

# Tinnitus: probable association with the elderly's cervical alterations

## Zumbido: possível associação com alterações cervicais em idosos

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Article received on April 6, 2011. Article approved on May 23, 2011.

### SUMMARY

**Introduction:** Tinnitus is a prevailing symptom that highly jeopardizes the elderly patient's quality of life. Neck pain and cervical column alterations are frequent in patients complaining about tinnitus.

**Objective:** Evaluate the prevalence of both tinnitus and neck pain on an elderly group, and verify the likely association between tinnitus, neck pain and the constraint to make wide cervical movements.

**Methods:** Retrospective transversal study, evaluating both the width of cervical movement by way of a goniometry and the tinnitus and neck pain by requesting a standard questionnaire to be filled out.

**Results:** Sample was comprised of 147 individuals aged between 69.22, 61.90% of whom were female. Among these individuals, 42.85% showed a buzz complaint and 51% of these individuals claimed to have a neck pain. Neither was association found between tinnitus and neck pain nor it was between tinnitus and the width constraint of cervical movements.

**Conclusion:** Despite not finding an association between tinnitus and neck pain or between tinnitus and the width constraint of cervical movements, there was a significant prevalence of tinnitus, neck pain and a reduction in the width of cervical movements on the elderly people. The results hereof, by finding this important prevalence of tinnitus in all the individuals of this study, will be the basis to integrate health professionals engaged in such alterations.

**Keywords:** tinnitus, neck pain, vertebral column, elderly.

### RESUMO

**Introdução:** O zumbido é um sintoma prevalente e de alto impacto na qualidade de vida do paciente idoso. A presença de cervicálgia e alterações na coluna cervical são comuns em pacientes com queixa de zumbido.

**Objetivo:** Avaliar a prevalência do zumbido e cervicálgia em um grupo de idosos e verificar a possível associação entre zumbido, cervicálgia e restrição de amplitude de movimento cervical.

**Método:** Estudo transversal retrospectivo com avaliação da amplitude de movimento cervical através de goniometria e do zumbido e da cervicálgia através da aplicação de questionário padronizado.

**Resultados:** A amostra foi constituída por 147 indivíduos, com idade média de 69,22 anos sendo 61,90% mulheres. Desses indivíduos, 42,85% apresentaram queixa de zumbido 51% dos indivíduos relataram queixa de dor cervical. Não houve associação entre zumbido e dor cervical e nem associação entre zumbido e restrição de amplitude de movimento cervical.

**Conclusão:** Embora não tenha sido constatada associação entre zumbido e dor cervical e entre zumbido e restrição de amplitude de movimento, observou-se grande prevalência de queixa de zumbido, de cervicálgia e de diminuição na amplitude de movimento cervical na população de idosos. Os resultados da presente pesquisa, por meio da constatação desta grande prevalência do zumbido em toda a população de estudo, servirão de base a uma integração entre profissionais da área de saúde envolvidos com tais alterações.

**Palavras-chave:** zumbido, cervicálgia, coluna vertebral, idoso.

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## INTRODUCTION

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The increase in age is directly proportional to the presence of several hearing symptoms, such as vertigo, presbycusis and tinnitus (1). Additionally, the prevalence of degeneration in the cervical joint and neck pain in individuals above 50 years of age is high, and severity tends to increase with age (2).

Tinnitus is defined as the perception of a sound in the ears or head without a sound produced by an external source. It impairs approximately 15% of the world population and this prevalence increases for 33% among the individuals above 60 years of age (3). Tinnitus is a symptom frequently accompanied by presbycusis and it is usually more disturbing than hearing loss itself (4).

Currently, it is known that tinnitus appears as the result of the dynamic interaction of several centers of the nervous and limbic systems and that the alterations and/or cochlear lesions are the predecessors of this process, causing a disequilibrium in the inferior paths of the auditory system, resulting in an abnormal neuronal activity, later stressed by the central nervous system and eventually felt as a tinnitus (3). Besides, the afferents from the cervical part with protrusions to the cochlear nucleus indicate an influence of the cervical column reflex to this hearing center (5).

Among the numberless etiologies of tinnitus, the otological, metabolic, cardiovascular diseases; cervical column, dental, neurological, psychiatric and other pathologies related to drug ingestion, alcohol and tobaccoism (6, 7). Not to mention the reduction in the auditory acuity, exposure to noises, head and cervical lesions, factors of life style and mental status (8).

The presence of pain neck and headache is common in tinnitus patients, and it is also verified that these patients can have the symptom influenced by the presence of myofascial trigger-points in the postural muscles of the cervical area, in the scapular waist and in the chewing muscles, where they provoke a spontaneous pain or when moving (9). In patients showing a chronic pain, especially myofascial pain in the cervical area or a degenerating disease of the cervical column, incidence of tinnitus and hearing loss is more elevated than it would be foreseeable in the general population (10).

The objective of this study was to investigate the prevalence of tinnitus and cervical alterations in elderly patients at the ALOS project (Aging and Longevity Study) and verify their probable associations.

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## METHOD

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A transverse study was performed whose inclusion criteria were elderly people aged 60 or older, both sexes, independent life, classified in levels 3 and 4 of the Functional Status suggested by SPINDUSO (11), who voluntarily accepted to participate in the study.

The first 147 individuals of the ALOS project (aging and longevity study) were allocated in the city of Londrina. The sampling was randomly and unchangeably defined at a random by taking into consideration the five areas of the city.

In this study, the active curvature movements, extension, lateral neutral extension to the right and to the left, neutral rotation to the right and to the left of the cervical column to evaluate whether there is a reduction of movement width in the studied population by goniometry by using a universal goniometer (Carci, Indústria e Comércio de Aparelhos Cirúrgicos e Ortopédicos Ltda, Brazil) with a two-by-two-degree measurement scale. To measure the cervical MW by goniometry, the measurement system developed by KAPANDJI (12) and MARQUES (13) was used: 0-65°, cervical curvature, 0-50° cervical extension, lateral 0-40° curvature to the right and to the left, and 0-55° cervical rotation. The presence of neck pain and tinnitus were verified by applying the standardized questionnaire used during the collections of the ALOS project.

This research was approved by UNOPAR's ethical committee in research under record nº 0070/09.

Chi Square and Relative Risk tests were performed to verify the probable associations between neck pain and the individuals showing and not showing tinnitus, as well as measure the cervical movement width so as to verify any restriction in the joint mobility and a probable association with tinnitus.

For univariate analysis,  $p < 0.01$  was considered, and for an inclusion in the final model for Chi Square and Relative Risk test  $p < 0,05$  was considered, both had a 95% confidence interval. The statistical software used was SAS 9.1.3

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## RESULTS

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The sample was comprised of 147 individuals aged between 60-95, with an average age of 69.22; 61.90% was (91) and 38.10% was male (56). Out of these individuals, 42.85% (63) had a tinnitus; 36.50% male (23) and 63.50% female (40); among the individuals with tinnitus (63),

**Table 1. Tinnitus with Cervical Pain.**

Tinnitus Frequency	Cervical Pain		Total
	No	Yes	
	No	45	84
	Yes	27	63
Total		72	147

Chi Square P = 0,1984

**Table 2. Tinnitus versus Cervical Movement Limitation.**

Variant	Average	Lower Limit of CI (95%, $\mu$ )	Higher Limit of CI (95%, $\mu$ )	Standard deviation	N	Minimum	Maximum
Cerv_curv..lim.	183.642.857	164.188.378	203.097.336	116.422.764	140	0	500.000.000
Cerv_ext_lim.	69.857.143	56.859.292	82.854.994	77.783.926	140	0	300.000.000
Cerv_rot_lim.r	100.647.482	87.353.766	113.941.198	79.264.816	139	0	350.000.000
Cerv_rot_lim.l	83.214.286	72.304.871	94.123.700	65.285.955	140	0	250.000.000
Lat_curv_lim_r	125.899.281	111.921.551	139.877.010	83.343.300	139	0	300.000.000
Lat_curv_lim_l	132.928.571	119.043.700	146.813.443	83.092.186	140	0	300.000.000

**Legend:** Cerv.curv.lim : cervical curvature limitation; Cerv. ext. lim.: cervical extension limitation; Cerv rot lim r: Cervical rotation limitation to the right; Cerv curv lim l: Cervical rotation limitation to the left; Lat curv lim r: lateral curvature limitation to the right; lateral curvature limitation to the left.

**Table 3.**

Variant	Method	T Test		T value	P >  t
		Variance	Liberty degrees(LG)		
cerv_ext_lim.	Pooled	Equal	138	0.90	0.3700
cerv_ext_lim.	Satterthwaite	Unequal	129	0.90	0.3718
cerv_ext_lim.	Pooled	Equal	138	0.22	0.8258
cerv_ext_lim.	Satterthwaite	Unequal	127	0.22	0.8270
cerv_ext_lim_r	Pooled	Equal	137	0.19	0.8470
cerv_ext_lim_r	Satterthwaite	Unequal	136	0.20	0.8447
cerv_rot_lim_l	Pooled	Equal	138	0.23	0.8170
cerv_rot_lim_l	Satterthwaite	Unequal	130	0.23	0.8172
lat_curv_lim_r	Pooled	Equal	137	1.06	0.2927
lat_curv_lim_r	Satterthwaite	Unequal	131	1.06	0.2920
lat_curv_lim_l	Pooled	Equal	138	0.11	0.9163
lat_curv_lim_l	Satterthwaite	Unequal	135	0.11	0.9155

**Legend:** Cerv.curv.lim : cervical curvature limitation; Cerv. ext. lim.: cervical extension limitation; Cerv rot lim r: Cervical rotation limitation to the right; Cerv curv lim l: Cervical rotation limitation to the left; Lat curv lim r: lateral curvature limitation to the right; lateral curvature limitation to the left.

61.90% had tinnitus bilaterally, 26.99 on the right ear and 11.11% on the left ear. Also, 51% of the individuals mentioned cervical pain, 70% of whom were female. When performing Chi Square and Relative Risk tests, there was no evidence to believe that there is an association between tinnitus and cervical pain, since  $p = 0.1984$  ( $p > 0.05$ ) (Table 1)

The elderly had a limitation in all the movement widths, as shown by Table 2. In comparison with the presence of tinnitus with the cervical movement width, there was no association between the limitation of cervical movements between people with and without tinnitus,  $p > 0.05$ . (Table 3) If the factor tinnitus is disregarded, there

is a difference in the sample between the size of cervical rotation limitation according to the side. In this case, the movement width restriction is more limited to the right side than to the left side  $p = 0.0324$  Table 4.

There was no association between the tinnitus-impaired side and the side of movement-restricting width in tinnitus patients either  $p > 0.05$ .

## DISCUSSION

The tinnitus prevalence in this population was 40%. In a study performed in Japan, the tinnitus prevalence was

**Table 4.**

Statistics Variant	Side	N	Limit Inferior of CI (95%, $\mu$ )	Average	Limit Superior of CI (95%, $\mu$ )	Limit Inferior CI Deviation Standard	Limit Superior CI Deviation Standard	Deviation Standard	Limit Superior Deviation Standard	Error-Standard	Minimum	Maximum
cerv_rot_lim	RIGHT	139	8.7354	10.065	11.394	7.0915	7.9265	8.9862	0.6723		0	35
cerv_rot_lim	LEFT	140	7.2305	8.3214	9.4124	5.843	6.5286	7.3978	0.5518		0	25
cerv_rot_lim	Diff (1-2)		0.0324	1.7433	3.4543	6.7013	7.2587	7.9181	0.8691			
lat_curv_lim	RIGHT	139	11.192	12.59	13.988	7.4563	8.3343	9.4485	0.7069		0	30
lat_curv_lim	LEFT	140	11.904	13.293	14.681	7.4367	8.3092	9.4155	0.7023		0	30
lat_curv_lim	Diff (1-2)		-2.664	-0.703	1.2586	7.6827	8.3217	9.0776	0.9964			

**Legend:** Cerv.curv.lim : cervical curvature limitation; Cerv. ext. lim.: cervical extension limitation; Cerv rot lim r: Cervical rotation limitation to the right; Cerv curv lim l: Cervical rotation limitation to the left; Lat curv lim r: lateral curvature limitation to the right; lateral curvature limitation to the left.

18.6% in individuals above 65 years of age; in Australia, it was prevalent in 32.7% above 60 years of age and in Nigeria 41.9% in individuals above 80 years of age (7, 8). Tinnitus can directly or indirectly impair the individual in their professional and leisure activities, interfere with their family and social relationships, and, in extreme cases, lead to suicide. Studies have demonstrated that tinnitus can reduce the elderly's quality of life and reduce their welfare sensation (14).

In a Brazilian study, 406 patients were evaluated within six months, 58% of whom had tinnitus disorder, out of whom 68% were female and 32% were male, compatible with these results, in which among the elderly with tinnitus, 63.50% were female (15).

The studies are controversial with regard to their sex influence when tinnitus is present. Although some show a discreet prevalence in the female gender, others suggest a higher prevalence in the male gender, but a statistical significance is rarely achieved. The possible reason for a higher prevalence in the male gender would be that men are more exposed to occupational noises. Conversely, women show a higher availability of time to search for a doctor, what would explain the findings of a higher prevalence in the female gender. In this study, there was a higher prevalence of female patients (3).

It was verified that 51% of the study population showed a neck pain, equivalent to studies in which the prevalence of neck pain the adult population can range from 6 to 50% (16). Such symptoms are derived from several degenerative processes, direct traumas or from cumulative microtraumas of the postural stress. The reduction in the muscular mass between 50 and 80 years of age is likely the result of the aging process of the

neuromuscular system in association with the reduction of the level of physical activity (2).

Research developed by a tinnitus research group showed that this symptom also has a strong association with the presence of myofascial trigger points on the areas of head, neck and scapular waist (9). Besides, it was demonstrated that in tinnitus patients, 75% of the patients showed an influence in the tinnitus intensity according to the movements of head and neck (18). Although the high prevalence of neck pain and tinnitus in our study, there was no association between these two disorders.

The elderly in this show had a reduction in the movement width in all the degrees of movement, the highest of which was in the cervical curvature. However, there was no association between tinnitus and the reduction in the movement width. The width reduces with age in nearly all the studies and there is apparently no intrinsic influence that can reduce this progression. The width reduction of the cervical movements is multifactorial. The degenerating processes must be taken into consideration, whether they are discs, osseous and/or ligamentous, in addition to muscle shortenings and discontinuance (2).

There was no association between the side impaired by tinnitus and the side of the width restriction of movements in the individuals of this study; however, there was a tendency to make a possible association because of the existence, in cases of muscle tension, of a connection between proprioceptive and nociceptive afferents of the cervical area and the cochlear nucleus (9). Based on the literature and the data found in this study, it is believe that in researches with a bigger population, an association between the side of movement width restriction and the tinnitus side can be evident.

## CONCLUSION

It was concluded that tinnitus and neck pain are importantly prevalent in the elderly and that, with aging, there is a reduction in the width of cervical movements in every way - curvature, extension, cervical rotation and lateral curvature, and the highest limitation in the cervical rotation to the right.

There was no association between tinnitus and neck pain or between tinnitus and a reduction of cervical width in this population. There was no association between the tinnitus-impaired side and the side of movement-restricting width in tinnitus patients either. The results of this preliminary study demonstrated the need for more researches and the advanced number of this sample to actually come to a conclusion of these associations.

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