ORIGINAL RESEARCH

Increased Serum Lipid Levels in Patients with Subjective Tinnitus

[1]Dr .Tarun Kumar, [2]Dr. Ranjan Kumar

[1]Senior Resident, Dept. Of Biochemistry, AIIMS, Patna, Bihar, India
[2]Associate Professor, Dept. Of ENT, BMIMS Pawapuri, Bihar, India

Corresponding Author
Dr. Ranjan Kumar
Associate Professor, Dept. Of ENT, BMIMS Pawapuri, Bihar, India

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ABSTRACT
Background: To evaluate serum lipid levels in subjective tinnitus patients.
Materials & Methods: A case-control study included a total of 50 patients with subjective tinnitus and a control group of 20 healthy volunteers. In the tinnitus group, there were 35 women (70%) and 15 men (30%), with an average age of 51.85 years. The control group consisted of 20 healthy individuals, comprising 13 women (65%) and 7 men (35%), with an average age of 50.24 years. The result was analysed using SPSS software. A p value of <0.05 was considered significant.
.**Results:** Among the 50 patients, 17 (34%) experienced tinnitus in their right ear, 19 (38%) in their left ear, and 14 (28%) had tinnitus in both ears (bilateral tinnitus). The mean Pure Tone Audiometry (PTA) threshold value was 19.84 dB HL (decibel hearing level) in the right ear and 18.56 dB HL in the left ear, with no significant difference observed between the two ears (P>0.05).
Conclusion: The tinnitus group had significantly elevated levels of TC (total cholesterol), TRG (triglycerides), and LDL (low-density lipoprotein) compared to the control group.
Keywords: Lipid levels, Triglycerides, Tinnitus.

INTRODUCTION

Tinnitus is described as the perception of a noise inside one's head in the absence of auditory stimulation.[1] Both genders are affected equally while 50 % of the cases are bilateral. [2] The prevalence of tinnitus has been reported to be 10–15 % in the adult population. [3] The prevalence of tinnitus shows a tendency to increase with age as follow: 7 % in the 3rd decade and 21 % in the 7th decade. [4] Tinnitus is generally divided into two groups as objective tinnitus (perceived by another individual) and subjective tinnitus (perceived only by the patient). Objective tinnitus is the perception of sounds transmitted to the cochlea or the middle ear by the bones. Subjective tinnitus is the perception of sounds caused by abnormal neural activity that is not evoked by sound. [5] Most cases of tinnitus are subjective. Tinnitus is a very prevalent condition, defined as a perception of sound or noise in the absence of an external source. It affects millions of people worldwide, often coexists with mood disorders, and impairs cognitive function, thus significantly diminishing the quality of life and placing a considerable burden on society, primarily due to financial repercussions of treatment cost. [6,7] The prevalence of tinnitus in the general population ranges between 10% and 15% and increases with age. [8] Tinnitus can occur in association with several disorders, including otologic diseases, acoustic trauma, metabolic and neurological diseases, or stress; however, most of the cases remain idiopathic. [9,10] Regardless of many efforts and research, the pathophysiology of this disease remains poorly understood. Many studies indicate that subjective tinnitus starts in the central auditory structures due to neuroplastic adaptations that occur in response to changes in the peripheral auditory system. [11] Hyperlipidemias are the most common type of dyslipidemias. These are also called hyperlipoproteinemias, which blood lipid levels are high. High low density lipoprotein (LDL) has clearly played a role in atherosclerosis and coronary artery disease. Conversely, high density lipoprotein (HDL) levels are often preferable and can reduce the risk of coronary artery disease. Triglyceride levels are high in

humans due to the recent diet of fatty foods. [12] Hence, this study was conducted to evaluate serum lipid levels in subjective tinnitus patients.

MATERIALS & METHODS

A case-control study included a total of 50 patients with subjective tinnitus and a control group of 20 healthy volunteers. In the tinnitus group, there were 35 women (70%) and 15 men (30%), with an average age of 51.85 years. The control group consisted of 20 healthy individuals, comprising 13 women (65%) and 7 men (35%), with an average age of 50.24 years. The participants underwent a comprehensive examination by ear, nose, and throat specialists, followed by pure tone audiometry, assessment of serum lipid levels, and magnetic resonance imaging of the temporal bone. The researchers recorded the specific clinical features of tinnitus for each patient. They also compared the serum levels of TC, TRG, LDL, and HDL between the two groups. The data was evaluated with independent samples t-test and categorical variables were evaluated using Chi-square test. The result was analysed using SPSS software. A p value of <0.05 was considered significant.

RESULTS

A total of 70 subjects were included. The subjects were divided into two groups as tinnitus group and healthy group. There were no significant differences between the tinnitus and control groups concerning age (P=0.9). Among the 50 patients, 17 (34%) experienced tinnitus in their right ear, 19 (38%) in their left ear, and 14 (28%) had tinnitus in both ears (bilateral tinnitus). The mean Pure Tone Audiometry (PTA) threshold value was 19.84 dB HL (decibel hearing level) in the right ear and 18.56 dB HL in the left ear, with no significant difference observed between the two ears (P>0.05). The mean Tinnitus Handicap Inventory (THI) score for the patient group was 42.50, indicating stage 3 tinnitus severity.

Table 1: variables and clinical features in both the groups

Variables	Tinnitus group	Control group	P – value
Age	51.85	50.24	0.9
Total cholesterol (mg/dl)	205.48	185.46	0.001*
Triglyceride (mg/dl)	168.95	110.75	0.001*
HDL(mg/dl)	48.26	51.84	0.2
LDL(mg/dl)	110.85	98.67	0.005*

significant (p - <0.05)
HDL: High density lipoprotein, LDL: low density lipoprotein

Table: 2: clinical data of tinnitus group

Variable		Number (%)
Side of Tinnitus	Right	17 (34%)
	Left	19 (38%)
	Bilateral	14 (28%)
THI average	Mean	42.50
PTA	Right	19.84
	Left	18.56

dB HL: decibels hearing level, THI: tinnitus handicap inventory, PTA: Pure tone average

DISCUSSION

Tinnitus is an imaginary auditory perception that occurs in humans. Tinnitus is an imaginary auditory perception that occurs in some people. Tinnitus is a disturbing problem that affects many people around the world and it is perceived as ringing in the ears. There is no effective drug treatment. However, much research continues on the treatment and its mechanism. The definitive treatment, physiopathology, and etiology of tinnitus are not yet mature. Before the treatment, appropriate clinical evaluation with a detailed history, measurement of the amount of hearing loss, measurement of tinnitus severity and determination of symptoms, and comorbidities related to etiological factors should be done. Successful treatment of tinnitus depends on teamwork consisting of otolaryngologist, audiologist, neurologists, psychologists, sleep, and pain experts. [13] Tinnitus is a complex symptom that requires a comprehensive multidisciplinary evaluation.[14] Tinnitus presents in 10–15% of the population. Treatment of patients with refractory tinnitus may be inadequate, then the presence of tinnitus reduces the patient's life quality, so patients may seek a different doctor. [15] Hence, this study was conducted to evaluate serum lipid levels in subjective tinnitus patients. In the present study, a total of 70 subjects were included. The subjects were divided into two groups as tinnitus group and healthy group. There were no significant

differences between the tinnitus and control groups concerning age (P=0.9). Among the 50 patients, 17 (34%) experienced tinnitus in their right ear, 19 (38%) in their left ear, and 14 (28%) had tinnitus in both ears (bilateral tinnitus). A study by Avci D et al, studied mean TC level was 200.57±41.06 mg/dL in the patient group and 179.0±39.03 mg/dL in the control group (P=0.001). Mean TRG level was 177.76±86.94 mg/dL in the patient group and 124.43±61.44 mg/dL in the control group (P=0.000). Mean LDL level was 115.88±32.56 mg/dL in the patient group and 101.31±34.42 mg/dL in the control group (P=0.008). Mean HDL level was 50.25±13.60 mg/dL in the patient group and 53.46±12.66 mg/dL in the control group (P=0.137). Among all the serum lipids, TC, TRG and LDL established a significant difference between the two groups. The results indicated that TC, TRG and LDL levels were significantly higher in tinnitus group and this increase implicates the potential role of hyperlipidemia associated with altered lipid metabolism in the etiology of tinnitus. They suggest that serum lipid levels could be useful and conducive in the diagnosis and prognosis of tinnitus. [16] In the present study, the mean Pure Tone Audiometry (PTA) threshold value was 19.84 dB HL (decibel hearing level) in the right ear and 18.56 dB HL in the left ear, with no significant difference observed between the two ears (P>0.05). The mean Tinnitus Handicap Inventory (THI) score for the patient group was 42.50, indicating stage 3 tinnitus severity. Another study by Ali Ismail A et al, sixty obese patients with CST were randomly assigned to group A (treatment group; n = 30; mean age = 44.10 ± 3.69 years) or group B (sham group; n = 30; mean age = 45.53 ± 3.62 years). Only group A showed significant within-group improvements. Except for HDLs, BMI, and WC, unpaired between-group comparisons showed significantly greater improvements in other outcome measures of all patients with tinnitus (TR-QoL, LDLs, TGs, C, and VAS) in group A than in group B. [17] Cholesterol has effects particularly on atherosclerosis and coronary artery disease. Total cholesterol is recognized by three lipoprotein fractions: HDL, LDL, and very low density lipoproteins. Lipoproteins are spherical macromolecule complexes made up of lipids. These lipids consist of free and bound cholesterol, triglycerides, and phospholipids. Proteins called apoproteins provide structural stability to cholesterol and also play a critical role in determining the metabolic fate of particles. [12] Hyperlipidemia is an inherited high risk factor for coronary artery disease, a directly modifiable risk factor. Therefore, the risk of life-threatening coronary heart disease increases, since the majority of patients with tinnitus are in the middle age group and have high lipoprotein values. [18] The hyperlipidemia of tinnitus patients should be treated, as these researchers noted. There is no gold standard in the treatment of tinnitus. [19] There is a close association between tinnitus and hearing loss. [20] Tinnitus has been found in 50 % of those having sudden sensorineural hearing loss, 70 % of those having presbycusis and 50–90 % in those having chronic acoustic trauma. [21] Satar et al. found that hypercholesterolemia affects negatively the stria vascularis and hair cells, thereby causing hearing loss and transduction abnormalities. [22] Hameed et al. evaluated 51 patients and showed a relationship between tinnitus and hyperlipidemia based on the finding that revealed that atorvastatin treatment decreased serum cholesterol levels and also improved tinnitus scores. [23] Similarly, Pulec et al. reported that the tinnitus scores improved by 83% among the patients treated with hyperlipidemic diet and also noted that the elevated serum lipid levels may lead to inner ear dysfunction. The authors attributed this condition to the relationship between hyperlipidemia and tinnitus. [24]

CONCLUSION

The tinnitus group had significantly elevated levels of TC (total cholesterol), TRG (triglycerides), and LDL (low-density lipoprotein) compared to the control group. This suggests a potential link between hyperlipidemia (high lipid levels in the blood) and changes in lipid metabolism in the development of tinnitus.

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