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Original Research Article

What is the prevalence of dyslipidemia in patients with idiopathic tinnitus?

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ABSTRACT

Background: Dyslipidemia is a metabolic disorder that results from imbalanced and overfeeding as well as sedentary life. Elevated blood lipid levels can affect cochlear blood flow and fluidity, leading to decreased hearing and tinnitus. We aimed to determine whether there is a relationship between tinnitus and dyslipidemia by investigating the blood lipoprotein values of patients with tinnitus.
Methods: The lipid profiles of the patients with idiopathic tinnitus who were selected among the patients who applied to Istanbul Haydarpaşa Numune Training and Research Hospital with the complaint of tinnitus between January 2019 and May 2020 were examined. The test results and age and gender distributions were compared with control groups without tinnitus complaints and statistical evaluation was performed.
Results: Hypercholesterolemia in 42% of 6472 patients with idiopathic tinnitus, 18% low HDL, 50% high LDL, Hyperlipidemia was detected in 21%. 1942 (30%) of these patients were male; 4530 (70%) are women. The number of patients in the control group without tinnitus was 6470. Hypercholesterolemia in 49% of this group; 21% low HDL, 42% high LDL, 16% hyperlipidemia was detected. In this control group, 1950 (30%) of the patients were male and 4520 (70%) were female. Cholesterol of male and female patients with tinnutus. When the cholesterol, LDL and triglyceride values of HDL and LDL values and female and male patients in the control group were examined, a statistically significant difference was found ($p < 0.005$). No statistically significant difference was found between HDL values of female and male patients with tinnutus and HDL values of female and male patients in the control group ($P > 0.05$).
Conclusions: There is a statistically relationship between tinnitus and dyslipidemia. The presence of dyslipidemia is vital due to atherosclerosis caused by dyslipidemia, especially coronary artery involvement. Therefore, dyslipidemia should be treated as it causes many diseases.

Keywords: Dyslipidemia, Hypercholesterolemia, Prevalence, Tinnitus

INTRODUCTION

Tinnitus is the sound that sounds outside without any sound source. More than 50 million people in the US reported having tinnitus, which is estimated to be 10% to 15% of adults.[1] It can be seen in both men and women at any age. Dyslipidemia does not affect the severity of tinnitus.[2] Its onset may be sudden, but in most cases it is insidious. Its severity may vary and some people show stress and exacerbation.[3]

Tinnitus is not a disease but appears as a finding of an underlying disease. The effects of tinnitus on the person

range from very mild effects on psychological effects that will seriously impair the patient's work, family, and social life. Patients can perceive tinnitus unilaterally or bilaterally, in the back, in the middle, on the side, inside or outside the head. It is reported that 52% of patients are bilateral, 37% are unilateral, 10% are at first and less than 1% are from tinnitus outside the head.[4]

Subjective tinnitus is the only sound that the patient hears. Objective tinnitus is sounds heard by others during auscultation. (Y) While the lens tinnitus is caused by sounds originating from any part of the body; subjective tinnitus is the perception of meaningless sounds when there is no physical sound. The most important characteristic of the lens tinnitus is that voices that disturb the patient are heard by others.[5]

Tinnitus can be caused by many local or systemic problems, and no underlying cause can be found. If an underlying disease is detected (such as an acoustic tumor, glomus tumor, systemic, metabolic, and endocrine disease), treatment should be directed towards the elimination of this disease. Elimination of this loss is one of the most important parts of treatment if the patient has concomitant hearing loss.[6]

Hyperlipidemias constitute the most common type of dyslipidemias. These are also called hyperlipoproteinemias. Blood lipid levels are high.[7] Hyperlipoproteinemia is described as an increase in plasma cholesterol, triglyceride, or low-density lipoprotein (LDL).[8]

METHODS

In this cross-sectional study, idiopathic tinnitus of the patients who applied to Istanbul Health Sciences University Haydarpaşa Numune Training and Research Hospital between January 2019 and May 2020 with the complaint of tinnitus were selected. Besides, a comparison was made with the same number of control group patients without tinnitus. Lipid profiles in blood biochemistry were examined with the age and gender of all patients. The results were statistically evaluated and included in the study. In total, 6472 patients with idiopathic tinnitus and 6470 patients in the control group were compared.

The criteria for exclusion from the study are those who have previously had head and neck trauma, those who have pulsatile, objective tinnitus, those with hearing loss, those with an autological disease, those who have used autotoxic drugs, those who have been exposed to high volume for a long time, and those with psychiatric disorders.

When evaluating lipid profiles in serum samples of these patients: Cholesterol values less than 200 mg/dl considered normal, 200-239 mg/dl considered as borderline-high and ≥240 mg/dl considered as high. HDL levels were less than 40 mg/dl considered as low and ≥ 40 mg/dl considered as desirable. LDL values less than 130 mg / dl considered to be desirable, 130-159 mg/dl borderline-high and ≥160 mg/dl considered as high. Triglyceride levels less than 200 mg/dl considered normal, 200-400 mg/dl borderline high, 400-1000 mg/dl high, and finally >1000 mg/dl considered as very high according to the American Heart Association criteria.[9]

Statistical analysis

The data were analyzed with SPSS (Statistical Package for the Social Sciences) 15.00 package program. In the descriptive statistics of the data, frequency distribution, mean, standard deviation, and t-test were used.

This study has been approved by the Istanbul Haydarpasa Numune Training and Research Hospital (Date: 11.01.2019; No: 563).

RESULTS

In this study, data of 6472 patients with idiopathic tinnitus and 6470 patients in the control group were compared. In both groups, 30% were male and 70% were female. The average age of patients with idiopathic tinnitus 56.85; The average age in the control group is 48.80 (Table 1 and 2).

Table 1: Age and gender distributions of cases.

		Tinnitus group (N=6472)		Control group (N=6470)	
		N	%	n	%
Age	≤29	210	3.24	1163	17.98
	30-39	485	7.49	873	13.49
	40-49	1130	17.46	1209	18.69
	50-59	1755	27.12	1352	20.90
	60-69	1729	26.72	1028	15.89
	≥70	1163	17.97	845	13.06
Gender	Female	4530	69.99	4520	69.86
	Male	1942	30.01	1950	30.14

Table 2. Mean and standard deviation results of patients' findings.

	Tinnitus group (N=6472)	Control group (N=6470)
	Mean.±SD	Mean.±SD
Age	56.85±13.91	48.80±17.97
Cholesterol	220.15±49.09	202.20±49.35
HDL	51.73±13.65	52.01±17.87
LDL	138.84±60.72	129.68±58.02
Triglycerides	150.74±103.97	140.41±137.74

Hypercholesterolemia in 42% of 6472 patients with idiopathic tinnitus; 18% low HDL, 50% high LDL, Hyperlipidemia was detected in 21%. 1942 (30%) of

these patients were male; 4530 (70%) are women. In the control group, the number of patients in the population without tinnitus was 6470. In this group, 49% of hypercholesterolemia; 21% low HDL; 42% high LDL; Hyperlipidemia was detected in 16%. In this control group, 1950 (30%) of the patients were male and 4520 (70%) were female (Table 3).

Table 3: Serum lipoprotein levels of patients.

		Tinnitus group (N=6472)				Control group (N=6470)				p
		Female		Male		Female		Male		
		n	%	n	%	n	%	n	%	
Cholesterol	<200 mg/dl	1329	20.53	914	14.12	2200	34.00	1074	16.60	0.000*
	200-239 mg/dl	1475	22.79	635	9.81	1348	20.83	545	8.42	
	≥240 mg/dl	1726	26.67	393	6.07	972	15.02	331	5.12	
HDL	<40 mg/dl	463	7.15	680	10.51	596	9.21	737	11.39	0.315
	≥40 mg/dl	4067	62.84	1262	19.50	3924	60.65	1213	18.75	
LDL	<130 mg/dl	2122	32.79	1085	16.76	2632	40.68	1148	17.74	0.000*
	130-159 mg/dl	1029	15.90	436	6.74	990	15.30	430	6.65	
	≥160 mg/dl	1379	21.31	421	6.50	898	13.88	372	5.75	
Triglycerides	<200 mg/dl	3569	55.15	1550	23.95	3962	61.24	1499	23.17	0.000*
	200-400 mg/dl	817	12.62	327	5.05	490	7.57	369	5.70	
	401-1000 mg/dl	144	2.22	65	1.00	64	0.99	74	1.14	
	≥1000 mg/dl	0	0.00	0	0.00	4	0.06	8	0.12	

As seen in this study, the complaint of tinnitus starts to occur more frequently over the age of 40 and peaks between the ages of 50-70. The majority of women are 70% of patients admitted to the hospital and diagnosed with idiopathic tinnitus.

The cholesterol of male and female patients with tinnitus. When the HDL and LDL values and the cholesterol, LDL, and triglyceride values of the male and female patients in the control group were examined, a statistically significant difference was found ($p < 0.005$).

No statistically significant difference was found between the HDL values of female and male patients with tinnitus and HDL values of female and male patients in the control group ($p > 0.05$) (Table 3). HDL height is a healthy and desired result and low HDL is an undesirable negative result.

Considering the results of this study, it is seen that there is a relationship between patients with tinnitus and elevated serum cholesterol, LDL, and triglycerides. Contrary to some publications, the relationship between tinnitus and dyslipidemia was found statistically significant in this study.

DISCUSSION

Tinnitus is a problem caused by many local and systemic diseases. There is no standard method of treatment as the reasons are various. In the presence of an underlying disease, tinnitus treatment will be directed towards eradicating this disease.[6] Tinnitus can be seen at any age, both men and women. Along with it, psychological problems affecting the quality of life of individuals can cause problems such as difficulty in concentration and sleep. It is seen in 10% to 15% of the adult population.[3]

Shargorodsky et al. detected tinnitus in approximately 50 million American adults. Smoking and hypertension are more common in these. Also, they found a relationship between the frequency of tinnitus in those working in gunshots and noisy environments.[10]

Melo et al. in their study in 502 patients over the age of 60, 40% of those exposed to occupational noise detected tinnitus; however, they did not find a statistically significant relationship between occupational noise exposure and presence of tinnitus compared to 43% detection of tinnitus in the control group not exposed to occupational noise.[11] In 1973, Spencer first investigated hyperlipoproteinemia in the etiology of inner ear diseases and found the relationship between hyperlipoproteinemia and sensorineural hearing loss and / or vestibular symptoms. Hyperlipoproteinemia was detected in 42% of patients in the study group.[12]

Cholesterol has had effects especially on atherosclerosis and coronary artery disease. Total cholesterol is recognized by three lipoprotein fractions, high-density lipoproteins (HDL), low-density lipoproteins (LDL) and very-low-density lipoproteins (VLDL). Lipoproteins are spherical macromolecule complexes made up of lipids. These lipids consist of free and bound cholesterol,

triglycerides, and phospholipids. Proteins called lipoproteins to provide structural stability to cholesterol and also play a critical role in determining the metabolic fate of particles.[7]

Two primary lipoproteins make up total cholesterol. These are low-density lipoprotein (LDL) and high-density lipoprotein (HDL). By circulation, it is converted from cholesterol to LDL in the liver and stored in other organs, especially in the heart and arteries. In contrast, HDL is transported from the organs and tissues to the liver through circulation. It causes a decrease in the formation of cholesterol plaques in large arteries. Consequently, high LDL and low HDL are characteristic of coronary artery disease. It is often accompanied by an increase in serum triglyceride levels and shows high levels of fat in the bloodstream.[13]

The cardiovascular risk of apparently healthy people often depends on many risk factors that interact with each other. This is the basis of total cardiovascular risk assessment and treatment. The risk factors study, which also includes the lipid profile, should include men over 40 years old and women over 50 years old or postmenopausal women.[14]

The most current guide to dyslipidemia, the 2019 European Society of Cardiology (ESC): The main goal of treatment in patients with atherosclerotic cardiovascular disease, defined as very high risk, is to lower the low-density lipoprotein (LDL) cholesterol below <55 mg/dl. The main goal of treatment in patients with ASHR is to lower low-density lipoprotein (LDL) cholesterol. The new guideline has set the target level of LDL-cholesterol as <55 mg/dl. In these patients, he recommends administering the highest dose of high-density statin that can be tolerated to bring the target LDL-cholesterol level below 55 mg / dl.[17] This suggestion is also followed in our hospital.

It is well known to cause dyslipidemia, atherosclerosis, and coronary artery disease. It also causes myocardial infarction, shock, and death.[13] Therefore, dyslipidemia should be treated. Hyperlipidemias constitute the most common type of dyslipidemias. These are also called hyperlipoproteinemias. Blood lipid levels are high. High LDL played a role in atherosclerosis and coronary artery diseases. Because high HDL levels are often desired and may reduce the risk of coronary artery disease. Recently, triglyceride levels are high due to feeding with fatty foods. Triglyceride levels, which are too high, pose a risk of pancreatitis. Very low total cholesterol levels also form the other part of dyslipidemia but are rare. Low cholesterol, cancer, liver cirrhosis may be related to respiratory problems, acute diseases, and injuries.[7]

It is believed that dyslipidemia causes a localized pathological process that occurs in the periphery of the cochlea, characterized by changes in the small blood vessels of the inner ear. Specific changes mentioned are the thickening of the capillaries in the endolymphatic sac and the basement membrane and stria vascularis. Besides, the thickening of the vein of the vestibulocochlear nerve was observed. These pathologies can affect inner ear function through a decrease in blood flow. As a result, dyslipidemia causes pathological changes in predisposed individuals as the basis for the onset of tinnitus.[15]

In their study on 40 volunteers with dyslipidemia, Evans et al. concluded that chronic dyslipidemia caused by an increase in triglycerides may also cause a decrease in hearing. Hypercholesterolemia may reduce cochlear vascularity and cause hearing loss.[13] Therefore, hearing loss can also be seen in patients with tinnitus and hearing testing is required.[16] In 1977, Lowry investigated lipid abnormalities in patients with 100 bilateral sensorineural hearing loss, It detected hyperlipoproteinemia in 20 patients. 20% of patients were diagnosed with both hyperlipoproteinemia and sensorineural hearing loss.[17]

Pulec et al, found the frequency of hypercholesterolemia in Tinnitus patients to 5.1%. In their studies, they showed that the hypolipidemic diet improves serum lipid propyl as well as tinnitus. Researchers have noted that in the case of hypercholesterolemia, the problem in the inner ear is the chronic obstruction of the capillary part of the stiff vessels, which can lead to both a biochemical change in the endolymphatic area and ischemia. They explained that tinnitus can be improved by hypolipidemic diet.[18]

Basut et al, said that a low-fat and low-glycemic-index diet decreased the severity of tinnitus.[19] Sutbas et al reported that the frequency of dyslipidemia was higher in tinnitus patients compared to the general population, and the severity of tinnitus decreased when the serum lipid profile returned to normal.[20] In this study, it was found to be statistically significant between the presence of dyslipidemia and tinnitus. Some argue that the high cholesterol level and tinnitus may be related, as well as those who claim otherwise. Kazmierczak and Doroszewska, compared with the control groups, found the relationship between tinnitus and glucose metabolism important; reported no significant difference between lipid metabolism.[21]

Shirazi could not find a relationship between Tinnitus and dyslipidemia. He stated that the most common form of dyslipidemia was hypercholesterolemia, and in their study of 1043 patients, hypercholesterolemia was seen at 14.4%, and the second frequency was low HDL (12.8), but the relationship between dyslipidemia and tinnitus was insignificant.[22] In the study conducted in 76 patients, Etemadi found that patients with tinnitus with dyslipidemia had the most hypercholesterolemia (23.68), while the second was high serum triglyceride (11.84%) and high LDL (5.21%) with low HDL (9.21%), respectively. They stated that the prevalence of dyslipidemia in patients with tinnitus was not statistically significant compared to the general population.[2] Lee et al, reported a slight change in blood biochemistry results in

elderly people with hearing measurements in 217 volunteers aged 60-82, showed that total cholesterol and LDL levels were slightly higher than normal but not statistically significant.[8]

Shirazi stated that total cholesterol, HDL, LDL, and triglyceride levels in all patients were not higher than the general population and that tinnitus was not accompanied by dyslipidemia.[22] Dyslipidemia may not cause tinnitus; however, there is a direct relationship in the duration and occurrence of the disease for reasons that may improve.[2]

CONCLUSION

The presence of dyslipidemia can lead to tinnitus. Besides, dyslipidemia is vital due to coronary artery involvement due to atherosclerosis it causes. Therefore, the presence of tinnitus becomes meaningful especially in the middle age group who have malnutrition with sedentary life. The presence of dyslipidemia can be seen as a stimulant for healthy life threats and should be treated.

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