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ORIGINAL

Incidence of Dyslipidemia as a public health issue within the provinces of Panamá, Herrera and Los Santos in patients of the General Medicine consultation at the Pueblo Nuevo Health Center, Hospital Dr. Gustavo Nelson Collado and Hospital Joaquín Pablo Franco: Clinical record review during february 2024

Incidencia de las Dislipidemias como problema de salud pública en las provincias de Panamá, Herrera y Los Santos en los pacientes de la consulta de Medicina General en el Centro de Salud de Pueblo Nuevo, Hospital Dr. Gustavo Nelson Collado y Hospital Joaquín Pablo Franco: Revisión de expedientes clínicos durante el mes de febrero de 2024

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ABSTRACT

The main objective of this research is to raise awareness of the high frequency, risks and consequences of lipid disorders. This is a public health problem we are currently facing in our modern society. However, it is a problem whose relevance is not adequately recognized. The consequences of dyslipidemias are concerning, and when left untreated, they are detrimental to the patient's health and quality of life. Increased cardiovascular risk, early development of atherosclerosis and hepatic steatosis are just some of the consequences of sustained high lipid levels over time, as well as, the consumption of tobacco products and other substances. Therefore, patient information and education is of crucial interest to curb the development of the disease. We have gathered data from several institutions to determine the prevalence of dyslipidemias in different areas of the country. Additionally, our aim is to educate the patient as to the risks and consequences that exist and the importance of adherence to treatment in order to obtain maximum efficacy of the treatment and to minimize these risks and consequences.

Keywords: Dyslipidemias; Cardiovascular Risk; Atherosclerosis; Education; Tobacco; Substance Abuse; Consequences; Efficacy.

RESUMEN

El objetivo principal de esta investigación es dar a conocer la frecuencia, los riesgos y consecuencias de la dislipidemia. Este es un problema de salud pública el cual enfrentamos actualmente como sociedad moderna. Sin embargo, es un problema cuya relevancia no es debidamente reconocida. Las consecuencias de las dislipidemias son preocupantes, y al no ser tratadas, son perjudiciales para la salud y calidad de vida del paciente. El aumento del riesgo cardiovascular, el desarrollo temprano de aterosclerosis y la esteatosis hepática son solo algunas de las consecuencias de los niveles elevados de lípidos sostenidos en el tiempo.

Además, el uso de tabaco u otras sustancias, por lo cual, la información y educación para el paciente resulta de crucial importancia para frenar el desarrollo de la enfermedad. Se ha recurrido a la recopilación de datos en distintas instituciones para determinar la prevalencia de las dislipidemias en diferentes áreas del país, a través de revisión de expedientes clínicos (Centro de Salud de Pueblo Nuevo, Hospital Dr. Gustavo Nelson Collado y Hospital Joaquín Pablo Franco). Así mismo, la finalidad es educar al paciente en cuanto a los riesgos y consecuencias que existen y la importancia de la adherencia al tratamiento para obtener la máxima eficacia de este y reducir al mínimo dichos riesgos y consecuencias.

Palabras clave: Dislipidemias; Riesgo Cardiovascular; Aterosclerosis; Educación; Tabaquismo; Uso de Sustancias; Consecuencias; Eficacia.

INTRODUCTION

Definition of dyslipidemia

Dyslipidemia can be defined as a spectrum of lipid abnormalities characterized by elevated plasma concentrations of cholesterol, triglycerides, or both. It affects the structure, metabolism, and physiology of lipoproteins.

Lipoproteins are complexes of lipids and proteins that are essential for the transport of cholesterol, triglycerides, and fat-soluble vitamins in plasma. Lipoproteins, chylomicrons, very low-density lipoproteins (VLDL), low-density lipoproteins (LDL), intermediate-density lipoproteins (IDL), and high-density lipoproteins (HDL) play a fundamental role in the absorption of dietary cholesterol, long-chain fatty acids, and fat-soluble vitamins. Additionally, they are crucial for transporting cholesterol from peripheral tissues back to the liver and ultimately to the intestine for excretion.[1,2,3]

These disorders of lipoprotein metabolism can be primary, associated with genetic conditions, or secondary to other diseases and/or environmental factors (diet, sedentary lifestyle). This causes an increase or decrease in the circulating levels of lipids or lipoproteins. Among the most prevalent are:

- Severe hypertriglyceridemia: Increase in fasting serum triglycerides (TG) > 500 mg/dl, associated with low HDL cholesterol levels.
- Severe hypercholesterolemia: Increased LDL levels > 190 mg/dl
- Mixed hyperlipidemia: Defined as TG > 150 mg/dl and LDL > 130 mg/dl

Lipoprotein imbalances can have various clinical consequences. Among the most common are atherosclerosis, increased cardiovascular risk, acute pancreatitis, cholelithiasis, hepatic steatosis, hepatic cirrhosis, and metabolic syndrome.

According to the National Cholesterol Education Program (NCEP) Adult Treatment Panel III (ATP III) 2001, mixed dyslipidemia is recognized as atherogenic, very common in the population, and frequently associated with metabolic syndrome and type 2 diabetes. In turn, this triad is a significant risk factor for cardiovascular disease, making early diagnosis extremely important, as treatment can significantly reduce the risks.[4,5,6]

Clinical importance of this study—Introduction:

The importance of this research lies in understanding the incidence of dyslipidemia in specific provinces of Panama, Herrera and Los Santos. The objective is to identify the characteristics of the most affected population, as well as the main etiologies of this disease. This knowledge is essential for both the treatment and prevention of the disease.

Understanding the demographic and health characteristics of the affected population can help design more effective intervention and prevention strategies. Identifying the specific etiologies of dyslipidemia can inform the implementation of targeted preventive measures, such as promoting healthy lifestyles. Additionally, investigating the most common complications associated with dyslipidemia would provide crucial information for improving medical care and reducing the disease burden in the population.[7,8,9]

Furthermore, it is crucial to assess the effectiveness of medications used in the healthcare system to treat dyslipidemia. Understanding which treatments are most effective and how they are utilized in clinical practice can help optimize treatment protocols and enhance health outcomes for affected patients. In summary, this research not only provides valuable information on the prevalence and characteristics of dyslipidemia in these provinces of Panama, but also has the potential to significantly impact the prevention, treatment, and management of this disease within the local health system.[10,11,12]

Physiology (normal lipid transport)

Lipoproteins contain a core of hydrophobic lipids (TG and cholesterol esters) surrounded by a coat of

hydrophilic lipids (phospholipids, unesterified cholesterol) and proteins (called apolipoproteins) that interact with body fluids.

Lipids acquired in the diet are hydrolyzed by intestinal lipases and emulsified with bile acids to form micelles. Another key function of lipoproteins is the transport of hepatic lipids from the liver to the periphery, providing a source of energy during fasting. During fasting, lipolysis of adipose triglycerides generates fatty acids that are transported to the liver, which is also capable of synthesizing fatty acids through the process of de novo lipogenesis. HDL, or high-density lipoprotein, plays a crucial role in the reverse transport of cholesterol and provides protective functions in the cardiovascular system. HDL synthesis occurs in both the liver and the intestine, where apolipoprotein A-I (apoA-I) is a key molecule incorporated during the formation of HDL particles. Newly secreted apoA-I acquires phospholipids and unesterified cholesterol through cell flow, leading to the formation of dissociated HDL particles. These HDL particles participate in the selective uptake of cholesterol.

Alternatively, cholesterol ester transfer protein (CETP) facilitates the transfer of cholesterol esters from HDL to other lipoproteins in exchange for triglycerides (TG). Cholesterol esters taken up by the hepatocyte are hydrolyzed, and the resulting cholesterol is excreted directly into the bile or converted to bile acids for elimination. Together, HDL transport facilitates the reverse transport of cholesterol, playing a vital role in removing excess cholesterol from peripheral tissues and thereby contributing to cardiovascular health.

Epidemiology

Dyslipidemia in Latin America, with a special focus on Panama, is a significant health problem. In the region, the prevalence of atherogenic dyslipidemia is significant, which has led to the creation of the Latin American Association for the Study of Lipids (ALALIP) to address this issue. Ministry of Health National Planning Directorate Workshop Analysis of the Health Situation in Panama 2015.

In Panama, dyslipidemia is closely associated with cardiovascular disease, being a common risk factor with a prevalence of up to 25 % in men and 42 % in women, which increases cardiovascular risk. Ministry of Health National Planning Directorate Health Situation Analysis Workshop Panama 2015.

Links to cardiovascular disease

Dyslipidemia is one of the main risk factors for ischemic heart disease, the leading cause of death worldwide. Early detection and early therapeutic intervention are key elements in the adequate prevention of cardiovascular disease. Despite the extensive evidence on its clinical management, the rate of patients who achieve reasonable control of their lipid levels, especially in patients with high and very high cardiovascular risk (CVR), is very low.[7]

Dyslipidemia can trigger a series of cardiovascular diseases due to the accumulation of lipids in the arteries and the associated inflammatory and procoagulant processes. One of the most common conditions is coronary artery disease, which develops when the coronary arteries that supply blood to the heart muscle narrow or become blocked due to the formation of atherosclerotic plaques. This can lead to angina pectoris, myocardial infarction, or sudden cardiac death, depending on the degree of obstruction and the response of the heart tissue to ischemia.

In addition, dyslipidemia increases the risk of cerebrovascular disease, including ischemic and hemorrhagic strokes, by promoting the formation of atherosclerotic plaques in the cerebral arteries or by contributing to the formation of blood clots that can obstruct cerebral blood flow. Other manifestations of dyslipidemia include peripheral arterial disease, which is characterized by narrowing of the arteries that supply blood to the extremities, increasing the risk of intermittent claudication, leg ulcers, and gangrene.

Legs and gangrene. Dyslipidemia can also precipitate the onset of less common but equally serious cardiovascular diseases, such as mesenteric artery disease, which affects the arteries that supply the intestines and can cause acute intestinal ischemia.

METHOD

Study population

The study population includes all patients diagnosed with dyslipidemia who consulted the general medicine services of the health centers in Pueblo Nuevo, as well as the Dr. Gustavo Nelson Collado and Joaquín Pablo Franco hospitals, between 7 a.m. and 12 p.m. from March 4 to 8, 2024. These data were obtained by reviewing the clinical records of the aforementioned institutions.

Inclusion and exclusion criteria

Inclusion criteria

Lipid parameters measured

Table 1. The most useful lipid parameters used to measure a patient's risk of developing cardiovascular disease

Criteria	Definition	Value (mg/dL)
Total cholesterol (TC):	This represents the total amount of cholesterol in the body, including that carried by lipoproteins.	< 200 mg/dl
LDL cholesterol (LDL-C):	Known as "bad cholesterol," this refers to cholesterol carried by low-density lipoproteins. High levels of this parameter indicate a high risk of cardiovascular disease.	< 100 mg/dl
HDL cholesterol (HDL-C):	Known as "good cholesterol," this refers to cholesterol carried by high-density lipoproteins. High levels of this parameter are associated with a lower risk of cardiovascular disease.	> 35 mg/dl Men > 40 mg/dl Women
Triglycerides (TG):	These represent the amount of triglycerides in the blood, a form of fat. High levels are associated with an increased risk of cardiovascular disease.	< 150 mg/dl

Study design (observational, clinical trial, etc.)

This study was conducted by collecting data obtained through a review of hospital medical records (Pueblo Nuevo Health Center, Dr. Gustavo Nelson Collado Hospital, and Joaquín Pablo Franco Hospital) .[1] The parameters were as follows:

a) Diet. Regular consumption of foods high in saturated fats and trans fats.
b) Sedentary lifestyle. Frequency of physical activity or lack of physical activity.
c) Comorbidities. Diabetes, hypertension, obesity, etc.
d) Family influence on the disease
e) Consumption of substances such as alcohol, tobacco, or drugs
f) Adherence to treatment and drug costs
g) More altered laboratory values, to determine whether it is hypercholesterolemia, hypertriglyceridemia, or mixed hyperlipidemia.

The information has been obtained from the following bibliographic sources: Harrison, Principles of Internal Medicine, Elsevier.

The main words were: dyslipidemia, cardiovascular risk, atherosclerosis, education, smoking, substance use, consequences, effectiveness.

The languages used to obtain information were Spanish and English.

RESULTS

Lipid levels found in the population.

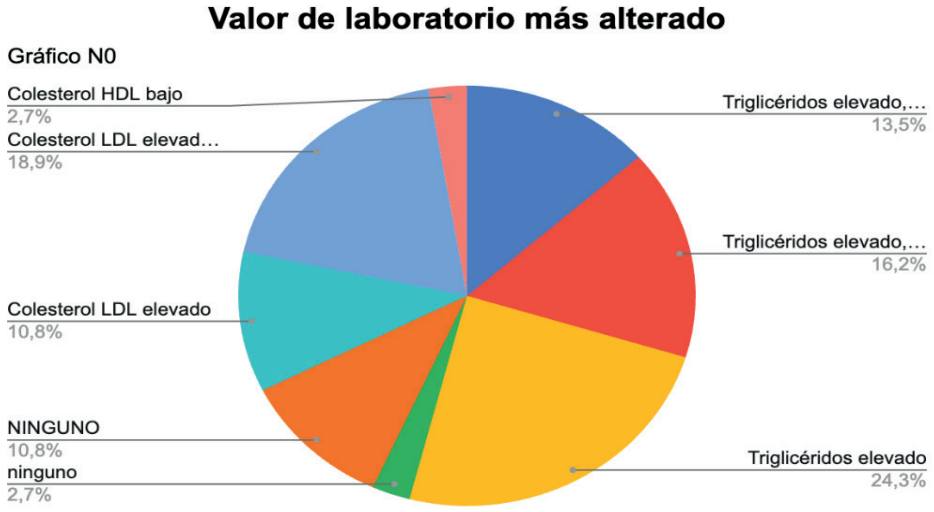


Figure 1. Distribution of lipid levels in reviewed clinical records

Among the files reviewed, 13 % of patients showed no changes in laboratory values, indicating that they did not exhibit elevated LDL cholesterol, triglycerides, or decreased HDL cholesterol. On the other hand, 54 % of

cases showed elevated triglycerides, with 45 % presenting isolated elevation of this component. Additionally, 59 % of patients exhibited an increase in LDL cholesterol levels, with 18 % experiencing an isolated rise in this type of cholesterol. Finally, 35 % of participants showed a decrease in cholesterol and HDL levels, with only 7 % of these cases presenting an isolated reduction in HDL cholesterol levels.

In contrast to the findings of the study "Distribution of lipid levels and prevalence of hyperlipidemia: data from NHANES 2007-2018" published in 2022, which reported significantly higher serum cholesterol levels than triglycerides in African Americans, Mexican Americans, and Caucasians, our results revealed an opposite trend. Our sample indicated that 54 % of the records reviewed showed patients had higher triglyceride levels than LDL cholesterol. This contrast between the findings underscores the importance of considering demographic and population variations when interpreting serum lipid-related data.

DISCUSSION

Interpretation of results in the context of the literature

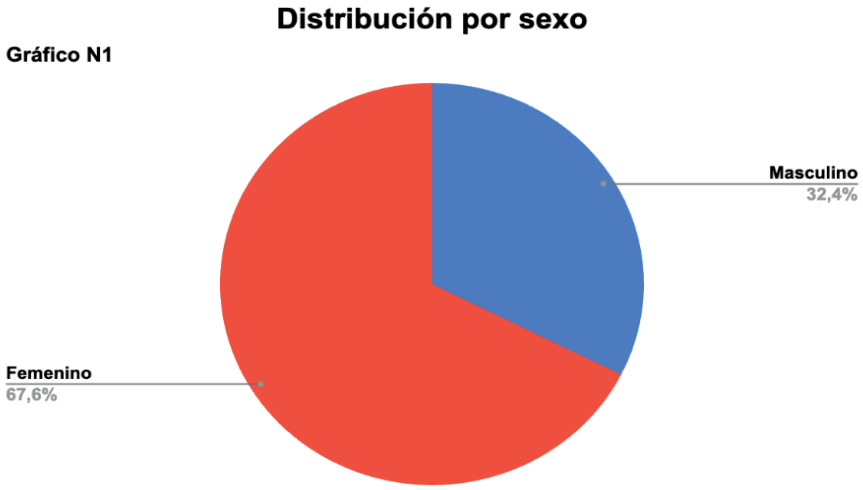


Figure 2. Distribution by sex

The majority of patients were female, accounting for 67,6 % of the total, while males comprised 32,4 %. The predominance of women (67,6 %) over men (32,4 %) in the sample may reflect a trend observed in larger epidemiological studies, where women tend to have lower levels of LDL cholesterol and triglycerides before menopause, but this difference decreases after menopause. Additionally, women tend to have higher HDL cholesterol levels than men, which may serve as a protective factor against cardiovascular disease.

According to a study conducted by the University of Cuenca, Ecuador. About sex, women were predominant with 34,4 %, and in men, with 28,7 %. The prevalence of hypertriglyceridemia was 58,5 %. Therefore, we can determine that dyslipidemia is more common in women.[6]

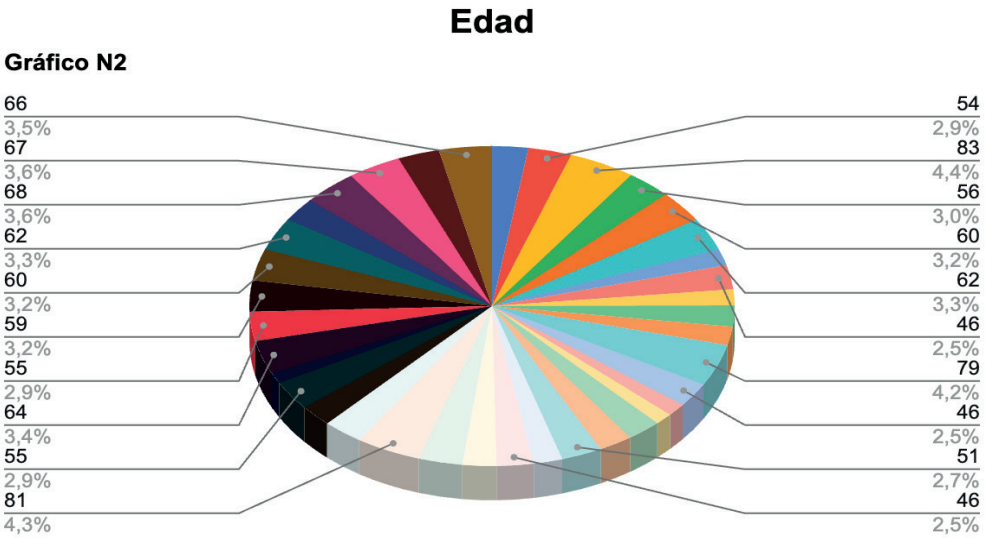


Figure 3. Age distribution

Patients aged between 20 and 80 were evaluated. The highest incidence of dyslipidemia was observed in people aged between 40 and 68. The ages with the lowest incidence were between 20 and 38 years old, as well as between 70 and 80 years old. This suggests that dyslipidemia is more common in middle-aged and older adults.

The predominance of dyslipidemia between the ages of 40 and 68 may be attributable to age-related physiological changes, such as decreased hepatic lipoprotein activity, which affects lipid metabolism. In addition, this age group tends to be more exposed to modifiable risk factors, such as diets high in saturated fats and simple carbohydrates, as well as physical inactivity, all of which are known to influence lipid profiles.

According to the same study mentioned above, conducted by the University of Cuenca, Ecuador. The average age was found to be 51 years, with 71,9 % of the participants being women.[6]

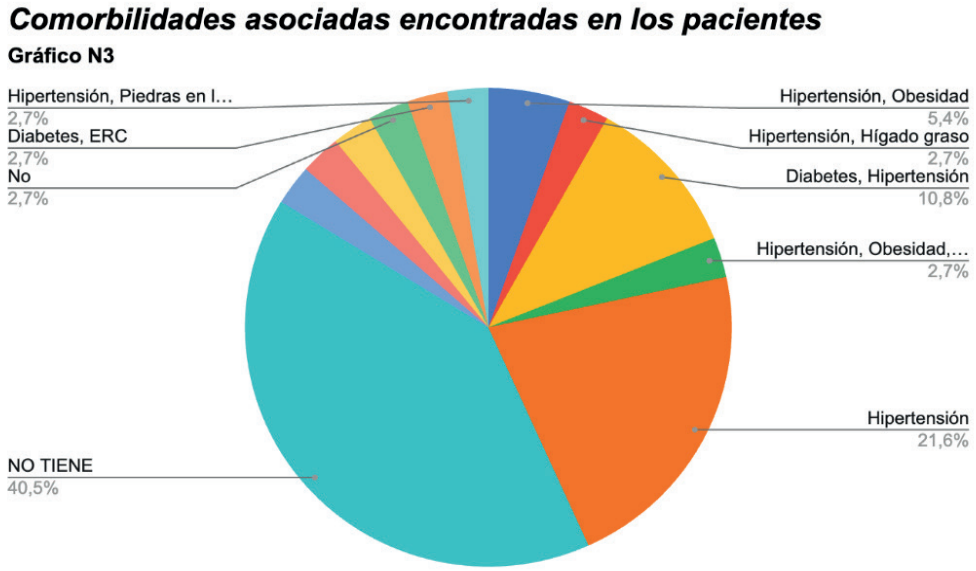


Figure 4. Associated comorbidities found in patientst

Hypertension was the most common disease presented by patients, followed by those who had no disease. Other diseases present included diabetes, obesity, gallstones, fatty liver, and chronic kidney disease (CKD), which were less common in the sample.

The association between hypertension and dyslipidemia is well known, as both conditions are often related and share common risk factors, such as obesity and an unhealthy diet. The presence of hypertension can also influence the pathophysiology of dyslipidemia, affecting lipid homeostasis and increasing the risk of cardiovascular disease.

According to a study conducted by the Pontificia Universidad Javeriana in Bogotá, Colombia, hypertension was the most prevalent comorbidity (63,1 %). We can therefore conclude that the most common comorbidity is hypertension.

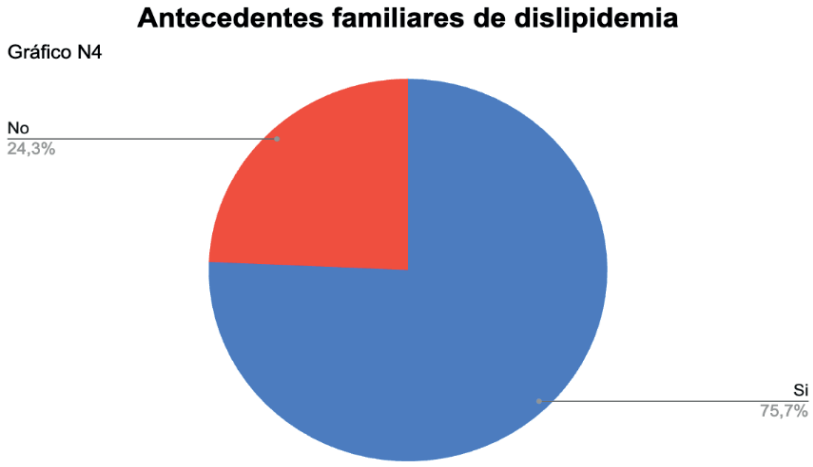


Figure 5. Family history of dyslipidemia

The high incidence of a family history of high cholesterol/triglycerides (75,7 %) among patients suggests a strong genetic component in the predisposition to dyslipidemia. The inheritance of lipid disorders can significantly influence an individual's lipid profile, increasing the risk of developing dyslipidemia throughout life. This genetic predisposition can interact with environmental factors, such as diet and lifestyle, to influence the manifestation of the disease's phenotypic expression.

According to a study conducted by the Pontificia Universidad Javeriana in Bogotá, Colombia. In relation to family history of dyslipidemia, the prevalence in patients was found to be approximately 40 %.

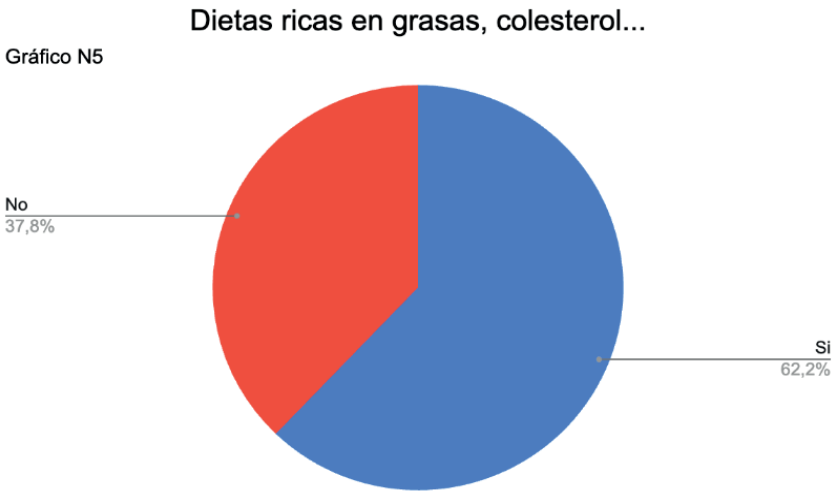


Figure 6. Distribution of high-fat dietst

In the data collected, most patients consumed a diet high in fat (62,2 %), suggesting eating habits that may contribute to the development of dyslipidemia. Saturated fats and trans fats present in processed and fried foods can raise LDL cholesterol and triglyceride levels in the blood, thus promoting the formation of atheromatous plaques and increasing the risk of cardiovascular disease.

According to a study conducted by the Mexican Social Security Institute, Mexico. In relation to diet, it was found that 166 people (58 %) have a healthy, low-fat diet.

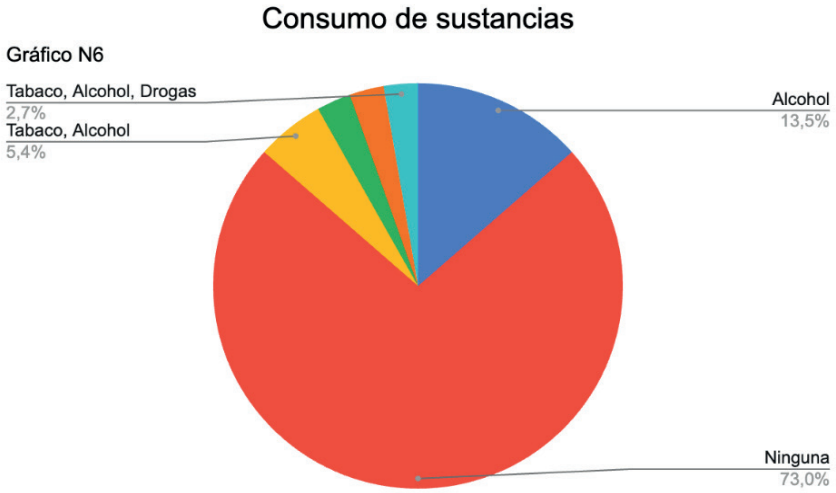


Figure 7. Substance use

Most patients do not consume any additional substances. However, in a significant number of the data collected, alcohol consumption was present in approximately 8,1 % of patients. A much smaller number mentioned tobacco or drug use. Moderate alcohol consumption has been associated with an increase in HDL cholesterol, which could have a beneficial effect on cardiovascular health. However, excessive and chronic alcohol consumption, represented by 2,7 % of patients, can increase triglyceride levels, contributing to the development of dyslipidemia and increasing cardiovascular risk.

According to a study conducted by the Pontificia Universidad Javeriana in Bogotá, Colombia. About substance use, it was found that 71,6 % of patients did not use additional substances.

Figure 8. Performing physical activity

The graph illustrates patients' responses regarding their regular exercise habits. We found that 51 % of them do exercise, while the other 49 % do not. Regular exercise is essential for maintaining a healthy lifestyle. It helps control weight, improves heart health and blood circulation, increases strength and endurance, and can improve mood and energy levels. Although more than half of the patients reviewed engage in some form of physical activity, a large percentage still do not. Encouraging physical activity is crucial to improving overall health and preventing chronic diseases.

According to a study conducted in Mexico on "Epidemiological characteristics of patients with dyslipidemia enrolled in Family Medicine Unit Number 66," which was conducted on 287 people, only 283 people (99 %) engage in low physical activity, and 4 (1 %) engage in moderate physical activity.

Figure 9. Adherence to treatment

The graph shows that most patients adhere to their medical treatment, taking medication regularly, while a significant group does not currently follow any medication regimen. A small number take medication intermittently or not at all. This underscores the importance of treatment adherence for the effective management of dyslipidemia.

According to the same study mentioned above by the Mexican Social Security Institute, of the 287 patients, 174 (61 %) were currently undergoing treatment.

The figure 10 illustrates patients' perceptions of the cost of their medications. Forty-eight point six percent of patients cannot afford the cost of drugs. Thirteen point five percent of patients can afford the cost. The remaining 37,8 % of patients do not have a medication regimen.

This suggests that most patients in this database experience financial difficulties in covering their medical expenses for medications or lack a medication coverage plan. This information is crucial for assessing the

accessibility and affordability of medical treatments, as it may indicate a need for assistance or intervention to improve access to medications.

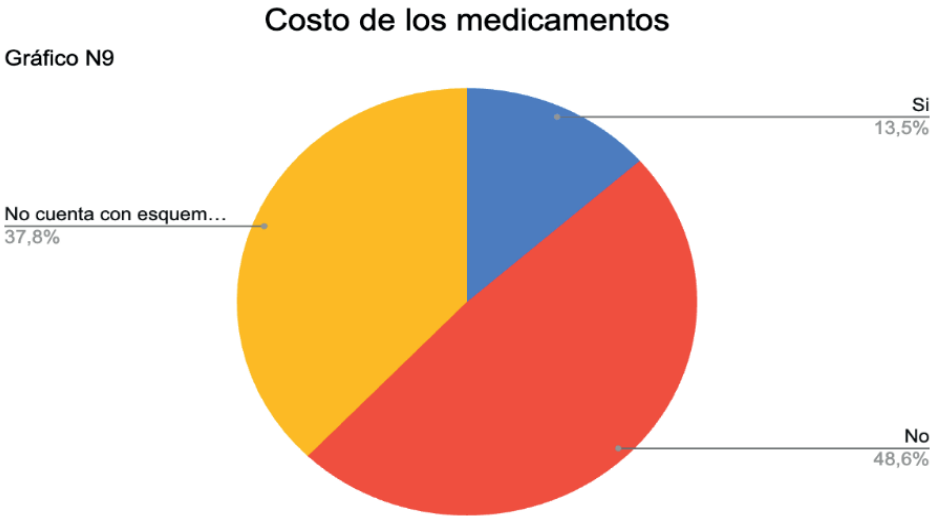


Figure 10. Cost of medications

According to a study conducted by the University of São Paulo in Brazil, 26 % of patients are unable to afford the cost of their medications.

Figure 11. Noticeable improvements in health

This graph illustrates the percentage of patients who have experienced a noticeable improvement in their health, depending on whether they use medications to treat dyslipidemia. Forty-eight point six percent of patients experienced noticeable improvements in their health. Only 10,8 % reported no improvements in their health. The remaining 40,5 % of patients do not have a medication monitoring plan in place.

These results suggest that nearly half of patients with dyslipidemia have experienced a significant improvement in their health, which is a positive outcome. However, a considerable proportion do not have a medication monitoring plan, which could suggest an opportunity to improve treatment management in these patients. The latter could affect treatment adherence and disease control, which is particularly important in the management of dyslipidemia, as adequate monitoring can significantly influence health outcomes.

Among the results found in a study at the Fuensanta Health Center in Valencia, Spain, on “Results of the improvement action in dyslipidemic patients

dyslipidemia at a health center” conducted from 2009 to 2011, the results showed a difference over the years in the reduction of total cholesterol with a difference of 19,4; LDL showed a difference of 19,7; HDL, 3,6; and triglycerides with a difference of 13,9 in the reduction of values.

It can therefore be concluded that with a good choice of medications and good adherence to treatment, lipid levels can be significantly reduced. Management of dyslipidemia: since 2001, there have been targets

based on the National Cholesterol Education Program and Treatment of High Blood Cholesterol in Adults (Adult Treatment Panel III) (NCEP-ATP III), whose report emphasized the importance of establishing LDL-C levels to be achieved according to the patient's overall risk, taking into account other variables such as age, total cholesterol, smoking status, HDL-C levels, and systolic blood pressure (SBP). According to the figures for these variables and based on the Framingham study, a sum of points was obtained that configured a risk for that specific patient, classified into three levels. According to this risk, the LDL-C targets were <100 mg/dL in the high-risk group, <130 mg/dL in the moderate-risk group, and <160 mg/dL in the low-risk group.

A look at the National Cholesterol Education Program: Adult Treatment Panel (ATP) III Guidelines At-A-Glance Quick Desk Reference (2001)
Determine lipoprotein levels—obtain a complete lipid profile after 9–12 hours of fasting

Table 2. ATP III Classification of LDL, Total, and HDL Cholesterol (mg/dL)

LDL cholesterol - Primary therapy goal	
< 100	Optimal
100-129	Near optimal/above optimal
130-159	High limit
160	High
> 190	Very high
Total cholesterol	
< 200	Desirable
200-239	High limit
> 240	High
HDL cholesterol	
< 40	Low
> 60	High

Treatment of High Blood Cholesterol in Adults (Adult Treatment Panel III) (NCEP-ATP III)

Identify the presence of clinical atherosclerotic disease that confers a high risk for coronary heart disease (CHD) (CHD risk equivalent):

- Clinical coronary heart disease
- Symptomatic carotid artery disease
- Peripheral arterial disease
- Abdominal aortic aneurysm.

Determine the presence of major risk factors (other than LDL)

Main risk factors (excluding LDL cholesterol) that modify LDL targets

- Cigarette smoking
- Hypertension (blood pressure greater than or equal to 140/90 mmHg or on antihypertensive medication)
- Low HDL cholesterol (<40 mg/dL) *
- Family history of premature coronary heart disease (coronary heart disease in a first-degree male relative under age 55; coronary heart disease in a first-degree female relative under age 65).
- Age (men >45 years; women >55 years)

*HDL cholesterol >60 mg/dL counts as a "negative" risk factor; its presence eliminates one risk factor from the total count.

If 2 or more risk factors (other than LDL) are present without coronary heart disease or its risk equivalent, assess the 10-year (short-term) risk of coronary heart disease (see Framingham tables).

Three levels of 10-year risk

- >20 % - equivalent risk of coronary heart disease
- 10-20 %
- <10 %

Determine the risk category

- Set LDL target for therapy.
- Determine the need for therapeutic lifestyle changes (TLC).
- Determine the level at which medication should be considered.

Table 3. LDL cholesterol goals and cut-off points for therapeutic lifestyle changes (TLC) and drug therapy in different risk categories

Risk category	LDL target	LDL level at which to initiate therapeutic lifestyle changes (TLC)	LDL level at which consider drug therapy
CHD or CHD equivalent risks (10-year risk >20 %)	<100 mg/dL	> 100 mg/dL	>130 mg/dL (100-129 mg/dL: drug optional)*
2+ risk factors (10-year risk <20 %)	<130 mg/dL	>130 mg/dL	10-year risk of 10-20 %: 130 mg/dL 10-year risk <10 %: >160 mg/dL
0-1 risk factor	<160 mg/dL	>160 mg/dL	>190 mg/dL (160-189 mg/dL: Optional medication to reduce LDL.)

Treatment of High Blood Cholesterol in Adults (Adult Treatment Panel III) (NCEP-ATP III)

Initiate therapeutic lifestyle changes (TLC) if LDL is above target

- TLC diet:
- Saturated fat <7 % of calories, cholesterol <200 mg/day.
- Consider increasing viscous (soluble) fiber (10-25 g/day) and phytosterols/phytostanols (2 g/day) as therapeutic options to enhance LDL reduction.
- Weight control
- Increased physical activity

Consider adding drug therapy if LDL exceeds the levels shown in the table in Step 5

- Consider using medications simultaneously with TLC for coronary heart disease (CHD) and its equivalents.
- Consider adding medications to TLC after 3 months for other risk categories.

Identify metabolic syndrome and treat it, if present, after 3 months of LTC (therapeutic lifestyle changes)

Table 4. Treatment of High Blood Cholesterol in Adults (Adult Treatment Panel III) (NCEP-ATP III)

Drug class	Agents and daily dose	Effects on lipids/ lipoproteins	Adverse effects	Contraindications
HMG-CoA reductase inhibitors (statins)	Lovastatin 20-80 mg Pravastatin 20-40 mg Simvastatin 20-80 mg Fluvastatin 20-80 Atorvastatin 10-80 Cerivastatin 0,4-0,8	LDL: <18-55 % HDL: >5-15 % TG: <7-30 %	Myopathies increased liver enzymes	Absolute: Active or chronic liver disease Relative: Concomitant use with
bile acid sequestrants.	Cholestyramine 4-16 g Colestipol 5-20 g Colesevelam 2,6-3,8 g	LDL: <15-30 % HDL: > 3-5 % TG: no change	Abdominal distress Constipation Decreased absorption of other drugs	Absolute: dysbetalipoproteinemia TG > 400 mg/dL Relative: TG >200 mg/dL
Nicotinic acid	Immediate-release nicotinic acid (crystalline) (1,5-3 g), extended-release nicotinic acid (Niaspan®) (1-2 g), sustained-release nicotinic acid (1-2 g).	LDL: <5-25 % HDL: >15-35 % TG: < 20-50 %	Flushing Hyperglycemia Hyperuricemia (or gout) Upper gastrointestinal distress Hepatotoxicity	Absolute: Chronic liver disease Severe gout Relative: Diabetes Hyperuricemia Peptic ulcer
Fibric acids (fibrates)	Gemfibrozil 600 mg BID Fenofibrate 200 mg Clofibrate 100 mg BID	LDL: >5-20 % (may increase in patients with high TG) HDL: >10-20 % TG: < 20-50 %	Dyspepsia Gallstones Myopathies	Absolute: Severe kidney disease Severe liver disease

Cyclosporine, macrolide antibiotics, various antifungal agents, and cytochrome P-450 inhibitors (fibrates and niacin should be used with caution).

Table 5. Treatment of High Blood Cholesterol in Adults (Adult Treatment Panel III) (NCEP-ATP III) Clinical identification of metabolic syndrome: any of the following 3 criteria

Risk factors	Defining level
Abdominal obesity	Waist circumference
Men	> 102 cm (>40 inches)
Women	> 88 cm (>35 inches)
Triglycerides	greater than or equal to 150 mg/dL
HDL cholesterol	
Men	<40 mg/dL
Women	<50 mg/dL
Blood pressure	greater than or equal to 130/85 mmHg
Fasting glucose	greater than or equal to 110 mg/dL

Treatment of metabolic syndrome

Treat underlying causes (overweight/obesity and physical inactivity):

- Intensify weight management.
- Increase physical activity.

Treat lipid and non-lipid risk factors if they persist despite these lifestyle therapies:

- Treat hypertension.
- Use aspirin in patients with coronary heart disease to reduce prothrombotic status.
- Treat elevated triglycerides and/or low HDL (as shown in Step 9).

Treat high triglycerides

ATP III classification of serum triglycerides (mg/dL)

- >150: Normal
- 150-199 High limit
- 200-499: High
- 500 or higher: Very high

Treatment of high triglycerides (greater than or equal to 150 mg/dL)

- The main goal of therapy is to achieve the LDL target.
- Intensify weight management.
- Increase physical activity.
- If triglycerides are >200 mg/dL after achieving the LDL target, set a secondary target for non-HDL cholesterol (total - HDL) 30 mg/dL higher than the LDL target.

Table 6. Comparison of LDL cholesterol and non-HDL cholesterol targets for three risk categories

Risk factors	LDL target (mg/dL)	Non-HDL target (mg/dL)
Coronary heart disease (CHD) and CHD risk equivalent (10-year CHD risk >20 %)	<100	<130
Multiple (2+) risk factors and 10-year risk <20 %	<130	<160
0-1 risk factor	<160	<190

If triglycerides are between 200-499 mg/dL after reaching the LDL goal, consider adding medication if necessary to reach the non-HDL goal

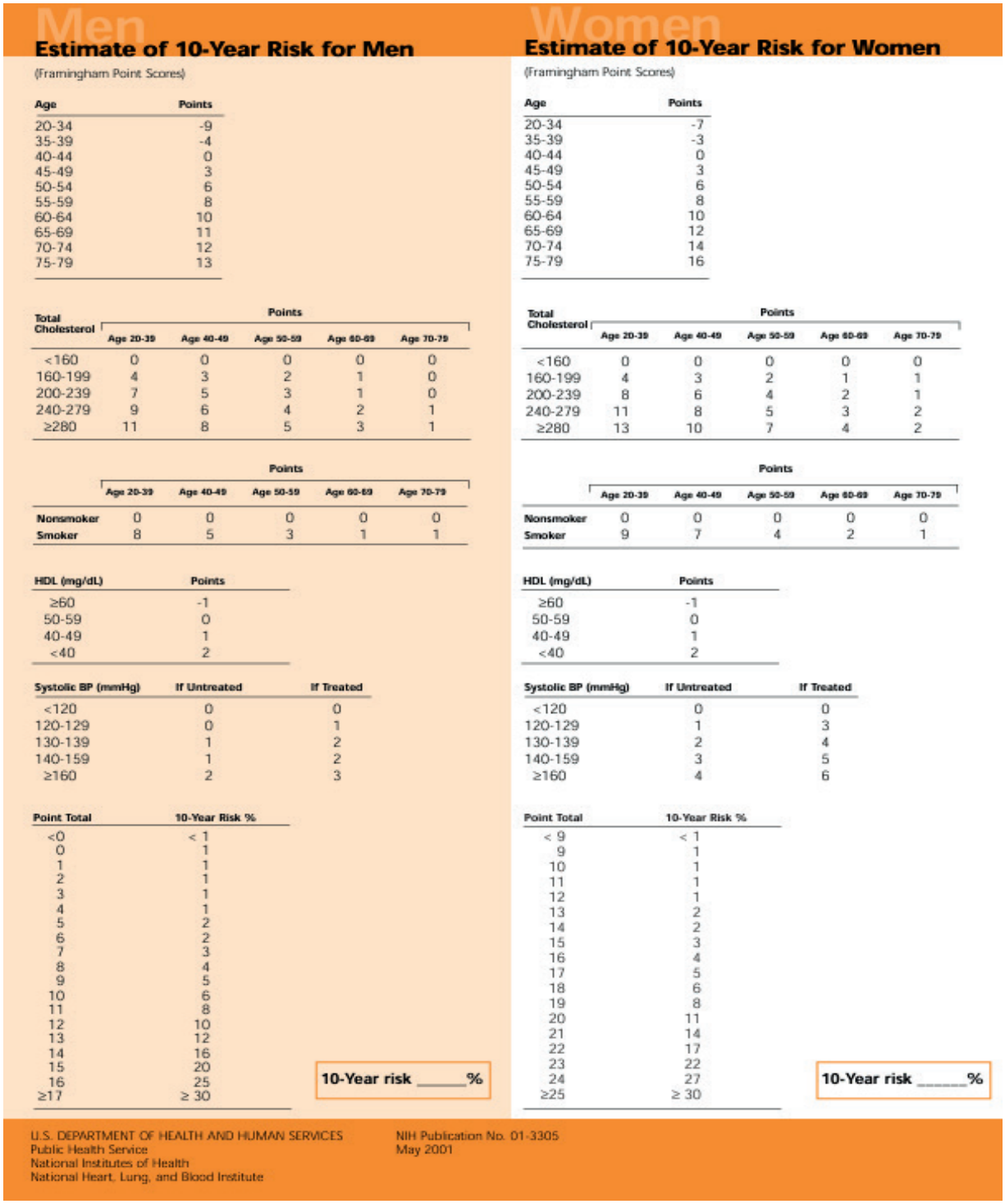
- Intensify LDL-lowering drug therapy.
- Add nicotinic acid or fibrate to further reduce VLDL.

If triglycerides are >500 mg/dL, first lower triglycerides to prevent pancreatitis

- Very low-fat diet (<15 % of calories from fat)
- Weight management and physical activity
- Fibrate or nicotinic acid
- When triglycerides are <500 mg/dL, resort to LDL-lowering therapy.

Treatment for low HDL cholesterol (<40 mg/dL)

- First achieve LDL goal, then:
- Intensify weight management and increase physical activity.
- If triglycerides are between 200-499 mg/dL, achieve non-HDL target.
- If triglycerides are <200 mg/dL (isolated low HDL) in CHD or its equivalent, consider nicotinic acid or fibrate.



Men

Estimate of 10-Year Risk for Men

(Framingham Point Scores)

Age	Points
20-34	-9
35-39	-4
40-44	0
45-49	3
50-54	6
55-59	8
60-64	10
65-69	11
70-74	12
75-79	13

Total Cholesterol	Points				
	Age 20-39	Age 40-49	Age 50-59	Age 60-69	Age 70-79
<160	0	0	0	0	0
160-199	4	3	2	1	0
200-239	7	5	3	1	0
240-279	9	6	4	2	1
≥280	11	8	5	3	1

	Points				
	Age 20-39	Age 40-49	Age 50-59	Age 60-69	Age 70-79
Nonsmoker	0	0	0	0	0
Smoker	8	5	3	1	1

HDL (mg/dL)	Points
≥60	-1
50-59	0
40-49	1
<40	2

Systolic BP (mmHg)	If Untreated	If Treated
<120	0	0
120-129	0	1
130-139	1	2
140-159	1	2
≥160	2	3

Point Total	10-Year Risk %
<0	< 1
0	1
1	1
2	1
3	1
4	1
5	2
6	2
7	3
8	4
9	5
10	6
11	8
12	10
13	12
14	16
15	20
16	25
≥17	≥ 30

10-Year risk _____%

Women

Estimate of 10-Year Risk for Women

(Framingham Point Scores)

Age	Points
20-34	-7
35-39	-3
40-44	0
45-49	3
50-54	6
55-59	8
60-64	10
65-69	12
70-74	14
75-79	16

Total Cholesterol	Points				
	Age 20-39	Age 40-49	Age 50-59	Age 60-69	Age 70-79
<160	0	0	0	0	0
160-199	4	3	2	1	1
200-239	8	6	4	2	1
240-279	11	8	5	3	2
≥280	13	10	7	4	2

	Points				
	Age 20-39	Age 40-49	Age 50-59	Age 60-69	Age 70-79
Nonsmoker	0	0	0	0	0
Smoker	9	7	4	2	1

HDL (mg/dL)	Points
≥60	-1
50-59	0
40-49	1
<40	2

Systolic BP (mmHg)	If Untreated	If Treated
<120	0	0
120-129	1	3
130-139	2	4
140-159	3	5
≥160	4	6

Point Total	10-Year Risk %
< 9	< 1
9	1
10	1
11	1
12	1
13	2
14	2
15	3
16	4
17	5
18	6
19	8
20	11
21	14
22	17
23	22
24	27
≥25	≥ 30

10-Year risk _____%

U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES
Public Health Service
National Institutes of Health
National Heart, Lung, and Blood Institute

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Figure 12. 10-year risk estimate for men and women

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Since ATP III, the guidelines for the treatment of hypercholesterolemia in adults had not been updated despite the extensive literature generated, until 2013 (12 years later), when Stone et al, endorsed by the American College of Cardiology and the American Heart Association (ACC/AHA) in the US, updated the ATP III and released what would become the ATP IV, a clinical practice guideline for the treatment of hypercholesterolemia in adults, using a selection process consisting exclusively of randomized controlled trials (RCTs) and/or meta-analyses of RCTs. The results obtained from these studies, based on a reduction in LDL-C and non-HDL cholesterol (total cholesterol minus HDL cholesterol), served as the basis for recommending the recommendations for CVD prevention, both primary and secondary, as well as for assessing the effect of lipid-lowering drugs, especially statins, with little mention of other drugs in the prevention of CVD. The most notable aspect of this guideline was that it did not consider LDL-C cut-off points as targets to be achieved, as recommended by European guidelines, causing a significant impact due to the paradigm shift that the new approach represented.

Table 7. Major recommendations for the treatment of hypercholesterolemia to reduce atherosclerotic cardiovascular disease

Facilitate and promote healthy lifestyle habits in all individuals. **Initiate or continue statin treatment at the appropriate intensity:**
1. Clinical cardiovascular disease (CVD) People ≤75 years of age who tolerate statins: high-intensity statins (class I, level A) People >75 years of age or with statin intolerance: moderate-intensity statins (class I, level A)
2. Primary prevention: LDL-C ≥190 mg/dL Rule out secondary causes of hypercholesterolemia. People ≥21 years of age: high-intensity statins (class I, level B) Achieve ≥50 % reduction in LDL-C (class IIa, level B), Consider non-statin therapy to further reduce LDL-C (class IIb, level C)
3. Primary prevention: people with DM between 40 and 75 years of age and with LDL-C between 70 and 189 mg/dL: Moderate-intensity statins (class I, level A) Consider high-intensity statins when the risk of CVD is ≥7,5 % (class IIa, level B)
4. Primary prevention: people aged 40 to 75 years without DM and with LDL-C between 70 and 189 mg/dL: Assess the 10-year risk of CVD (using a risk calculator based on joint cohort equations is recommended) in people who are not being treated with statins; reassess the risk every 4–6 years (class I, level B). The initial decision to take a statin should be agreed with the patient, informing them of the reduction in CVD risk, the adverse effects of statins, drug interactions, and the patient's preferences (class IIa, level C). Insist on healthy lifestyle habits and assess other risk factors. If statin treatment has been chosen: People at risk of CVD ≥7,5 % at 10 years: moderate- or high-intensity statins (class I, level A) People at risk of CVD between 5 and 7,5 % at 10 years: moderate- or high-intensity statins (class IIa, level B) Consider other risk factors: LDL-C ≥160 mg/dL, family history of premature CVD, lifetime CVD risk, high-sensitivity CRP ≥2,0 mg/L, coronary calcium score ≥300 Agatston units, or ATI <0,9 (class IIb, level C).
5. Primary prevention when LDL-C is <190 mg/dL and the person is <40 years old or >75 years old and has a 10-year risk of CVD <5 %: Statins may be considered in selected individuals who may be at increased risk (class IIb, level C).
6. Initial treatment with statins is not routinely recommended in patients with NYHA class II-IV heart failure or who are undergoing hemodialysis.

Table 8. Doses of different statins to be considered high, moderate, and low intensity

Type of statin	**Daily dose**		
	High intensity (*)	**Moderate intensity (**)**	**Low intensity (***)**
Atorvastatin	40-80 mg	10 (20) mg	-
Rosuvastatin	20 (40) mg	(5) 10 mg	-
Simvastatin	-	20-40 mg	10
Pravastatin	-	40 (80) mg	10-20 mg
Lovastatin	-	40 mg	20
Fluvastatin	-	80 mg (XL)	20-40 mg
Fluvastatin	-	40 mg	-
Pitavastatin	-	2-4 mg	1 mg

Note: *A daily dose reduces LDL-C ≥50 %. **A daily dose reduces LDL-C by 30-50 %. ***A daily dose reduces LDL-C by <30 %. LDL-C: low-density lipoprotein cholesterol.

Therefore, the primary objective of this study was to compare the two guidelines and, based on current knowledge, to monitor over time the points of consensus and differences identified between the two recommendations. The current European and US guidelines for the management of dyslipidemia disagree on their objectives and recommendations (2023).

In summary, the main contributions of ATP IV, based on meta-analyses and RCTs, focused on the following points:

- Lifestyle changes. Adopting healthy lifestyles. Special emphasis is placed on the implementation of this section.
- Definition of groups that will benefit from statin treatment (special importance is given to agreeing on treatment with the patient).
- Safety of statins.
- When to start taking statins.
- Estimation of CVR using a risk calculator with a 10-year prediction of MI or stroke, based on the US population, not validated in Spain.
- Intensity of statin treatment.
- Treatment objectives.

Table 9. Most commonly used lipid-lowering drugs and their mechanism of action

Lipid-lowering agent	Class	Mechanism of action
Statins (Atorvastatin, Simvastatin)	HMG-CoA reductase inhibitors	Inhibit HMG-CoA reductase, a key enzyme in cholesterol biosynthesis, thereby reducing LDL cholesterol levels.
Fibrates (Fenofibrate, Gemfibrozil)	Fibrates	They work by activating the peroxisome proliferator-activated receptor alpha (PPAR-α), which results in a decrease in triglycerides and a slight increase in HDL cholesterol.
Ezetimibe	Cholesterol absorption inhibitor	Inhibits cholesterol absorption in the intestine, lowering total and LDL cholesterol levels.
Omega-3 fatty acids (eicosapentaenoic acid, docosahexaenoic acid)	Omega-3 fatty acids	Reduce plasma triglycerides by decreasing VLDL synthesis in the liver.
PCSK9 inhibitors (Evolocumab, Alirocumab)	PCSK9 inhibitors	Bind to and inhibit PCSK9, a protein that degrades LDL receptors, resulting in increased removal of LDL cholesterol from plasma.
Bile acid sequestrants (Cholestyramine, Colesevelam)	Bile acid sequestrants	They bind to bile acids in the intestine, preventing their reabsorption and promoting their excretion, which leads to increased conversion of cholesterol to bile acids.

CONCLUSIONS

Dyslipidemias, disorders characterized by abnormal blood lipid levels, represent a significant risk factor for the development of cardiovascular disease. Generally classified by elevations in the concentrations of low-density lipoprotein (LDL) cholesterol, high-density lipoprotein (HDL) cholesterol, triglycerides, or a combination of these, dyslipidemias can be primary, derived from genetic factors, or secondary, resulting from lifestyle and health conditions.

This research has revealed fundamental aspects of health practices, the management of lipid-related diseases, and perceptions of treatment with lipid-lowering drugs among patients treated at the Pueblo Nuevo Health Center, Dr. Gustavo Nelson Collado Hospital, and Joaquín Pablo Franco Hospital. Data obtained from medical records indicate a concerning prevalence of high-fat diets and a nearly equal distribution between those who exercise regularly and those who do not. Surprisingly, a high percentage of patients have a family history of high cholesterol or triglycerides, highlighting the importance of genetic predispositions in cardiovascular health.

Moderate consumption of potentially harmful substances such as alcohol, tobacco, and drugs reflects a partial awareness of risk factors. Although many patients follow their medication regimens, perceptions about the cost of medications and variability in the experience of health improvement highlight the complexity of accessing treatments and their perceived effectiveness.

The introduction of the most common lipid-lowering drugs and their mechanisms of action in our research provides us with a deeper understanding of the therapeutic options available to combat lipid-related diseases. The effectiveness of these drugs, combined with personal health practices and prevention, plays a crucial role in managing cardiovascular risk.

This research underscores the crucial need for public health strategies that foster healthy lifestyles, enhance cardiovascular health education, and facilitate access to effective treatments. Interventions aimed at improving diet, increasing physical activity, and guiding the use of lipid-lowering drugs may be key to reducing the burden of cardiovascular disease. In addition, it is essential to promote greater awareness of the importance of medication adherence and to understand the financial implications of treatment, ensuring a better quality of life for patients.

RECOMMENDATIONS

An appropriate approach to treating dyslipidemia can enhance the effectiveness of medications. It is essential to consider the relationship between different markers, such as blood triglyceride and cholesterol levels, to optimize therapy.

When treating dyslipidemia, it is crucial to individualize treatment by considering specific triglyceride and cholesterol levels. This allows us to select the most appropriate medication to address the underlying cause of elevated lipid levels. Therefore, it is essential to determine whether the elevation is isolated or occurs in conjunction with other conditions.

Additionally, it is crucial to determine whether the medication is being administered correctly to the patient, taking into account their concurrent medical conditions and individual characteristics. This comprehensive approach to treatment ensures optimal care and more favorable outcomes for the patient overall.

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The authors declare that there is no conflict of interest.

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