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Original Research Article

Retrospective Evaluation of Lipid Profile Abnormalities and Their Association with Cardiovascular Diseases in Patients Attending a Tertiary Care Hospital

Rakesh Roshan[1], Kumari Amrita[2], Priti Abha[3], Anita Suneel[4]

[1]Senior Resident, Department of Biochemistry, Netaji Subhas Medical College and Hospital, Bihta, Patna, Bihar, India.

[2]Senior Resident, Department of Biochemistry, Netaji Subhas Medical College and Hospital, Bihta, Patna, Bihar, India.

[3]Senior Resident, Department of Biochemistry, Netaji Subhas Medical College and Hospital, Bihta, Patna, Bihar, India.

[4]Professor and HOD, Department of Biochemistry, Netaji Subhas Medical College and Hospital, Bihta, Patna, Bihar, India.

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Corresponding Author: Dr. Kumari Amrita

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Abstract:

Background: Dyslipidemia is a major modifiable risk factor for cardiovascular diseases (CVDs), particularly coronary artery disease (CAD). Abnormal lipid levels accelerate atherosclerosis and increase the risk of adverse cardiovascular events.

Aim: To evaluate lipid profile abnormalities and their association with cardiovascular diseases among patients attending a tertiary care hospital.

Methodology: This retrospective cross-sectional study was conducted over 3 months at a Netaji Subhas Medical College and Hospital in Bihta, Patna, Bihar, India. Medical records of 125 adult patients with cardiovascular diseases were reviewed. Data on demographic characteristics and fasting lipid profile parameters were collected. Dyslipidemia was classified according to the NCEP ATP III guidelines. Statistical analysis was performed using SPSS version 26.0, with $p < 0.05$ considered statistically significant.

Results: The mean age was 57.3 ± 11.8 years, and 62.4% of participants were male. Coronary artery disease was the most common diagnosis (41.6%). Overall dyslipidemia was observed in 79.2% of patients. Elevated non-HDL cholesterol (61.6%) was the most frequent abnormality, followed by elevated total cholesterol (59.2%), LDL-C (56.8%), low HDL-C (55.2%), and elevated triglycerides (53.6%). Dyslipidemia showed a significant association with cardiovascular diseases ($p = 0.011$).

Conclusion: Dyslipidemia was highly prevalent among cardiovascular disease patients and was significantly associated with disease occurrence, highlighting the importance of routine lipid screening and early intervention.

Keywords: Cardiovascular diseases, dyslipidemia, lipid profile, coronary artery disease, LDL cholesterol, HDL cholesterol, retrospective study.

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Introduction

Cardiovascular diseases (CVDs) continue to be the major source of morbidity and mortality and a significant proportion of premature deaths and disability globally. Coronary artery disease (CAD) is the most common and life-threatening cardiovascular disease and is a major burden of disease around the world. The prevalence of dyslipidaemia and cardiovascular diseases in both developed and developing countries has increased at a high rate due to rapid urbanisation, sedentary lifestyles, unhealthy diets, growing psychological stress, obesity, diabetes mellitus, and hypertension [1]. India, especially, had witnessed a significant epidemiological transition in the last few decades and heart and blood related diseases are one of the major causes of deaths in adults. CAD is a significant burden for health care systems, and early detection and control of modifiable risk factors, including dyslipidaemia [2].

CAD is the most common cardiovascular disease associated with the underlying pathological process of atherosclerosis. It is a disease in which lipids, inflammatory cells and fibrous elements are progressively deposited into the arterial wall and, ultimately, coronary arteries become narrowed, causing

reduced blood supply to the heart. Oxidative stress, endothelial dysfunction, chronic inflammation, insulin resistance, and lipid metabolism disorders are all factors in the development of atherosclerosis [3]. Of these mechanisms, disturbances in serum lipid levels are important causes of the onset and development of plaque. Hence lipid profile has been recently established as an essential part of cardiovascular risk evaluation and preventive cardiology [4]. This lipid profile is also known as the coronary risk panel which contains the following. Also known as the coronary risk panel, the lipid profile consists of the following. These are important parameters which give information on the metabolism of lipids and the individual's risk of cardiovascular diseases [5].

World Heart Federation notes that for cardiovascular death, LDL-C was responsible for about 3.8 million deaths worldwide, making it a key factor in the progression of the disease. Likewise, the Global Burden of Disease Study estimates that cardiovascular diseases cause almost 25% of all deaths in India, and that this figure is increasing [6]. These figures highlight the need for screening strategies to be effective in identifying those at higher cardiovascular risk. Dyslipidemia is a disorder of lipoprotein metabolism defined as an increase in the levels of total cholesterol, LDL-C, triglycerides, or a decrease in HDL-C, or a combination of these abnormalities. High LDL-C and total cholesterol levels help to deposit cholesterol in the wall of the arteries, while high triglycerides and low HDL-C levels lead to endothelial dysfunction and inflammation and accelerate atherosclerosis [7].

Many epidemiological and clinical studies have consistently shown that dyslipidaemia is one of the most important and modifiable risk factors for cardiovascular diseases. While non-modifiable factors like age and gender and genetic predisposition cannot be changed, lipid abnormalities can be managed effectively with lifestyle changes, diet changes and drugs, so early detection is especially important [8]. In addition to the traditional lipid parameters, there is an increasing interest in a number of derived lipid ratios and indices of atherogenic activity that offer a broader perspective on cardiovascular risk. These indices involve several lipid parameters and thus provide an overall index of the relationship between atherogenic and protective lipoproteins. Some of the commonly used indices are Castelli's Risk Index-I (CRI-I), Castelli's Risk Index-II (CRI-II), Atherogenic Coefficient (AC) and Atherogenic Index of Plasma (AIP) [9].

Several studies have shown these indices to have a better ability to predict cardiovascular events than individual lipid parameters. Specifically, AIP has been found to be associated with small dense LDL particles, insulin resistance and metabolic syndrome, and non-HDL-C has become a good predictor of coronary artery disease and cerebrovascular events [10]. Therefore, the use of these indices in clinical practice may help better cardiovascular risk stratification and help to implement timely interventions. Dyslipidaemia can present in very different ways in different populations, depending on ethnicity, diet, socioeconomic factors, environmental exposure and genetic factors. Asian Indians have a characteristic dyslipidemic profile, characterized by a significant increase in triglycerides, a decrease in HDL-C, an increase in small, dense LDL particles and relatively normal or elevated levels of LDL-C [11].

This special lipid profile is responsible for the higher prevalence of early onset coronary artery disease seen in Indians. There are also some regional variations within India due to variation in nutritional practice, lifestyle behaviour and health care accessibility. In eastern India, Bihar is one of the densely populated states where the prevalence of non-communicable diseases has been increasing, especially cardiovascular diseases; however, there is only limited information available on lipid abnormalities in Bihar-specific population with cardiovascular diseases. Therefore, it is important to be aware of the local variations of dyslipidaemia to design specific preventive measures and implement patient management in a more effective way [12].

Routine health care records provide a cost-effective and efficient way of gaining insight into disease patterns and clinically relevant associations in the real world. Data on the lipid abnormalities seen in tertiary care hospitals could be useful for the real-world setting as far as the prevalence of dyslipidaemia and its association with cardiovascular diseases is concerned. This information can help clinicians identify individuals at high risk, help enhance risk assessment tools, and help inform evidence-based therapeutic interventions that aim to decrease cardiovascular morbidity and mortality [13]. With the rising rise of cardiovascular diseases and the proven role of lipid profile abnormality in atherosclerosis, the present retrospective study was conducted with the objective of assessing the lipid profile abnormality and its association with cardiovascular diseases in the patients attending Bihta hospital, Patna, Bihar, India, a tertiary care hospital.

The study also seeks to evaluate the distribution of the conventional lipid parameters and investigate their association with the cardiovascular disease burden in this regional population. The research outcomes will be useful epidemiological data which can be useful in the early diagnosis, risk stratification and development of a preventive health care strategy for the patient suffering from cardiovascular diseases in east India.

Methodology

Study Design: This study was designed as a retrospective cross-sectional observational study to evaluate lipid profile abnormalities and their association with cardiovascular diseases (CVDs) among patients attending a tertiary care hospital. The retrospective design enabled the assessment of existing hospital records to determine the prevalence and pattern of dyslipidemia in patients diagnosed with cardiovascular diseases.

Study Area: The study was conducted in the Department of Biochemistry in collaboration with the Department of General Medicine/Cardiology at Netaji Subhas Medical College and Hospital, Bihta, Patna, Bihar, India

Study Duration: The study was conducted over a period of 3 months.

Sample Size: A total of 125 patients were diagnosed with cardiovascular diseases and having complete lipid profile investigations available in the hospital records were included in the study. The sample size was determined based on the availability of complete retrospective clinical and biochemical records fulfilling the study eligibility criteria during the study period.

Study Population: The study population consisted of adult patients (≥18 years) of both sexes diagnosed with cardiovascular diseases, including coronary artery disease, ischemic heart disease, acute coronary syndrome, myocardial infarction, angina, or other clinically confirmed cardiovascular disorders, who attended the tertiary care hospital and had documented fasting lipid profile investigations in their medical records.

Data Collection: Data were collected retrospectively from the hospital medical records and laboratory database.Demographic details (age and gender), clinical diagnosis, and fasting lipid profile parameters including total cholesterol (TC), triglycerides (TG), HDL-C, LDL-C, VLDL-C, and non-HDL-C were retrieved using a structured data collection form. Lipid parameters had been analyzed in the hospital laboratory using standard enzymatic methods with appropriate quality control measures. Dyslipidemia was classified according to the NCEP ATP III guidelines, and atherogenic indices were calculated wherever complete lipid profile data were available.

Inclusion Criteria

- Adults aged 18 years and above.
- Both male and female patients.
- Patients are diagnosed with cardiovascular diseases.
- Patients with complete fasting lipid profile reports available in hospital records.
- Patients whose medical records contained complete demographic and clinical information.

Exclusion Criteria

- Patients younger than 18 years.
- Patients with incomplete medical records or missing lipid profile data.
- Patients with known inherited lipid metabolism disorders.
- Pregnant women.
- Patients with severe hepatic disease, nephrotic syndrome, hypothyroidism, or malignancy that could significantly alter lipid metabolism.
- Duplicate patient records.

Study Procedure: After ethical approval, hospital records of patients with cardiovascular diseases were reviewed, and eligible cases were selected according to the inclusion and exclusion criteria. Demographic information, clinical details, and lipid profile results were extracted and entered into a standardized data collection sheet. Patients were categorized based on lipid abnormalities as per NCEP ATP III guidelines, and the association between lipid profile abnormalities and cardiovascular diseases was subsequently evaluated.

Statistical Analysis: The data collected were entered into Microsoft Excel 2021 and analyzed using SPSS version 26.0 (IBM Corp., Armonk, NY, USA). Continuous variables were expressed as mean ± standard deviation (SD), while categorical variables were presented as frequencies and percentages. Comparisons between groups were performed using the student's t-test, Chi-square test, or Mann Whitney U test, wherever appropriate. A p-value <0.05 was considered statistically significant".

Result

Table 1 presents the demographic characteristics of the study participants. Among the 125 patients included in the study, the majority belonged to the 41–60 years age group (44.8%), followed by those aged >60 years (37.6%) and 18–40 years (17.6%). The mean age of the participants was 57.3 ± 11.8 years, indicating that cardiovascular diseases were more common among middle-aged and older adults. Male participants constituted 62.4% of the study population, while females accounted for 37.6%, demonstrating a higher prevalence of cardiovascular diseases among males.

Table 1: Demographic Characteristics of Study Participants (N = 125)		
Variable	**Frequency (n)**	**Percentage (%)**
Age Group (Years)		
18–40	22	17.6
41–60	56	44.8
>60	47	37.6
Mean Age (years)	**57.3 ± 11.8**	
Gender		
Male	78	62.4
Female	47	37.6

Table 2 shows the distribution of cardiovascular diseases among the study participants. Coronary artery disease (CAD) was the most frequently diagnosed condition, affecting 41.6% of patients, followed by acute coronary syndrome (22.4%), myocardial infarction (15.2%), ischemic heart disease (12.8%), and stable angina (8.0%). These findings indicate that CAD constituted the largest proportion of cardiovascular cases attending the tertiary care hospital during the study period.

Table 2: Distribution of Cardiovascular Diseases Among Study Participants (N = 125)		
Cardiovascular Disease	**Frequency (n)**	**Percentage (%)**
Coronary artery disease (CAD)	52	41.6
Acute coronary syndrome (ACS)	28	22.4
Myocardial infarction (MI)	19	15.2
Ischemic heart disease (IHD)	16	12.8
Stable angina	10	8

Table 3 summarizes the mean lipid profile parameters of the study population. The mean total cholesterol (218.6 ± 42.7 mg/dL), triglycerides (182.9 ± 58.6 mg/dL), LDL-C (138.7 ± 35.9 mg/dL), and non-HDL-C (178.8 ± 40.9 mg/dL) were above the recommended reference values, whereas the mean HDL-C (39.8 ± 8.5 mg/dL) was below the desirable level. These findings suggest that the majority of patients exhibited an unfavorable lipid profile, reflecting an increased risk for cardiovascular disease.

Table 3: Lipid Profile Parameters of Study Participants (N = 125)		
Lipid Parameter	**Mean ± SD (mg/dL)**	**Normal Reference Value**
Total Cholesterol (TC)	218.6 ± 42.7	<200
Triglycerides (TG)	182.9 ± 58.6	<150
HDL-C	39.8 ± 8.5	≥40
LDL-C	138.7 ± 35.9	<130
VLDL-C	36.6 ± 11.7	<40
Non-HDL-C	178.8 ± 40.9	<160

Table 4 illustrates the prevalence of lipid profile abnormalities among the study participants. Elevated non-HDL-C was the most common abnormality, observed in 61.6% of patients, followed by elevated total cholesterol (59.2%), elevated LDL-C (56.8%), reduced HDL-C (55.2%), and elevated triglycerides (53.6%). Overall, 79.2% of the participants had at least one lipid abnormality, indicating a high prevalence of dyslipidemia among patients with cardiovascular diseases.

Table 4: Prevalence of Lipid Profile Abnormalities Among Study Participants (N = 125)		
Lipid Abnormality	**Frequency (n)**	**Percentage (%)**
Elevated Total Cholesterol (>200 mg/dL)	74	59.2
Elevated LDL-C (>130 mg/dL)	71	56.8
Elevated Triglycerides (>150 mg/dL)	67	53.6
Reduced HDL-C (<40 mg/dL)	69	55.2
Elevated Non-HDL-C (>160 mg/dL)	77	61.6
Overall Dyslipidemia	**99**	**79.2**

Table 5 demonstrates the association between dyslipidemia and different cardiovascular diseases. Dyslipidemia was most prevalent among patients with coronary artery disease (90.4%), followed by myocardial infarction (84.2%) and acute coronary syndrome (78.6%). Lower proportions of dyslipidemia were observed in patients with ischemic heart disease (56.3%) and stable angina

(50.0%). The association between dyslipidemia and cardiovascular disease categories was found to be statistically significant (p = 0.011), indicating that lipid abnormalities were significantly associated with the occurrence of cardiovascular diseases in the study population.

Table 5: Association of Dyslipidemia with Cardiovascular Diseases (N = 125)

Cardiovascular Disease	Dyslipidemia Present n (%)	Normal Lipid Profile n (%)	p-value
Coronary artery disease (CAD) (n=52)	47 (90.4)	5 (9.6)	
Acute coronary syndrome (ACS) (n=28)	22 (78.6)	6 (21.4)	
Myocardial infarction (MI) (n=19)	16 (84.2)	3 (15.8)	
Ischemic heart disease (IHD) (n=16)	9 (56.3)	7 (43.7)	
Stable angina (n=10)	5 (50.0)	5 (50.0)	
Total	**99 (79.2)**	**26 (20.8)**	**0.011***

Discussion

In the world, cardiovascular diseases (CVDs), especially coronary artery disease (CAD) are still a major cause of morbidity and mortality, and dyslipidaemia is considered as one of the most important modifiable risk factors. This current retrospective study assessed lipid profile abnormalities and its correlation with cardiovascular diseases in tertiary care hospital, Bihta, Patna, Bihar, India. Results revealed a high prevalence of dyslipidaemia (79.2% of the patients had at least one abnormal lipid parameter). This observation is of importance as it reflects the high burden of cardiovascular diseases associated with lipid abnormalities and the need for lipid screening in high-risk patients" [14].

The demographic profile of the present study revealed that most of the patients were in the age range 41-60 years (44.8%) followed by age group over 60 years (37.6%) with mean age of 57.3 ± 11.8 years. The majority of the study population (62.4%) were male, suggesting that cardiovascular diseases were more prevalent in men. These results are similar to those reported by Roth et al. (2020) who found that cardiovascular diseases occur most commonly in middle and older aged adults, and that males are more likely to have cardiovascular diseases because they have a higher burden of behavioral and metabolic risk factors in comparison to females (Roth et al., 2020). The same was found by Virani et al. (2021), who mentioned that age and sex are other non-modifiable factors that are significant for determining cardiovascular disease risk (Virani et al., 2021) [15].

Of the cardiovascular diseases assessed, coronary artery disease (41.6%) was the most prevalent diagnosis while acute coronary syndrome and myocardial infarction were the next most prevalent (22.4% and 15.2%, respectively). This distribution is consistent with the current knowledge that CAD is the major clinical expression of atherosclerosis. Libby (2021) reported similar results that atherosclerotic coronary artery disease is the leading cause of cardiovascular mortality worldwide and that it is largely due to the accumulation of lipids leading to chronic vascular inflammation (Libby, 2021) [16].

The mean value of total cholesterol (218.6 ± 42.7 mg/dL), LDL-C (138.7 ± 35.9 mg/dL), triglycerides (182.9 ± 58.6 mg/dL), and non-HDL-C (178.8 ± 40.9 mg/dL) were all above the recommended reference value, and the mean value of HDL-C (39.8 ± 8.5 mg/dL) was below the desirable value. These results suggest an atherogenic lipid profile in patients with cardiovascular diseases. Mach et al. (2020) also reported similar lipid abnormality, highlighting its role in raising the risk of atherosclerosis and the potential for cardiovascular events; elevated levels of LDL-C and triglycerides, and reduced levels of HDL-C, make people more susceptible to cardiovascular events (Mach et al., 2020). Similarly, European Society of Cardiology Guidelines emphasized the role of LDL-C as a direct contributor to plaque formation as the main therapeutic target in cardiovascular disease prevention (Visseren et al., 2021) [17].

In the present study, the overall dyslipidemia was found in 79.2% of the patient as compared to 72.2% observed in the study conducted by Vemula et al. (2024) which was based in Telangana. A higher prevalence was noted in the present study, likely because only patients with existing cardiovascular disease were recruited, compared to previous studies which recruited a larger outpatient population. In addition, there may be regional differences in dietary patterns, physical activity, socio-economic status, obesity, and access to healthcare which have also led to the variation seen. The current study indicates that early lipid screening is important among those at cardiovascular risk due to the high prevalence found [18].

Individual lipid abnormalities were most common as elevated non-HDL cholesterol (61.6%), followed by elevated total cholesterol (59.2%), elevated LDL-C (56.8%), reduced HDL-C (55.2%) and elevated triglycerides (53.6%). Caution and similar observations have been made by Sniderman et al. (2021), who showed that non-HDL cholesterol was a better predictor of cardiovascular events than LDL-C

alone, because it was a better measure of the total burden of atherogenic lipoproteins (Sniderman et al., 2021). Similarly, Grundy et al. noted that non-HDL cholesterol levels were another source of prognosis, especially for those with hypertriglyceridemia and/or mixed dyslipidemia (Grundy et al., 2019) [19].

The present study found a significant correlation between dyslipediemia and cardiovascular diseases ($p = 0.011$). The most common conditions were coronary artery disease (90.4%), myocardial infarction (84.2%) and acute coronary syndrome (78.6%) followed by patients with dyslipidemia. The results provide strong evidence for the well-established role of lipid abnormalities in the pathogenesis of atherosclerotic cardiovascular diseases. Other such associations have been observed by Ference et al. who showed that high LDL cholesterol for long periods of time significantly raises the lifetime risk of coronary artery disease and major adverse cardiovascular events (Ference et al., 2017). Similarly, it has been found by Virani et al., 2021 that good lipid management is an effective way to decrease the number of subsequent cardiovascular events and total mortality in individuals with established cardiovascular disease [20].

The high prevalence of dyslipidemia in this retrospective study underscores the need for routine measurement of lipid profile as an important part of cardiovascular risk assessment. Early detection of abnormal lipid values creates early opportunities for early lifestyle changes, dietary counseling, and early start of lipid-lowering medication to prevent cardiovascular disease and reduce the disease process. Limited information on dietary habits, obesity, physical activity, smoking status, and medication use were available due to a retrospective design and small sample size, however, the findings from this study will contribute to the current regional understanding of the burden of dyslipidemia among cardiovascular disease patients receiving treatment at a tertiary care hospital in Bihar. Further, multicentric prospective studies with larger sample size and lifestyle/socio-economic factors are recommended to understand the association of dyslipidaemia with cardiovascular diseases in the Indian population.

Conclusion

The present retrospective study showed that 79.2% of the patients having cardiovascular diseases attending the present tertiary care hospital in Bihta, Patna, Bihar had one or more lipid abnormalities. The levels of non-HDL cholesterol, total cholesterol, LDL cholesterol and triglycerides were generally high, whereas HDL cholesterol was low, all of which are associated with an atherogenic lipid profile in the study population. A statistically significant association between dyslipidemia and cardiovascular diseases further highlights the important role of abnormal lipid metabolism in the development and progression of cardiovascular disorders, particularly coronary artery disease. The results highlight the importance of regular lipid profile checking, screening for early risk, and prompt lifestyle changes and lipid-lowering treatment to minimize cardiovascular disease morbidity and mortality. This study, though retrospective and small in size, offers some regional evidence of the burden of dyslipidemia among patients of cardiovascular diseases in Bihar. These data warrant further large-scale prospective multicenter studies to confirm the results and to assess the effect of lifestyle, diet and other cardiovascular risk factors on lipid abnormalities and disease outcomes.

References

1. Di Cesare M, Bixby H, Gaziano T, Hadeed L, Kabudula C, McGhie DV, Mwangi J, Pervan B, Perel P, Piñeiro D, Taylor S. World heart report 2023: Confronting the world's number one killer. World Heart Federation: Geneva, Switzerland. 2023;1.
2. Roth GA, Mensah GA, Johnson CO, Addolorato G, Ammirati E, Baddour LM, Barengo NC, Beaton AZ, Benjamin EJ, Benziger CP, Bonny A. Global burden of cardiovascular diseases and risk factors, 1990–2019: update from the GBD 2019 study. Journal of the American college of cardiology. 2020 Dec 22;76(25):2982-3021.
3. Sia CH, Simon O, Loh PH, Poh KK. Atherosclerotic cardiovascular disease landscape in Singapore. Frontiers in Cardiovascular Medicine. 2024 Apr 24;11:1342698.
4. Muntner P, Jaeger BC, Foti K, Ghazi L, Bundy JD, Chen L, Safford MM. Predicted cardiovascular risk by the PREVENT equations in US adults with stage 1 hypertension. Hypertension. 2024 Sep;81(9):1976-85.
5. Alkhulaifi HS, Alshammari NN, Hakami AH, Alqarnii MS, Alshehri KM, Alshammary HH, Somily TI, Mahnashi AB, Albalawi SE, Al Otabei MH, Alshammari AH. Impact of Lifestyle Interventions on Heart Disease Prevention-Hypertension and Atherosclerotic Cardiovascular Disease. Egyptian Journal of Chemistry. 2024 Dec 1;67(13):881-909.
6. Ray KK, Ference BA, Severin T, Blom D, Nicholls SJ, Shiba MH, Almahmeed W, Alonso R, Daccord M, Ezhov M, Olmo RF. World heart federation cholesterol roadmap 2022. Global heart. 2022 Oct 14;17(1):75.
7. Singh G, Sharma M, Kumar GA, Rao NG, Prasad K, Mathur P, Pandian JD, Steinmetz JD, Biswas A, Pal PK, Prakash S. The burden of neurological disorders across the states of India: the Global Burden of Disease Study 1990–2019. The Lancet Global Health. 2021 Aug 1;9(8):e1129-44.

8. Merćep I, Vujević A, Strikić D, Radman I, Pećin I, Reiner Ž. Present and future of dyslipidaemia treatment—a review. Journal of Clinical Medicine. 2023 Sep 8;12(18):5839.
9. Ference BA, Ginsberg HN, Graham I, Ray KK, Packard CJ, Bruckert E, Hegele RA, Krauss RM, Raal FJ, Schunkert H, Watts GF. Low-density lipoproteins cause atherosclerotic cardiovascular disease. 1. Evidence from genetic, epidemiologic, and clinical studies. A consensus statement from the European Atherosclerosis Society Consensus Panel. European heart journal. 2017 Aug 21;38(32):2459-72.
10. Visseren FL, Mach F, Smulders YM, Carballo D, Koskinas KC, Bäck M, Benetos A, Biffi A, Boavida JM, Capodanno D, Cosyns B. 2021 ESC Guidelines on cardiovascular disease prevention in clinical practice: Developed by the Task Force for cardiovascular disease prevention in clinical practice with representatives of the European Society of Cardiology and 12 medical societies With the special contribution of the European Association of Preventive Cardiology (EAPC). European heart journal. 2021 Sep 7;42(34):3227-337.
11. Ardiana M, Harsoyo PM, Hermawan HO, Firmanda DR, Sufiyah IM. Understanding the Relationship between Atherogenic Index of Plasma and Other Risk Factors for Cardiovascular Disease among Police Officers in East Java, Indonesia. World Heart Journal. 2022;14(1):69-76.
12. Gupta K, Hirsch JR, Kalsi J, Patel V, Gad MM, Virani SS. Highlights of cardiovascular disease prevention studies presented at the 2022 American Heart Association scientific sessions. Current Atherosclerosis Reports. 2023 Jan;25(1):31-41.
13. Writing Committee, Lloyd-Jones DM, Morris PB, Ballantyne CM, Birtcher KK, Covington AM, DePalma SM, Minissian MB, Orringer CE, Smith Jr SC, Waring AA. 2022 ACC expert consensus decision pathway on the role of non-statin therapies for LDL-cholesterol lowering in the management of atherosclerotic cardiovascular disease risk: a report of the American College of Cardiology Solution Set Oversight Committee. Journal of the American College of Cardiology. 2022 Oct 4;80(14):1366-418.
14. Ference BA, Ginsberg HN, Graham I, Ray KK, Packard CJ, Bruckert E, Hegele RA, Krauss RM, Raal FJ, Schunkert H, Watts GF. Low-density lipoproteins cause atherosclerotic cardiovascular disease. 1. Evidence from genetic, epidemiologic, and clinical studies. A consensus statement from the European Atherosclerosis Society Consensus Panel. European heart journal. 2017 Aug 21;38(32):2459-72.
15. Ference BA, Ginsberg HN, Graham I, Ray KK, Packard CJ, Bruckert E, Hegele RA, Krauss RM, Raal FJ, Schunkert H, Watts GF. Low-density lipoproteins cause atherosclerotic cardiovascular disease. 1. Evidence from genetic, epidemiologic, and clinical studies. A consensus statement from the European Atherosclerosis Society Consensus Panel. European heart journal. 2017 Aug 21;38(32):2459-72.
16. Grundy SM, Stone NJ, Bailey AL, Beam C, Birtcher KK, Blumenthal R, Braun LT, de Ferranti S, Faiella-Tommasino J, Forman DE, Goldberg R. Guideline on the management of blood cholesterol. Ateroscleroz. 2020 Apr 25;15(4):5-32.
17. Mach F, Baigent C, Catapano AL, Koskinas KC, Casula M, Badimon L, Chapman MJ, De Backer GG, Delgado V, Ference BA, Graham IM. 2019 ESC/EAS Guidelines for the management of dyslipidaemias: lipid modification to reduce cardiovascular risk: the Task Force for the management of dyslipidaemias of the European Society of Cardiology (ESC) and European Atherosclerosis Society (EAS). European heart journal. 2020 Jan 1;41(1):111-88.
18. Sniderman AD, Thanassoulis G, Glavinovic T, Navar AM, Pencina M, Catapano A, Ference BA. Apolipoprotein B particles and cardiovascular disease: a narrative review. JAMA cardiology. 2019 Dec 1;4(12):1287.
19. Vasan RS, Enserro DM, Xanthakis V, Beiser AS, Seshadri S. Temporal trends in the remaining lifetime risk of cardiovascular disease among middle-aged adults across 6 decades: the Framingham study. Circulation. 2022 Apr 26;145(17):1324-38.
20. Holtrop J, Bhatt DL, Ray KK, Mach F, Smulders YM, Carballo D, Steg PG, Visseren FL, Dorresteijn JA. Impact of the 2021 European Society for Cardiology prevention guideline's stepwise approach for cardiovascular risk factor treatment in patients with established atherosclerotic cardiovascular disease. European journal of preventive cardiology. 2024 Apr;31(6):754-62.