International Journal of Pharmaceutical Research and Applications
Volume 8, Issue 6 Nov-Dec 2023, pp: 241-244 www.ijprajournal.com ISSN: 2249-7781

Dyslipidemia: Classification, Etiology and Management- A Systemic Review

Ekta A. Andriyas[1] Imran Hussain[2]
[1]Assistant Professor, Department of Medical Lab Technology, Era University, Lucknow
[2]Assistant Professor, Department of Medical Lab Technology, Integral university University, Lucknow
Corresponding Author: Imran Hussain[2]

Submitted: 10-11-2023 Accepted: 20-11-2023

ABSTRACT: Dyslipidemia is characterised by excessively high plasma lipids and dysregulated plasma lipids.HDL cholesterol is decreased by triglycerides, total cholesterol, and LDL cholesterol. Dyslipidemia is a disease of lipoprotein metabolism that manifests as rising triglyceride and cholesterol levels. Dyslipidemia is divided into two categories: primary (genetic and more prevalent in children) and secondary (related to lifestyle and prevalent in adults).One or more gene mutations that result in the overproduction or improper clearance of TG & are the causes of primary dyslipidemia.LDL cholesterol, increased HDL clearance, and underproduction of HDL. Overconsumption of alcohol, a sedentary lifestyle, and an excessive diet high in saturated fat, cholesterol, and trans-fats are the main causes of secondary dyslipidemia.Common symptoms of dyslipidemia include disorientation, dyspnoea, and balance problems. Tickling, tingling, burning, and pricking sensations, tendinousxanthomas (elbow and knee tendons), aphasia (difficulty speaking), and peripheral arterial disease are symptoms of vascular disorders such coronary artery disease and peripheral arterial disease. Acute pancreatitis can result from TG levels that are too high (> 1000 mg/dL). The retinal arteries and veins may look milky white in the presence of severe hypertriglyceridemia (> 2000 mg/dL; lipemiaretinalis). Blood plasma may also seem lactescent (milky) when lipid levels are extremely high.

KEYWORDS: Dyslipidemia, Cardiovascular Disease, HDL, LDL, Lipid Metabolism

I. INTRODUCTION

Dyslipidemia is characterised by excessively high plasma lipids and dysregulated plasma lipids. HDL cholesterol is decreased by triglycerides, total cholesterol, and LDL cholesterol. Dyslipidemia is a disease of lipoprotein metabolism that manifests as rising triglyceride and cholesterol levels.Dyslipidemia is potential riskfactors for further developing cardiovascular disease [1]. Some anti-dyslipidemia drugs currently available in themarket include statins, fibrates, niacin, ezetimibe, and bile acid binding resins [2].

CLASSIFICATION & ETIOLOGY OF DYSLIPIDEMIA

Dyslipidemia is divided into two categories: primary (genetic and more prevalent in children) and secondary (related to lifestyle and prevalent in adults) [3].One or more gene mutations that result in the overproduction or improper clearance of TG & are the causes of primary dyslipidemia.LDL cholesterol, increased HDL clearance, and underproduction of HDL. Overconsumption of alcohol, a sedentary lifestyle, and an excessive diet high in saturated fat, cholesterol, and trans-fats are the main causes of secondary dyslipidemia. Several medical disorders have been linked to secondary dyslipidemia, including primary biliary cirrhosis, chronic renal disease, diabetes mellitus, and others cholestatic liver conditions.

Symptoms

Common symptoms of dyslipidemia include disorientation, dyspnoea, and balance problems. Tickling, tingling, burning, and pricking sensations, tendinous xanthomas (elbow and knee tendons), aphasia (difficulty speaking), and peripheral arterial disease are symptoms of vascular disorders such coronary artery disease and peripheral arterial disease. Acute pancreatitis can result from TG levels that are too high (> 1000 mg/dL). The retinal arteries and veins may look milky white in the presence of severe hypertriglyceridemia (> 2000 mg/dL; lipemia retinalis). Blood plasma may also seem lactescent (milky) when lipid levels are extremely high [6].

International Journal of Pharmaceutical Research and Applications
Volume 8, Issue 6 Nov-Dec 2023, pp: 241-244 www.ijprajournal.com ISSN: 2249-7781

Physiological Consequences of Dyslipidemia
Cardiovascular Disease:

Continued excessive fat intake causes aberrant blood lipid profiles and can cause lipid build up in blood vessels, which can have a variety of negative effects on the body. It might be coronary artery disease, which causes fat deposits in the arteries to impede blood flow and deprive the heart of nutrients [7].Other dangerous conditions include gangrene, atherosclerosis, and stroke [8].

Other Disorders:

Lipid problems both directly and indirectly advance a wide range of illnesses, including type diabetes mellitus, a number of prevalent malignancies, and PCOS in females [9]. Mental illness like bipolar disorder, schizophrenia [10], Physical inactivity and stress [11]. Dyslipidemia also encourages the growth and contractility of the prostate, which are significant risk factors for the occurrence of benign prostatic hyperplasia.

Dyslipidemia and Obesity:

The prevalence of obesity is constantly rising worldwide, and dyslipidemia frequently develops concurrently. 2.8 million people worldwide pass away each year as a result of being overweight or obese [13]. If the current pattern continues, 86.3% of people will be overweight by 2030, and there would be a significant increase in mortality.

Dyslipidemia: Mechanisms

Three main pathways, including the exogenous pathway, the endogenous pathway, and reverse cholesterol transport pathways, are in charge of the uptake, transport, and storage of lipids in the body. As a result, the process of lipid metabolism is very complex and only one abnormality can result in dyslipidemia. [15]Exogenous (dietary) lipids are transported from the intestine to the lymphatic system and then into the circulation by lipoproteins called CM, which are generated in the intestinal epithelial cells (enterocytes).These CM circulate to the peripheral tissues, including the muscles and adipose tissues, where it involve cholesterol esters (CE) and TAG that are created by the re-esterification of FFA. FFA are released and subject to beta-oxidation by the action of activated LPL, where they can either be utilised as an energy source or stored as fat in the adipose tissues. Additionally, CM can obtain CE from HDL through the use of the cholesterol ester transfer protein (CETP) in return for TAG. Additionally, apo A-I and apo A-II from the lymphatic system are exchanged for apo C and apo E from HDL via CM. The activation of the LPL requires apo C, while the liver's receptors need apo E in order to identify the CM remains.[16]

Management:

The first line of defence against abnormal cholesterol in dyslipidemia typically involves a diet low in saturated and trans-fats and high in fruits, vegetables, nuts, and seeds, as well as quitting smoking and alcohol use and upping daily exercise. The liver produces every type of cholesterol as necessary for the body. Dietary sources of cholesterol include items derived from animals, such as milk, eggs, and meat. Drugs that decrease cholesterol or lower blood lipids include niacin/nicotinic acid, fibric acid derivatives, 3-hydroxy-3-methylglutaryl coenzyme A (HMG-CoA) reductase inhibitors, and bile acid sequestrates cholesterol absorption inhibitors. [17]

HMG-CoA Reductase Inhibitor (Statins):

Statins block HMG-CoA reductase, which reduces the production of cholesterol. Statins including lovastatin, simvastatin, pravastatin, atorvastatin, and rosuvastatin are currently on the market[17].The major enzyme in the cholesterol biosynthetic pathway, HMG-CoA reductase, catalyses the conversion of HMG-CoA to mevalonate, which is a rate-limiting step in the cholesterol manufacturing process. [19]

Fibrates:

The first fibrate medication was clofibrate, which was created in Japan in the 1960s. One of the characteristics of the action of fibrate medications is the activation of the Peroxisome Proliferators Activated Receptor (PPAR). [20]

Niacin/Nicotinic acid:

Niacin, often known as vitamin B3, is a lipid-lowering prescription drug as well as an over-the-counter dietary supplement. Niacin's lipid-lowering properties were initially discovered in 1955; through several methods, it decreased total cholesterol, LDL cholesterol, and boosted HDL cholesterol. [21]

Bile-acid binding resins:

The oldest and safest lipid-lowering medications are bile acid resins. The three bile acid resins cholestyramine, colesevelam, and colestipol are the most often used. [22]

International Journal of Pharmaceutical Research and Applications
Volume 8, Issue 6 Nov-Dec 2023, pp: 241-244 www.ijprajournal.com ISSN: 2249-7781

Cholesterol Absorption Inhibitors:

Inhibitors of cholesterol absorption lessen the amount of dietary and biliary cholesterol that is absorbed into the intestine. Consequently, less intestinal cholesterol that reaches the liver leads to greater hepatic LDL receptor activity, which increases LDL cholesterol clearance. [23]

Lipid-Regulating Agent:

To treat hypertriglyceridemia, omega-3-acid ethyl ester, which belongs to the class of drugs known as lipid-regulating medicines, can be used in conjunction with dietary and lifestyle modifications. [24]

II. CONCLUSION:

Unhealthy blood levels of one or more lipid types are referred to as dyslipidemia. Dyslipidemia can be caused by a number of things, including smoking, being overweight, living a sedentary lifestyle, and eating foods high in fat. To manage cholesterol and triglyceride levels, lifestyle adjustments may be helpful.

Moreover, regular exercise and weight loss may enhance cholesterol profiles. Dyslipidemia is typically treated with statins, fibrates, and a healthy lifestyle.

Conflict of Interest –

The authors declare no conflicts of interest.

REFERENCES:

[1]. Shankar K, Singh SK, Kumar D, Varshney S, Gupta A, Rajan S, Srivastava A, Beg M, Srivastava AK, Kanojiya S, Mishra DK. Cucumismelo ssp. agrestis var. agrestis ameliorates high fat diet induced dyslipidemia in Syrian golden hamsters and inhibits adipogenesis in 3T3-L1 adipocytes. Pharmacognosy magazine. 2015 Oct;11(Suppl 4):S501

[2]. Varshney S, Shankar K, Beg M, Balaramnavar VM, Mishra SK, Jagdale P, Srivastava S, Chhonker YS, Lakshmi V, Chaudhari BP, Bhatta RS. Rohitukine inhibits in vitro adipogenesis arresting mitotic clonal expansion and improves dyslipidemia in vivo [S]. Journal of lipid research. 2014 Jun 1;55(6):1019-32.

[3]. Roth GA, Fihn SD, Mokdad AH, Aekplakorn W, Hasegawa T, Lim SS. High total serum cholesterol, medication coverage and therapeutic control: an analysis of national health examination survey data from eight countries. Bulletin of the World Health Organization. 2011;89:92-101.

[4]. Innerarity TL, Young SG, Poksay KS, Mahley RW, Smith RS, Milne RW, Marcel YL, Weisgraber KH. Structural relationship of human apolipoprotein B48 to apolipoprotein B100. The Journal of clinical investigation. 1987 Dec 1;80(6):1794.https://www.hindawi.com/journals/jnme/2022/4782344/8https://www.hindawi.com/journals/jnme/2022/4782344/

[5]. Purva A, Sharma K, Khan MS. A review on dyslipidemia: types, risk factors and management. Asian Journal of Pharmaceutical Research and Development. 2020 Apr 13;8(2):96-8.https://www.hindawi.com/journals/jnme/2022/4782344/

[6]. Collison KS, Makhoul NJ, Inglis A, Al-Johi M, Zaidi MZ, Maqbool Z, Saleh SM, Bakheet R, Mondreal R, Al-Rabiah R, Shoukri M. Dietary trans-fat combined with monosodium glutamate induces dyslipidemia and impairs spatial memory. Physiology &behavior. 2010 Mar 3;99(3):334-42.

[7]. Bryant LM, Christopher DM, Giles AR, Hinderer C, Rodriguez JL, Smith JB, Traxler EA, Tycko J, Wojno AP, Wilson JM. Lessons learned from the clinical development and market authorization of Glybera. Human gene therapy Clinical development. 2013 Jun 1;24(2):55-64.

[8]. Leong BD, Ariffin AZ, Chuah JA, Voo SY. Prevalence of peripheral arterial disease and abdominal aortic aneurysm among patients with acute coronary syndrome. Med J Malaysia. 2013 Feb;68(1):10-2.

[9]. Fulghesu A, Magnini R, Portoghese E, Angioni S, Minerba L, Melis GB. Obesity-related lipid profile and altered insulin incretion in adolescents with polycystic ovary syndrome. Journal of Adolescent Health. 2010 May 1;46(5):474-81.

[10]. Saravane D, Feve B, Frances Y, Corruble E, Lancon C, Chanson P, Maison P, Terra JL, Azorin JM. Drawing up guidelines for the attendance of physical health of patients with severe mental illness. L'encephale. 2009 Jul 9;35(4):330-9.

[11]. Costa R, Tamascia ML, Nogueira MD, Casarini DE, Marcondes FK. Handling of

International Journal of Pharmaceutical Research and Applications
Volume 8, Issue 6 Nov-Dec 2023, pp: 241-244 www.ijprajournal.com ISSN: 2249-7781

adolescent rats improves learning and memory and decreases anxiety. Journal of the American Association for Laboratory Animal Science. 2012 Sep 15;51(5):548-53.

[12]. Vikram A, Jena G, Ramarao P. Insulin-resistance reduces botulinum neurotoxin-type A induced prostatic atrophy and apoptosis in rats. European journal of pharmacology. 2011 Jan 10;650(1):356-63.

[13]. Hanson MA, Roth CB, Jo E, Griffith MT, Scott FL, Reinhart G, Desale H, Clemons B, Cahalan SM, Schuerer SC, Sanna MG. Crystal structure of a lipid G protein–coupled receptor. Science. 2012 Feb 17;335(6070):851-5.

[14]. Sladek R, Rocheleau G, Rung J, Dina C, Shen L, Serre D, Boutin P, Vincent D, Belisle A, Hadjadj S, Balkau B. A genome-wide association study identifies novel risk loci for type 2 diabetes. Nature. 2007 Feb 22;445(7130):881-5.

[15]. Sultan F, Cardona-Sanclemente LE, Lagrange D, Lutton C, Griglio S. Lipoprotein lipase and hepatic lipase activities in a hypercholesterolaemic (RICO) strain of rat. Effect of dietary cholesterol. Biochemical Journal. 1990 Mar 1;266(2):349-53.

[16]. https://www.intechopen.com/chapters/66265

[17]. Huang Y, Ji ZS, Brecht WJ, RallJr SC, Taylor JM, Mahley RW. Overexpression of apolipoprotein E3 in transgenic rabbits causes combined hyperlipidemia by stimulating hepatic VLDL production and impairing VLDL lipolysis. Arteriosclerosis, thrombosis, and vascular biology. 1999 Dec;19(12):2952-9.

[18]. Innerarity TL, Young SG, Poksay KS, Mahley RW, Smith RS, Milne RW, Marcel YL, Weisgraber KH. Structural relationship of human apolipoprotein B48 to apolipoprotein B100. The Journal of clinical investigation. 1987 Dec 1;80(6):1794-8.

[19]. Abumrad NA, Davidson NO. Role of the gut in lipid homeostasis. Physiological reviews. 2012 Jul;92(3):1061-85.

[20]. Rader DJ, Hobbs HH. Disorders of lipoprotein metabolism. Harrisons principles of internal medicine. 2005;16(2):2286.

[21]. Karpe F, Dickmann JR, Frayn KN. Fatty acids, obesity, and insulin resistance: time for a reevaluation. Diabetes. 2011 Oct 1;60(10):2441-9.

[22]. Klop B, WouterJukema J, Rabelink TJ, Castro Cabezas M. A physician's guide for the management of hypertriglyceridemia: the etiology of hypertriglyceridemia determines treatment strategy. Panminervamedica. 2012 Jun 1;54(2):91.

[23]. Datta DV, Sherlock S. Cholestyramine for long term relief of the pruritus complicating intrahepatic cholestasis. Gastroenterology. 1966 Mar 1;50(3):323-32.

[24]. Sharifi F, Hojeghani N, Mazloomzadeh S, Shajari Z. The efficacy of Ezetimibe added to ongoing Fibrate-Statin therapy on postprandial lipid profile in the patients with type 2 Diabetes mellitus. Journal of Diabetes & Metabolic Disorders. 2013 Dec;12:1-8.