have a variety of causes. One of these can be musculoskeletal disorders involving the cervical spine, TMJ, and its related muscles and ear, which may be amenable to manual therapy and exercise. It may be advantageous for otolaryngologists and primary care physicians to have at their disposal clinicians who are skilled at the examination and manual treatment of cervical spine and the musculoskeletal system in general, who can provide input regarding the possible involvement of these tissues.<sup>2</sup>

The results of the present study have shown that 40.9% of the elderly population with earache complaints has TMJD. According to all studies cited in this research, there was an association between TMJD and TMJ palpation, masticatory muscles, and cervical muscles and between TMJD with earache. The significant association between TMJD and earache in the studied population demonstrated the importance of identifying risk factors for earache complaints that can be modified through specific interventions.

## Conclusion

This research demonstrated a significant association between TMJD and earache complaints but there was no a significant association between the TMJD and ear fullness. This significant association in the studied population demonstrated the importance of identifying risk factors for earache that can be modified through specific interventions.

## References

- Konnur MK. Vertigo and vestibular rehabilitation. *J Postgrad Med* 2000;46(3):222–223
- Murphy DR, Gay CW. Manual therapy and ear pain: a report of four cases. *J Can Chiropr Assoc* 2011;55(1):40–46
- Felício CM, Mazzetto MO, de Silva MA, Bataglion C, Hotta TH. A preliminary protocol for multiprofessional centers for the determination of signs and symptoms of temporomandibular disorders. *Cranio* 2006;24(4):258–264
- Lam DK, Lawrence HP, Tenenbaum HC. Aural symptoms in temporomandibular disorder patients attending a craniofacial pain unit. *J Orofac Pain* 2001;15(2):146–157
- Costen JB. A syndrome of ear and sinuss symptoms dependent upon disturbed function of the temporomandibular joint. *Ann Otol Rhinol Laryngol* 1997;106(10Pt1):805–19
- Vieira MM, Ávila CRB, Caovilla HH, Ganança MM. Repercussão otoneurológica da disfunção da articulação têmporo-mandibular. *Acta A WHO* 1992;11(2):68–72
- Pascoal MIN, Rapoport A, Chagas JFS, Pascoal MBN, Costa CC, Magna LA. Prevalência dos sintomas otológicos na desordem temperomandibular: estudo de 126 casos. *Rev Bras Otorrinolaringol* 2001;67(5):627–633
- Marchiori LLM, Oltramari-Navarro PVP, Meneses-Barriviera CL, et al. Probable correlation between temporomandibular dysfunction and vertigo in the elderly. *Int Arch Otorhinolaryngol* 2014;18(01):49–53
- Spidurso WW. Dimensões físicas do envelhecimento. *Barueri: Manole*; 2005:168–199
- Miller MH. A integração dos achados audiológicos. In: Katz J (org) *Tratado de audiologia clínica*. 3a ed. São Paulo, Brazil: Manole; 1999:268–270
- Davis H, Silverman SR. *Hearing and Deafness*. 3rd ed. New York, NY: Holt, Rinehart and Winston; 1970
- Austin DG, Pertes RA. Examination of the dysfunction patients. In: Pertes RA, Gross SG, eds. *Clinical Management of TMJD and Orofacial Pain*. Chicago, IL: Quintessence; 1995:123–160
- Conti PC, Ferreira PM, Pegoraro LF, Conti JV, Salvador MC. A cross-sectional study of prevalence and etiology of signs and symptoms of temporomandibular disorders in high school and university students. *J Orofac Pain* 1996;10(3):254–262
- Helkimo M. Studies on function and dysfunction of the masticatory system. II. Index for anamnestic and clinical dysfunction and occlusal state. *Sven Tandlak Tidskr* 1974;67(2):101–121
- Ohrbach R, Fillingim RB, Mulkey F, et al. Clinical findings and pain symptoms as potential risk factors for chronic TMD: descriptive data and empirically identified domains from the OPPERA case-control study. *J Pain* 2011;12(11):27–45
- D'Antonio W, Ikno CMY, Castro SM, Balbani APS, Jurado JRP, Bento RF. Distúrbio temporomandibular como causa de otalgia: um estudo clínico. *Rev Bras Otorrinolaringol* 2000;66(1):46–50
- Keersmaekers K, De Boever JA, Van Den Berghe L. Otalgia in patients with temporomandibular joint disorders. *J Prosthet Dent* 1996;75(1):72–76
- Poveda Roda R, Bagán JV, Díaz Fernández JM, Hernández Bazán S, Jiménez Soriano Y. Review of temporomandibular joint pathology. Part I: classification, epidemiology and risk factors. *Med Oral Patol Oral Cir Bucal* 2007;12(4):E292–E298
- Badel T, Savić-Pavčin I, Zadravec D, Marotti M, Krolo I, Grbesa D. Temporomandibular joint development and functional disorders related to clinical otologic symptomatology. *Acta Clin Croat* 2011;50(1):51–60
- Felício CM, Faria TG, Silva MAMR, Aquino AMCM, Junqueira CA. Desordem temporomandibular: relações entre sintomas otológicos e orofaciais. *Rev Bras Otorrinolaringol* 2004;70(6):786–793