IOSR Journal of Dental and Medical Sciences (IOSR-JDMS)
e-ISSN: 2279-0853, p-ISSN: 2279-0861.Volume 24, Issue 8 Ser. 3 (August. 2025), PP 54-58
www.iosrjournals.org

Correlation Between Tinnitus And Arterial Hypertension

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Abstract
Introduction
Sensation of hearing a sound in the absence of an external stimulus or a sound sensation in the absence of an external or internal acoustical source or electrical stimulation. 1
It affects 25% of the general populations. tinnitus can be classified as pulsatile and non- pulsatile.2
Materials And Methods
This was a case control study conducted in Department of ENT, between December 2020 and August 2022. Two groups were created: (A) patients with tinnitus(case) of at least 3 months duration. (B) patients without tinnitus (control). The control group is matched with respect to age, gender and race. 120 patients with tinnitus in the study group and 120 patients in the control group without tinnitus.
Results
The average age is 53.55 years of age for the tinnitus group and 53.79 years for the control group (non-tinnitus). Although the duration of the arterial hypertension (avg 61.12 months) in group presenting with tinnitus i.e. ~ approx. 5 years. The median value of age presented with tinnitus is 52 years. And 50% of the population lies in age group of 42-60 years. Arterial hypertension is 3.2 times more in tinnitus patients than with non-tinnitus. Presbycusis is also associated with tinnitus. There is increase in prevalence of tinnitus with increase in age. Median time duration of arterial hypertension to cause tinnitus is 67 months.
Conclusion
Tinnitus and arterial hypertension is positively correlated irrespective of age. The association between tinnitus and hypertension is strong in older patients. Tinnitus is positively corelated with sensorineural hearing loss. The use of ACE inhibitors, potassium sparing diuretics, loop diuretics was more prevalent in tinnitus patients suggesting that an eventful oto-toxicity of these drugs may be involved in tinnitus patho-physiology a hypothesis that should be evaluated in further studies.
Keywords: *Tinnitus; Arterial Hypertension; Sensory Neural Hearing loss*

Date of Submission: 04-08-2025 Date of Acceptance: 14-08-2025

I. Introduction

Sensation of hearing a sound in the absence of an external stimulus or a sound sensation in the absence of an external or internal acoustical source or electrical stimulation.[1]

It affects 25% of the general populations.[1] Tinnitus can be classified as pulsatile and non pulsatile. Pulsatile tinnitus can be classified as synchronous and non synchronous. Tinnitus can be classified into subjective and objective variety[2]

According to the most recent trends of thought tinnitus is considered as a symptom which may have multiple causes sometimes even in a single patient.[3,4]

Systemic risk factors like Cardiovascular diseases, hypertension, diabetes, hypothyroidism, smoking, Alcohol addiction.. Otological cause like Meniere's disease Otosclerosis, Vestibular schwannoma, Chronic otitis media,presbycusis.[5,6] . Musculoskeletal causes like Cervical disease, Temporomandibular joint dysfunction, Head injury[7,8,9] Drugs like Salicylates, Quinine, Aminoglycoside Antibiotic, Antineoplastic agents (particularly platinum agent),

Loop diuretics Tinnitus can have a genetic predisposition Pulsatile synchronous tinnitus may be due to Anaemia, thyrotoxicosis,Pseudotumour cerebri,Atherosclerosis,Vascular tumour in temporal bone,Aortic dissection. Pulsatile non synchronous tinnitus due to Palatal myoclonus, Myoclonus involving stapedial tendon and tenson tympani muscle .systemic arterial hypertension is a multifactorial clinical condition characterized by raised and sustained arterial pressure level. It is defined as systolic level equal or greater than 140mmHg and diastolic level equal or greater than 90mmHg.[10] The presence of comorbidity such as diabetes mellitus and

dyslipidemias and habits such as smoking was demonstrated to increase complication risk.[11]. Arterial hypertension has been described as a possible cause of tinnitus since 1940. [12]

Three principle mechanisms suspected of being involved are:Damage to inner ear microcirculation[1] Ototoxicity by antihypertensive drugs[14], Perception of noise generated by blood vessel[15]

As related to inner ear microcirculation the stria vascularis was demonstrated to the main cochlear site damaged by arterial hypertension[16]. Sodium retension could also lead to an increase in extracellular fluid volume including the perilymph[17].

Moreover hypertension has been associated with a higher loss in brain ischemia[13] and also a slower recovery in sudden sensorineural hearing loss[18]. In considering ototoxicity an extensive reviw cited diuretic, betablocker,ACEI,angiotensinII receptor blocker, CCB, ototoxic medication[19]. Furosemide oto toxicity is the most studied form producing a quick reversable decrease of endocochlear potential[20] .As for vascular tinnitus a high incidence of bony dehiscence of carotid canal in the middle ear, which may affect the inner ear microcirculation and generate vascular noises[21]. the main purpose of the study to analyse the presence of arterial hypertension in tinnitus and non tinnitus patient and any correlation between tinnitus and hypertension. Secondary purpose is to evaluate the association between the presence of tinnitus and diverse antihypertensive drug employed

II. Materials And Methods

It is case control study.

Aims And Objectives: *To study the correlation between Tinnitus and Arterial hypertension.*

Inclusion Criteria*-18 years of age or older with and without tinnitus were selected in ENT OPD from December 2020 to August 2022.*

Exclusion Criteria

1.individuals with multiple comorbidity
2. individuals who were on other drugs along with antihypertensives
3. those who did not give consent
4. individual <18 years of age

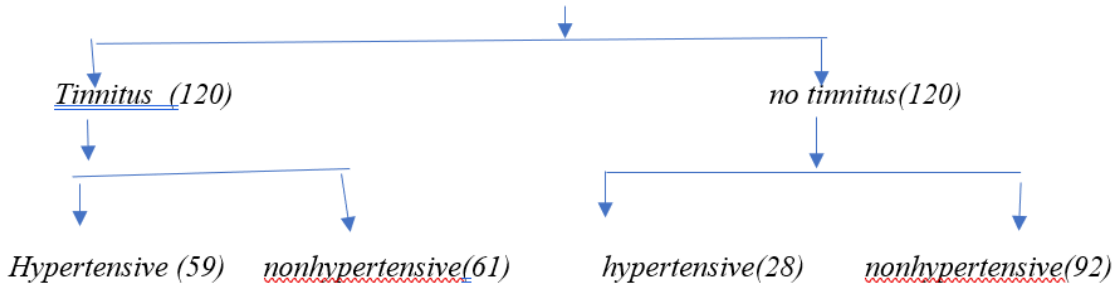
Two groups were created: (A) patients with tinnitus(case) of at least 3 months duration. (B) patients without tinnitus (control). The control group is matched with respect to age, gender and race. 120 patients with tinnitus in the study group and 120 patients in the control group without tinnitus. Clinical, audiometrical characteristics of the subjects were compared. Written informed consent was taken from all the patients.

Tools Used For Study

1. *Blood pressure is calibrated with sphygmomanometer in order to exclude possible undiagnosed arterial hypertension.*
2. *tunning fork test, Pure tone audiometry is done in all the study subjects.*

Tinnitus Related Questionarres*- Tinnitus patients were questioned regarding their tinnitus characteristics (duration, type of sound, laterality, periodicity of tinnitus). The whole sample analysis the comparison of the variables is done with chi-square test.*

III. Results



The average age is 53.55 years of age for the tinnitus group and 53.79 years for the control group (non-tinnitus). Although the duration of the arterial hypertension (avg 61.12 months) in group presenting with tinnitus i.e. ~ approx. 5 years

Table I: Shows the analysis of the numerical variables age, duration of arterial hypertension.

The median value of age presented with tinnitus is 52 years. And 50% of the population lies in age group of 42-60 years. Arterial hypertension is more prevalent in tinnitus patients (p=0.0002) reject null at 99% confidence, demonstrating an association of tinnitus and arterial hypertension. odd's ratio of having tinnitus is 3.20 i.e. arterial hypertension is 3.2 times more in tinnitus patients than with non tinnitus. Presbycusis is also associated with tinnitus. There is increase in prevalence of tinnitus with increase in age i.e. p value = 0.0001 Median time duration of arterial hypertension to cause tinnitus is 67 months.

Table I

Analysis of the numerical variables (age, duration of arterial hypertension according to the group).							
Variable	*Tinnitus*			*No tinnitus*			*p-Value*
	n	*Median*	*IQA*	*n*	*Median*	*IQA*	
Age (years)	*120*	*52*	*42-60*	*120*	*51.5*	*43-61*	*0.0001*
Arterial hypertension duration (months)	*57*	*67*	*61.5-73.5*	*28*	*25.5*	*12-62*	*0.0002*
IQA-interquartile amplitude Q1-Q3							

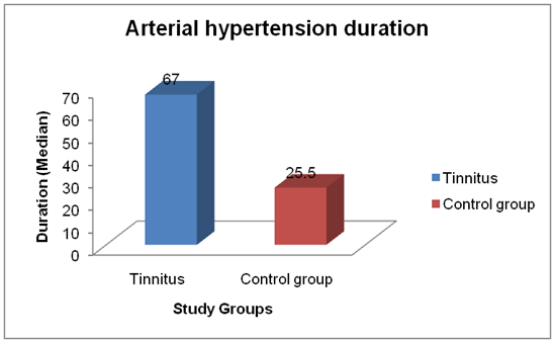


Figure 1

Table II shows categorical variables the latter confirming the pairing by gender and age. It shows equal distribution of tinnitus in male and female representatives. Tinnitus is more prevalent in age group of 41-55years i.e 62 i.e. in 51.67% of cases of total tinnitus patients attended in ENT OPD.

Table II					
Analysis of categorical variables (gender, age) according to the groups.					
Variable	*Category*	*Tinnitus*		*No Tinnitus*	
		N	*%*	*N*	*%*
Gender	*Male*	*60*	*50.00*	*60*	*50*
	Female	*60*	*50.00*	*60*	*50*
Age (years)	*≤40*	*27*	*22.50*	*22*	*18.33*
	41–55	*62*	*51.67*	*65*	*54.17*
	56-70	*16*	*13.33*	*15*	*12.50*
	≥70	*15*	*12.50*	*18*	*15.00*

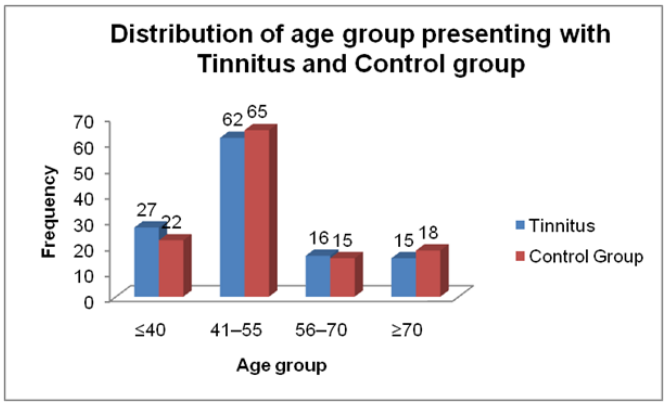


Figure 2

Table III shows prevalence of hearing loss in patients presented with tinnitus. i.e in 65% of patients presenting with tinnitus are having sensorineural hearing loss whereas in control group only 30.8% presented without tinnitus have hearing loss. Hearing loss is positively correlated with tinnitus with a P value of 0.0001.

Table III

Prevalence of hearing loss among tinnitus and non-tinnitus patients (χ2 test).						
Variable	*Category*	*Tinnitus*		*No Tinnitus*		*p-Value*
		N (ears)	*%*	*N (ears)*	*%*	
Hearing loss	*Yes*	*78*	*65%*	*37*	*30.8%*	*0.0001*
	No	*42*	*35%*	*83*	*69.16%*	

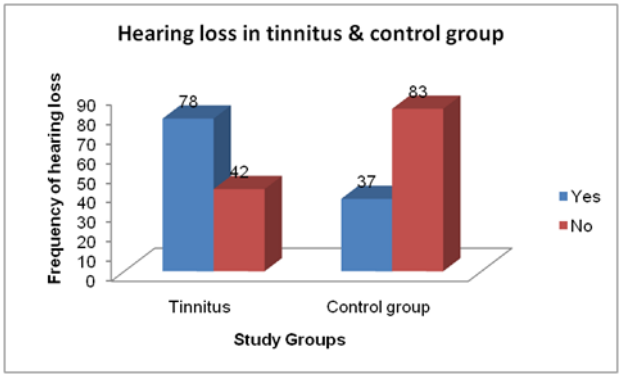


Figure 3

Table IV: *Analysis of antihypertensive drugs used and their chance of causing ototoxicity manifesting as tinnitus*

Analysis of the categorical variable – antihypertensive drugs used according to the groups.						
Variable	*Category*	*Tinnitus*		*No tinnitus*		*p-Value*
		n	*%*	*N*	*%*	
ACEI	*Yes*	*28*	*23.33*	*14*	*11.67*	*0.006*
	No	*92*	*76.67*	*106*	*88.33*	
Loop diuretic	*Yes*	*5*	*4.17*	*2*	*1.67*	*0.047*
	No	*115*	*95.83*	*118*	*98.33*	
K sparing diuretic	*Yes*	*5*	*4.17*	*2*	*1.67*	*0.001*
	No	*115*	*95.83*	*118*	*98.33*	

IV. Discussions

Based on baseline data from ELSA-Brasil, the association between hypertension and SNHL was studied. 33% were having hypertension. Participants with hypertension were more likely to be older and male compared with individuals without hypertension which is consistent with the trend observed in previous studies. In my study arterial hypertension is 3.2 times more common in tinnitus patients than control (Non-tinnitus) where age is not the confounding factor. The median value of age presented with tinnitus is 52 years.50% of the population lies in age group of 42-60 years. Arterial hypertension is more prevalent in tinnitus patients (p=0.0002). Prevalence of hearing loss in patients presented with tinnitus. i.e. in 65% of patients presenting with tinnitus are having sensorineural hearing loss whereas in control group only 30.8% presented without tinnitus having hearing loss. Hearing loss is positively correlated with arterial hypertension with a P value of 0.0001. The difference concerning arterial hypertension duration which was significantly lower in the tinnitus group may be due to a lack of proper control of blood pressure in first years which may lead to perfusion and reperfusion vascular events in cochlea.

The average duration of arterial hypertension was longer than the duration of tinnitus and for most of the patient the onset of hypertension preceded the onset of tinnitus. The ototoxicity of many antihypertensive medication has been well established, especially with diuretics. Data from the study demonstrated that the use of ACE inhibitors, loop diuretics, k+ sparing diuretics was more prevalent in the tinnitus with hypertensive patients than in the control groups. These findings have a partial correspondence with prior studies.

V. Conclusions

Tinnitus and arterial hypertension is positively correlated irrespective of age. The association is strong in older patients and with sensory neural hearing loss which was also more prevalent in tinnitus patients. The use

of ACE inhibitors, potassium sparing diuretics, loop diuretics was more prevalent in tinnitus patients suggesting that an eventful oto-toxicity of these drugs may be involved in tinnitus patho-physiology a hypothesis that should be evaluated in further studies.

Clinical significance

Arterial hypertension is one of the preventable etiology of tinnitus. If we can reduce the incidence of arterial hypertension by dietary modification and by performing regular exercises we can prevent prevalence of tinnitus.Hypertensive patients on medications should be evaluated over a period of 5 years so that any ototoxicities can be detected early and antihypertensives can be changed accordingly.

Drawbacks and limitations

Other common causes for tinnitus like noise exposure, diabetes, hypothyroidism, head injuries , drug intake other than antihypertensives were not included in the study .

there is scope for further research and further studies with large sample size can be conducted. Randomised control study can be conducted

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