

Temporomandibular dysfunction and tinnitus the knowledge of the dental surgeon in primary health care

Paulo Francisco Arant Martins*
Jose Stechman-Neto
Killian Evandro Cristoff
Gloria Maria Nogueira Cortz
Ravazzi
Flavio Magno Goncalves
Rosane Santos Sampaio

ABSTRACT

A longitudinal study of quantitative nature applied through a structured and self-administered questionnaire. The purpose of the questionnaire was to verify the knowledge of the Primary Health Care Dentist (PHC) on the interrelationship between temporomandibular dysfunction and tinnitus after continuing education. The collected data (n=37) indicated insufficient knowledge with no significant statistical difference in knowledge or professional conduct. It is important to emphasize the importance of instructing and strengthening the knowledge of the PHC professional on the interrelationship between temporomandibular dysfunction and tinnitus. This may help minimize problems such as the professionals' lack of attention in the routine of care in changes that affect the patients' quality of life. Moreover, there is a need to sensitize managers to institute tools that subsidize the professional in this care with resoluteness.

Keywords: Temporomandibular dysfunction, tinnitus, knowledge, primary health care.

Department of Communication Disorders and Center for Diagnosis and Treatment of Tempomandibular Joint, University of Parana Tuiti, Brazil

*Send correspondence to: Paulo Francisco Arant Martins

Department of Communication Disorders and Center for Diagnosis and Treatment of Tempomandibular Joint, University of Parana Tuiti, Brazil, Email: paulof.a.martins@gmail.com Phone: +5532155233, Paper submitted to the ITJ on November 11, 2019; and accepted on December 12, 2019.

INTRODUCTION

The interrelationship of Otolological symptoms and Temporomandibular Dysfunction (TMD) is evolved from several researches from the last century which states that symptoms of deafness is associated with the position of mandible and Temporomandibular Joint (TMJ) between non-Otolological symptoms and TMD producing tinnitus. Characteristics such as pain in the masticatory muscles, pain around the ear, headache, limited or asymmetrical mandibular movements and noises of TMJ are reported by patients with TMD as well as otorhinolaryngological, neurological, vascular, neoplastic or infectious diseases in the orofacial region^{2,3}. The most common otorhinolaryngological symptoms associated with TMD are tinnitus, dizziness, vertigo, earache, a sensation of hypoacusis, hyperacusis, and sensation of atrial fullness^{4,5}. Tinnitus is defined as an experience in which the individual hears a sound in the absence of a corresponding sound stimulus⁶. Researchers such as Sanchez⁷, Pascoal⁸ et al. consider tinnitus to be a symptom of auditory pathway involvement that can have several causes, such as primarily otological diseases or other diseases that affect the ear secondarily due to metabolic, neurological, cardiovascular, pharmacological, dental and psychological causes, which in return, may be present concomitantly in the same individual. In addition to the auditory system commonly associated with this phantom auditory perception⁹, the somatosensory system also may contribute to tinnitus resulting from somatosensory-auditory interactions in the central nervous system¹⁰. Somatic involvement of external ear structures, such as the TMJ and masticatory muscles, may also interfere with the perception of tinnitus (somatic tinnitus)¹⁰. Several cranial nerves innervate the ear. These include the trigeminal (V), facial (VII), glossopharyngeal (IX), vagus (X), and autonomic nerves. The TMJ is also innervated by cranial nerves V and VII with communicating branches such as the chorda tympani, which is close to the ear structures. Due to the common cranial nerves between the ear and the TMJ, hearing difficulties such as tinnitus, earache and vertigo may also be connected to TMD¹¹. Ralli mentions that somatic tinnitus is one that is preceded or associated with a somatic disorder. As such, it may be related to musculoskeletal system problems, rather than to ear problems¹². Ralli's studies (2018) suggest that both patients with chronic tinnitus and normal hearing, with a self-reported history of somatic tinnitus modulation that occurs simultaneously in the TMJ region, may be useful for preliminary identification of patients with TMD¹³. Tinnitus can also be modulated when there is no somatic disorder. Therefore, a careful investigation, including an association of history and somatic screening, may be necessary in order to diagnose and treat multidisciplinary tinnitus patients^{14,15}. Considering that many patients present subclinical symptoms and specific comorbidities related to TMD and to otological symptoms, in particular,

tinnitus, the knowledge of the proper diagnosis and interrelationship between these disorders can decrease the time spent diagnosing, reducing costs for Public Health Services, and especially, improving the quality of life of the population. According to a study⁹ otological signs and symptoms vary between 10-31%. However, in the population with TMD, the prevalence of otological signs is as high as 85% of the population. According¹⁰, patients with tinnitus presented a 22% prevalence of TMD. This turns into a public health issue, and requires the need for specific knowledge in the professionals involved. In this way, the correct diagnosis can be made and be aimed at alleviating symptoms and improving quality of life in the population. The Pan American Health Organization (PAHO) defines continuing education as a "dynamic, active and permanent teaching-learning process designed to update and improve the capacity of individuals or groups while considering scientific and technological developments, social need, and institutional goals and objectives¹¹. It emphasizes that the realization of continuing education has proved to be increasingly necessary, since it provides renewal of knowledge and skills. The result is that professionals perform with more confidence and have better working relationships with members of the team while seeking improvement. The objective of this research was to verify knowledge acquisition and to identify the recognition and referral process of Dental Surgeons (DS) in Primary Health Care (PHC) after continuing education in the interrelation of temporomandibular dysfunction and tinnitus in the city of Curitiba.

MATERIALS AND METHODS

A longitudinal study of a quantitative nature was used to measure the degree of knowledge acquisition in dental surgeons. This assessment covered the interrelation between tinnitus and TMD. A structured and self-administered questionnaire was used at two different times, with an average interval of 90 days. In this period, a trained dental surgeon taught short sessions on content related to the pathologies, showing the importance of knowing about comorbidities that affect the population's quality of life. The questionnaires were applied to a group of dental surgeons who work in the PHC. The inclusion criteria for taking part in the study were dental surgeons that work in PHC in the city of Curitiba, who were present and agreed to participate. The exclusion criteria were anyone that participated in only the first questionnaire, or performed their duties in secondary, not primary, care.

The research was developed in three phases:

Phase 1: The two steps for the questionnaire about continuing education. Step 1 – Making the DSs aware of the guidelines on the purpose of the research followed by the signing of the consent form. Step 2 – The three-part structured questionnaire with closed questions

was applied. The first part focused on general data about the health professional. The second part was composed of questions aiming to assess the knowledge of the interrelationship of TMD and tinnitus. The third part contained questions to ascertain the recognition and referral process of TMD and tinnitus at PHC in Curitiba.

Phase 2: A meeting of approximately 3 hours was held with a presentation on topics related to the theme. The resources used were texts, illustrations, diagnosis and treatment with an expository class and discussions of clinical cases with the aim of giving tools to the participants based on current scientific evidences.

Phase 3: Over an average time period of 90 days (range of 30-150 days), the same questionnaire was reapplied, aiming at measuring the knowledge acquisition regarding TMD and tinnitus in PHC in Curitiba.

Statistical analyses were descriptive through absolute and relative frequency distributions. The chi-squared test (2) for independent samples was used for calculating a significance level of $p=0.05$. In order to compare the questionnaires, the proportional difference was used to verify if there were statistical differences between two proportions (first and second questionnaire). The research project was approved by the Research Ethics Committee of the Charity Evangelical Society

of Curitiba (registry number 777.519) and its feasibility approved by the Research Ethics Committee of the Municipal Health Department of Curitiba (registry number 797.186).

RESULTS

Fifty-four questionnaires were applied at the first meeting, of which only 37 individuals responded to the second questionnaire that was applied after an average interval of 90 (range 30-150) days. Initial questionnaires were excluded from those who did not respond to the second questionnaire. The results show that 31 (70.37%) are female and 6 (29.63%) are male with an average age of 47 (26-62) years old. It shows that there was no improvement in the assessment of masticatory muscles and TMJ even after the continuing education. However, the professionals recognized the multi professional nature of the aetiology (Table 1).

Table 2 shows the level of the dental surgeons' knowledge of the interrelationship between TMD and comorbidities before and after continuing education. It was observed that there were no significant statistical differences between the two.

In (Table 3), the calculation of the difference of proportions was applied in order to obtain the percentage of correctness and average values in the questions (Q3 to Q9)

Table 1: Evaluation and etiology.

Questionnaire	QUESTIONNAIRE 1		QUESTIONNAIRE 2		p
	n	%	n	%	
Q1 – Assessment of TMJ and masticatory muscles during the Clinical Exam					
Yes	5	13.5	3	8.1	0.3944
No	4	10.8	2	5.4	
Sometimes	28	75.68	32	86.49	
TOTAL	37	100	37	100	
Q2 – Etiology of TMD					
Not multifactorial	4	10.8	1	2.7	0.1643
Multifactorial	32	86.4	35	94.5	
No answer	1	2.7	1	2.7	
TOTAL	37	100	37	100	

Source: Author, 2015

Table 2: Questions that assessed knowledge.

Questions	Questionnaire 1		Questionnaire 2		p
	n	%	N	%	
Q3 – Pain in TMJ	18	48.65	24	64.86	0.1636
Q4 – Connection between TMD and Tinnitus	31	83.78	31	83.78	1
Q5 – Connection between occlusion and TMD	-	0	-	0	1
Q6 – Connection between occlusion and Tinnitus	2	5.4	5	13.5	0.1909
Q7 – Can the occlusion be the main cause of TMD	14	37.84	16	43.24	0.6376
Q8 – Is the bruxism significant in the development of TMD?	29	78.38	32	86.49	0.3624
Q9 – Is stress a factor in development of TMD/Tinnitus	32	86.49	35	94.59	0.2378

Through the difference-of-proportions test, at the significance level of 0.05. SOURCE: Author, 2015

that assessed the knowledge about the interrelationship between TMD and tinnitus. There was no significant difference between the 1st and 2nd questionnaire.

In (Table 4) encompasses questions 10 to 15 (Q10 to Q15) on the recognition and referral process of TMD/ tinnitus

cases. There was no significant difference in recognition before and after the intervention in any response.

In (Table 5) is related to informing DSs on the inter-relationship between TMD and tinnitus. There was no significant difference between the 1st and 2nd questionnaire.

Table 3: Difference in proportion of the answers of the 1st and 2nd questionnaire on the knowledge of the connection between TMD and tinnitus.

ANSWERS	1st QUESTIONNAIRE		2nd QUESTIONNAIRE		p
	%	Average Values	%	Average values	
Correct	54.63	29.5	67.57	25	0.2574
Incorrect	34.95	18.875	28.04	10.38	
Did not know	8.19	4.625	4.05	1.5	
Did not answer	1.85	1	0.34	0.13	
TOTAL	100		100		

SOURCE: Author, 2015

Table 4: Recognition and referral process.

ANSWERS	Questionnaire 1		Questionnaire 2		p
	N	%	n	%	
Q10 – Examines the health unit of patients with TMD and tinnitus					
Yes	33	89.19	36	97.3	0.1647
No	4	10.81	1	2.7	
TOTAL	37	100	37	100	
Q11 – Referral process before the TMD patients					
Treats	12	32.4	13	35.1	0.784
Refers to another professional	9	24.3	13	35.1	
Does not refer	2	5.4	2	5.4	
Does not treat	5	13.5	5	13.5	
No answer	9	24.3	4	10.8	
TOTAL	37	100	37	100	
Q12 – Reasons for no treatment					
Insufficient knowledge	18	48.6	17	45.9	0.3165
Absence of material	1	2.7	3	8.1	
Not agreed procedure					
No answer	18	48.6	16	43.2	
TOTAL	37	100	37	100	
Q13 – Specialty referred to					
Dentistry	15	40.5	21	56.7	1
Medical, dentistry, psychology, speech therapy, physiotherapy	5	13.5	7	18.9	
No answer	17	45.9	9	24.3	
TOTAL	37	100	37	100	
Q14 –Dental specialty referred to					
Orthodontist, occlusion prosthesis oral maxillofacial, acupuncture	7	18.9	4	10.8	0.2907
DTM, orthodontists, occlusion prosthesis oral maxillofacial, acupuncture	9	24.3	14	37.8	
DTM	5	13.5	11	29.7	
No answer	16	43.2	8	21.6	
TOTAL	37	100	37	100	
Q15 – Reasons for not referring					
Insufficient knowledge	2	5.4	2	5.4	0.7262
Not sure on procedure, referral unavailable in the required expertise	16	43.2	11	29.7	
No answer	19	51.3	24	64.8	
TOTAL	37	100	37	100	

SOURCE: Author, 2015

Table 5: Education on TMD and its inter-relationship with the tinnitus.

ANSWERS	QUESTIONNAIRE 1		QUESTIONNAIRE 2	
	N	%	n	%
Yes	35	94.59	34	91.89
No	-	0	-	0
No answer	2	5.41	3	8.11
TOTAL	37	100	37	100

In this case, Chi-square test does not apply, because there was no frequency in the answer number

SOURCE: Author, 2015

DISCUSSION

Dental practice advocates a comprehensive approach to the patient. An adequate clinical examination involves assessment of orofacial, TMJ, and masticatory disorders, contributing to the diagnosis of TMD and tinnitus which determines promotion, prevention and treatment actions. The data show that even after continuing education, professionals “sometimes” perform the examination of TMJ and masticatory muscles during a clinical examination. They do not perform them routinely in all patients, even though this procedure can diagnose conditions such as TMD, tinnitus and determine their relationship. The dental surgeon’s search for better results in his actions must be based on comprehensive and integral healthcare, contemplating the principles and guidelines of the Unified Public Healthcare System (SUS) that understands integrality of care as “an articulated and continuous set of actions with preventive and curative services, individual and collective, required for each case at all levels of complexity in the system”¹³. The clinical care of patients is an integral part of the dental practice. Considering that many patients present subclinical symptoms related to TMD and tinnitus, a proper diagnosis is necessary because it is a public health problem due to the high prevalence of this relationship²⁻¹⁴. The study carried out by Martins et al.¹⁵ reinforces the importance of an adequate clinical examination with the inclusion of a TMJ and masticatory muscle exam, which allows a correct diagnosis and adequate referral process. The results show that the professionals consider the cause of TMD to be multifactorial, which is in agreement with the scientific literature. Camparis et al¹⁶ and explain that there is not only a single factor, but a set of factors that can trigger or worsen the dysfunction. According to the data obtained in the set of questions related to the knowledge of the dental surgeon on TMD and tinnitus after the intervention, it is observed that the statistical variations were not significant. It is noteworthy that in question 5 (Q5), which assesses the knowledge about the existence of the relationship between occlusion and TMD, the wrong answer was given by 100% of the professionals in both questionnaires Bosio¹⁷ and Sartoretto et al.¹⁸. Point out the non-association of the relationship between occlusion and TMD. During the professionals’ training, the argument that the TMD problem is an occlusion problem

still persists in some educational institutions. Occlusion is a comprehensive term with many variables. This is the reason why we find fewer and fewer scientific articles discussing the relationship between occlusion and TMD, since the main focus is TMJ. According to Sartoretto et al.¹⁸, although controversial subjects remain, the scientific evidence does not seem to support the orthodontic-TMD relationship or the occlusion relationship. Studies confirm the absence of clinically significant orthodontic effects in relation to the cause of TMD¹⁹. The results of the present study indicated a relatively low level of knowledge in the questions that assessed the interrelationship between TMD and tinnitus. Table 3 shows that the percentage of correct answers was 54.63% in the first questionnaire and 67.57% in the second questionnaire. It is noteworthy that, in the national or international literature, no studies were found on the assessment of dental surgeons’ knowledge of PHC on TMD. However Bitencourt²⁰ assessed the knowledge of medical students about brain death. Their low level of knowledge led to the conclusion that it is due to the lack of contact that students have with the subject during their education as well as to the low importance given to the subject in the institutions. It is emphasized that the objective of continuing education is to improve or upgrade the professional according to his own needs, the demands of the institution in which he works, and the prevalence of the problem. However, professionals seem to lack interest in improving their knowledge on the topic of this research. Although it is relevant to the patient, it does not catch the attention of the professional. It is necessary to reflect that the advances of knowledge that are associated with rapid changes that occur, should motivate professionals to review and renew their knowledge, as well as to rethink their attitude and actions that influence the search of more knowledge in order to obtain greater competence and autonomy. They should arrive at their own conclusions, question complex problems with confidence, and build capacity for future successes in their practice^{21,22}.

The results obtained in regarding information about the recognition and referral process show that the variations were not statistically significant. However, it can be numerically observed in question 10 (Q10) that the number of dental surgeons that recognized patients with TMD/ tinnitus increased. When we consider that DSs

recognized the high prevalence of patients with TMD/ tinnitus, and if we analyze question 1 (Q1), in which the DSs answered that they “sometimes” perform the evaluation of the masticatory muscles during the clinical examination, it is assumed that some patients with the disease are not recognized. It then makes early diagnosis difficult and results in inadequate behavior and unnecessary referrals to specialists. It generates an increase in public costs, in demand at the secondary level, and in a worsening of the patient's clinical condition. However, a study conducted in the city of Curitiba Leao²³ found 494 (95.7%) patients that reported at least one para functional habit, related to otological symptoms 393 (76,16%) patients reported having at least one symptom, of which 138 (26,74%) with occurrence of tinnitus. This situation is contrary to the foundations of PHC which seek full and resolute attention to the patient. It excels in quality and tries to optimize and ration resources. Because, according to Santos²⁴, primary care should act as if it were an initial filter, solving most of the health needs (around 85%) of users and organizing the demand for more complex services. It should also organize the flows of continuity of attention or care. This essential role of primary care, not only in the resolution of cases, but also in referring the patient to other levels, turns it into the structural base of a pyramidal system. Martins points out the need to give tools to the professionals who work in PHC, as well as to subsidize planning at all levels of attention that consider actions regarding the resolution of the problem for the population under their responsibility. It is observed in question 11 (Q11) that when identifying TMD/ tinnitus, there was no significant change in the referral process adopted after continuing education. However, the numerical decrease of professionals who did not answer the 2nd questionnaire was noted. There was also an increase of dental surgeons that refer cases to another professional. It is noticed that the dental surgeon chooses to refer patients with TMD/ tinnitus instead of treating them. This fact is probably due to insufficient knowledge to perform the treatment, since the professional does not select other alternatives and prefers not to deal with it in question 12 (Q12). There was no significant change in the data obtained on the treatment carried out by dental surgeons. However, according to Martinez²⁵ there are reversible therapeutic resources that can be performed right at primary care, such as medication, guidelines on para functional habits, physiotherapy, psychotherapy, laser therapy, acupuncture, dry-needling, and infiltration. It is important to emphasize that these actions are not always possible due to the availability of material, working conditions, and professional knowledge. This leads to a discussion about the manager's knowledge about the importance of the topic, considering that there actually are therapeutic resources in PHC. The implementation in the care process where it establishes procedures on the care of patients with TMD/ tinnitus at all levels is also important

to note. When referring patients with TMD/ tinnitus, we highlight the numerical increase of the professionals who refer them to dentistry as a basis for follow-up and specialized procedures. It is observed that among the dental specialties, the initial referral to dentistry specialties such as TMD, Orthodontics, Occlusion, Prosthesis and Oral and Maxillofacial stands out. As we see, when the professionals in PHC informally refer to orthodontics, prosthesis and maxillofacial surgery, they go to the third stage of treatment, reinforcing the thought of having insufficient knowledge on the subject. It also reinforces the thought of the unavailability of procedures and resources in PHC as well as recommendations of specialists for referrals, provoking disagreement with SUS principles. It should be noted that the Intra Occlusal Device (IOD) is the most popular therapeutic resource used by professionals in secondary care, aiming at muscle relaxation, condylar repositioning and function restoration. However, there is not enough scientific evidence to prove the efficacy of these therapies²⁶.

As for the fact that dental surgeons do not refer patients, there was a numerical increase of professionals who did not answer the question. That was followed by an unawareness of flow/ unavailability of referrals in the required specialty, and insufficient knowledge demonstrated in the reasons already addressed. The objective of the questions was to identify the recognition and referral process performed by the PHC professional. However, it is highlighted that there is no established referrals procedure for TMD specialists in the municipality. Thus, an informal referral happens in the attempt to resolve the problem. Analyzing all the data, it is noticed that the professionals report a lack of knowledge about the subject. They recognize the need for improved education. However, there was no significant alteration of the answers about the subject's knowledge after going through the continuing education modules. It is noted that the learning process, in light of the demands of the population and the new needs of the dental surgeons, must be contemplated more thoroughly. It must happen either through an individual search by the professional, or by learning developed through practice, in order to help the surgeon overcome difficulty. Thus, a complete resolution may occur. Among the actions and challenges of the manager is the necessity to establish strategies that arouse the professional's interest in improvement so that it results in action. Such a situation would contribute to the improvement of care, service quality, and patient satisfaction. In addition, it would aid in the construction of a network of strengthened and structured care in dentistry. For such presuppositions to be followed, the existing educational structure in organizations should create opportunities for discussion, propose strategies, and allocate resources in order to offer its professionals a chance to master the necessary technology and knowledge, while giving them the time and space they need, so that creative solutions may be

found²⁷. According to Salum and Prado et al^{28,29} this type of education is a way for professionals to respond not only to the rapid changes in knowledge of health care performance, but also to raise professional standards in their current practice. We must remember that continuing education is one of the ways to promote professional improvement, and when dealing with a complex subject such as TMD/ tinnitus, this requires a greater mobilization and monitoring of actions. Knowledge brings particularities needed to perform accurate diagnoses and efficient treatments. Since PHC requires a competent, proactive professional that uses scientific knowledge and contributes to the resolution and quality of service, it is important to give tools to the dental surgeon. It should be emphasized that continuing education may be a strategy to arouse in the professional the need to expand his knowledge in a particular area, because it is perceived that there was no substantial knowledge acquired in this case. However, looking at it in a slightly different way and practicing it later are considered gains. The refusal of some participants to complete the second questionnaire can be considered a limiting factor of the present study. It reduces the sample size and the descriptive analyses through distributions of absolute and relative frequencies.

CONCLUSION

The data presented in this study indicate that PHC dental surgeons that work in the city of Curitiba do not have enough knowledge about the interrelationship between TMD and tinnitus. There was no statistically significant retention of knowledge after continuing education. Insufficient knowledge about TMD and tinnitus influences the recognition and referral process that can be performed in PHC. The lack of care standards in TMD/ tinnitus holds back the whole care assistance of the patients and contributes to delayed service, inadequate or informal referrals. This can lead to patient dissatisfaction and increased expenses for health. It should be pointed out that this study differs from others for being the first to specifically assess dental surgeons' knowledge of the interrelationship of TMD/ tinnitus in PHC, since we did not find any other study in the national or international literature with these characteristics. This study contributed in showing that although there was no significant statistical difference, there was a numerical increase in knowledge after continuing education. It is suggested that the professional be sensitized to the need of continuous improvement, improvement before the new health demands of the population, and the development of the learning process with the most active approach, enabling the professional to be the subject of his own learning.

CONFLICT OF INTEREST

The author declares no conflict of interest.

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