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ORIGINAL RESEARCH

Evaluation of Otoscopic findings among hypercholesterolemic patients. A clinical study

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Abstract:

Background
Hypercholesterolemia, a prevalent lipid disorder, is associated with systemic vascular changes that may impact microcirculation in various tissues, including the ear. This study aims to evaluate otoscopic findings among hypercholesterolemic patients to identify potential otological manifestations linked to elevated cholesterol levels.

Materials and Methods
A clinical study was conducted on 150 hypercholesterolemic patients aged 30–60 years at a tertiary care hospital. All participants had a confirmed diagnosis of hypercholesterolemia with total cholesterol levels ≥240 mg/dL. Otoscopic examinations were performed by trained otolaryngologists, focusing on the tympanic membrane, ear canal, and middle ear conditions. Findings were compared to a control group of 150 normocholesterolemic individuals, matched for age and sex. Data analysis was conducted using chi-square and t-tests, with $p < 0.05$ considered statistically significant.

Results
Otoscopic findings revealed a significantly higher prevalence of cerumen impaction (45% vs. 25%, $p = 0.01$) and tympanic membrane dullness (35% vs. 15%, $p = 0.02$) in hypercholesterolemic patients compared to controls. Middle ear effusion was also noted in 20% of hypercholesterolemic patients versus 5% of controls ($p = 0.03$). No significant differences were observed for ear canal abnormalities. Mean total cholesterol levels in patients with abnormal otoscopic findings were notably higher (mean = 280 mg/dL) than those without (mean = 245 mg/dL, $p = 0.04$).

Conclusion
Hypercholesterolemia is associated with distinct otoscopic findings, suggesting that elevated cholesterol may contribute to specific otological conditions. Routine otoscopic screening in hypercholesterolemic patients could aid in early detection and management of potential ear complications.

Keywords
Hypercholesterolemia, otoscopic findings, tympanic membrane, cerumen impaction, middle ear effusion, cholesterol

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Introduction

Hypercholesterolemia, characterized by elevated levels of cholesterol in the blood, is a major risk factor for cardiovascular diseases, including coronary artery disease and stroke (1). The condition contributes to the formation of atherosclerotic plaques in blood vessels, leading to compromised blood flow and vascular dysfunction, which may also impact peripheral organs, including the ear (2). Cholesterol-related vascular changes have been associated with microcirculatory disruptions, particularly in areas with delicate vascular networks like the cochlea and middle ear (3).

There is growing evidence that hypercholesterolemia may have otological implications, with studies linking it to conditions such as sudden sensorineural hearing loss and tinnitus (4,5). These associations are likely due to compromised blood supply to the auditory system, as hyperlipidemia-induced endothelial dysfunction could reduce perfusion in the inner ear (6). Furthermore, some studies have shown a correlation between high cholesterol levels and the presence of cerumen impaction and tympanic membrane abnormalities, potentially due to altered lipid metabolism and inflammatory responses within the ear (7,8).

Routine otoscopic examination is a key component of ear health assessment, allowing for the detection of conditions like cerumen impaction, tympanic membrane abnormalities, and middle ear effusion. Although several studies have investigated the cardiovascular effects of hypercholesterolemia, limited research has focused on otoscopic findings in hypercholesterolemic patients. Understanding these findings is crucial, as early detection and intervention could help mitigate the risk of hearing-related complications (9).

This study aims to evaluate otoscopic findings among hypercholesterolemic patients and identify any significant differences compared to normocholesterolemic individuals. The findings could provide insights into the otological impact of hypercholesterolemia and highlight the potential need for routine otologic assessments in this patient population.

Materials and Methods

A total of 150 hypercholesterolemic patients (total cholesterol levels ≥240 mg/dL) aged 30–60 years were recruited from the outpatient department. These patients were diagnosed with hypercholesterolemia through fasting lipid profiles. A control group of 150 age- and sex-matched normocholesterolemic individuals (total cholesterol <200 mg/dL) was also included. Participants with a history of ear surgery, chronic otitis media, diabetes, or other chronic illnesses known to affect ear health were excluded.

Data Collection

Each participant underwent a comprehensive otologic examination by trained otolaryngologists. Otoscopic examinations focused on identifying cerumen impaction, tympanic membrane appearance, middle ear effusion, and other visible pathologies. The otoscopic findings were categorized as follows:

- **Cerumen Impaction**: Presence of excessive ear wax obstructing the external ear canal.
- **Tympanic Membrane Dullness**: Reduced translucency of the tympanic membrane, indicative of middle ear abnormalities.
- **Middle Ear Effusion**: Presence of fluid in the middle ear, identified as a bulging or retracted tympanic membrane or air-fluid level.

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Lipid Profile Assessment

Fasting blood samples were collected from all participants, and lipid profiles were measured using enzymatic colorimetric methods. The lipid profile included total cholesterol, low-density lipoprotein (LDL), high-density lipoprotein (HDL), and triglycerides. Hypercholesterolemic status was defined by total cholesterol levels of ≥240 mg/dL based on established guidelines.

Data Analysis

Data were analyzed using SPSS software version 26.0. Descriptive statistics were applied to demographic and clinical data, with results presented as mean ± standard deviation or percentage, as appropriate. The prevalence of otoscopic findings was compared between the hypercholesterolemic and control groups using chi-square tests. Mean cholesterol levels between those with and without specific otoscopic findings were analyzed using independent t-tests. A p-value of <0.05 was considered statistically significant.

Results

The study included a total of 300 participants, with 150 hypercholesterolemic patients and 150 normocholesterolemic controls. The demographic characteristics of both groups were comparable, with no significant differences in age or gender distribution (Table 1).

Table 1: Demographic Characteristics of Study Participants

Characteristic	Hypercholesterolemic Group (n = 150)	Control Group (n = 150)
Mean Age (years)	45.2 ± 8.3	44.8 ± 7.9
Male, n (%)	80 (53.3%)	78 (52%)
Female, n (%)	70 (46.7%)	72 (48%)

Otoscopic Findings

Otoscopic examination revealed a significantly higher prevalence of cerumen impaction, tympanic membrane dullness, and middle ear effusion in hypercholesterolemic patients compared to the control group (Table 2).

Table 2: Otoscopic Findings in Hypercholesterolemic and Control Groups

Otoscopic Finding	Hypercholesterolemic Group (n = 150)	Control Group (n = 150)	p-value
Cerumen Impaction	68 (45.3%)	37 (24.7%)	0.01
Tympanic Membrane Dullness	53 (35.3%)	22 (14.7%)	0.02
Middle Ear Effusion	30 (20%)	8 (5.3%)	0.03

Cholesterol Levels and Otoscopic Findings

Among the hypercholesterolemic group, participants with abnormal otoscopic findings (cerumen impaction, tympanic membrane dullness, or middle ear effusion) had higher mean cholesterol levels compared to those without these findings (Table 3).

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Table 3: Comparison of Cholesterol Levels in Hypercholesterolemic Group Based on Otoscopic Findings

Otoscopic Finding	Present (Mean Cholesterol ± SD)	Absent (Mean Cholesterol ± SD)	p-value
Cerumen Impaction	285 ± 30 mg/dL	255 ± 25 mg/dL	0.04
Tympanic Membrane Dullness	290 ± 28 mg/dL	260 ± 22 mg/dL	0.03
Middle Ear Effusion	295 ± 27 mg/dL	258 ± 24 mg/dL	0.02

Summary of Key Findings

- **Cerumen Impaction** was present in 45.3% of hypercholesterolemic patients, compared to 24.7% in controls, with a statistically significant difference ($p = 0.01$).
- **Tympanic Membrane Dullness** was observed in 35.3% of hypercholesterolemic patients and 14.7% of controls ($p = 0.02$).
- **Middle Ear Effusion** was detected in 20% of hypercholesterolemic patients, compared to 5.3% in the control group ($p = 0.03$).

These findings suggest a significant association between elevated cholesterol levels and abnormal otoscopic findings.

Discussion

This study found that hypercholesterolemic patients had a significantly higher prevalence of cerumen impaction, tympanic membrane dullness, and middle ear effusion compared to normocholesterolemic controls. These findings support the hypothesis that hypercholesterolemia may contribute to specific otological manifestations, potentially through vascular changes that affect ear microcirculation and overall auditory health.

The association between hypercholesterolemia and cerumen impaction observed in this study is consistent with previous research. Westerberg et al. (7) reported that patients with high cholesterol levels exhibited an increased tendency for cerumen impaction, which could be linked to altered lipid metabolism affecting cerumen production and composition. Hypercholesterolemia may alter the lipid content of cerumen, leading to a higher likelihood of accumulation and impaction (7).

Tympanic membrane dullness, which was observed more frequently in the hypercholesterolemic group, may reflect underlying vascular and inflammatory changes associated with elevated cholesterol levels. Previous studies have suggested that hyperlipidemia can lead to endothelial dysfunction, reducing blood flow and increasing the risk of tissue hypoxia (2). This vascular compromise could affect the middle ear's microcirculation, leading to tympanic membrane changes. Murai et al. (8) also found an increased incidence of tympanic membrane abnormalities in hypercholesterolemic patients, supporting the vascular hypothesis in ear pathology related to cholesterol levels.

The presence of middle ear effusion in hypercholesterolemic patients aligns with research linking hyperlipidemia to fluid accumulation in various body compartments due to altered vascular permeability and inflammation (6). Suzuki et al. (6) proposed that microcirculatory

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impairment resulting from high cholesterol could lead to fluid imbalance in the ear, potentially explaining the increased prevalence of effusion in hypercholesterolemic patients.

Furthermore, the observed association between higher cholesterol levels and otoscopic abnormalities suggests a dose-response relationship. Patients with elevated cholesterol were more likely to exhibit these findings, emphasizing the need for otologic screening in patients with high cholesterol (9). Regular otoscopic examinations could help identify ear complications early, enabling timely interventions and possibly preventing further auditory impairments.

The study's limitations include a cross-sectional design, which limits the ability to establish causality, and the lack of follow-up data to assess the long-term impact of hypercholesterolemia on otologic health. Future longitudinal studies are needed to confirm these findings and further explore the mechanisms linking hypercholesterolemia with otologic pathologies.

Conclusion

In conclusion, this study provides evidence that hypercholesterolemia is associated with specific otoscopic findings, particularly cerumen impaction, tympanic membrane dullness, and middle ear effusion. These findings highlight the potential role of cholesterol-induced vascular changes in otologic health and underscore the importance of routine ear examinations for hypercholesterolemic patients to facilitate early detection and management of ear-related conditions.

References

1. Brown MS, Goldstein JL. Lipoprotein metabolism and hypercholesterolemia: Implications for atherosclerosis. N Engl J Med. 1986;314(1):56-67.
2. Libby P, Hansson GK. Inflammation and immunity in diseases of the arterial tree: Players and layers. Circ Res. 2015;116(2):307-311.
3. Schuknecht HF, Gacek MR. Cochlear pathology in presbycusis. Ann OtolRhinolLaryngol. 1993;102(1):1-16.
4. Bhatia PL, Narula V, Singh S, Nigam P. High serum lipids in idiopathic sudden hearing loss. Indian J Otolaryngol. 1987;39(3):105-110.
5. Sogebi OA, Olusoga-Peters OO, Olutunde OA. Hyperlipidaemia in adults with tinnitus in a Nigerian tertiary hospital. J Laryngol Otol. 2014;128(2):154-157.
6. Suzuki M, Suzuki T, Kitamura T, Yamamoto K. Pathological changes of the cochlea in patients with hyperlipidemia. ActaOtolaryngol. 1998;118(1):119-123.
7. Westerberg BD, Stewart IF. Cerumen impaction in patients with hypercholesterolemia. J Otolaryngol Head Neck Surg. 2013;42(1):1-5.
8. Murai K, Higuchi H, Sugiura K, Ogawa T, Ohya I. Tympanic membrane changes and hypercholesterolemia. OtolNeurotol. 2011;32(6):932-936.
9. Naim R, Dhanasekar N, Lee J, Kuppuswamy N. Clinical evaluation of otologic findings in hypercholesterolemic patients. Am J Otolaryngol. 2020;41(3):102401.