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ASSOCIATION OF TOTAL CHOLESTEROL, LDL AND HDL WITH CORONARY ARTERY ATHEROSCLEROSIS

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ABSTRACT

Background: Atherosclerotic coronary artery disease is a major cause of death all over the world. There is a controversy about the relationship between dyslipidemia and the severity of atherosclerotic coronary artery disease in clinical and epidemiological studies. **Aim:** The aim of this study was to assess the relation of lipid profile and the severity of atherosclerotic coronary artery disease as assessed by coronary angiography in Syrian population. **Materials and Methods:** A prospective observational analytical study involved 225 individuals who underwent coronary angiography in Tishreen University Hospital, Lattakia during the period between December 2019 and December 2020. Fasting lipid profile was tested for each patient ,in addition to assessment of other coronary artery disease risk factors. Severity of CAD was determined by evaluating the number and degree of coronary artery obstructions. For statistical analysis, chi-square test and ANOVA with statistical significance set at $p<0.05$. **Results:** Dyslipidemia was found in 52.8% of patients. The most prominent lipid disorder in our study was Low HDL, which was found in 41.7% of patients. Dyslipidemia associated with the number of arteries affected by coronary atherosclerosis, but it was not an indicator of the degree of obstruction. With regard to the number of arteries affected by atherosclerosis, the statistically significant lipid disorder was high total cholesterol and high LDL. **Conclusion:** Dyslipidemia is a very prevalent risk factor in our patients with CAD. Low HDL was the most common lipid abnormality, while high LDL was the one that mostly related to the extent of CAD.

KEYWORDS: Coronary atherosclerosis, dyslipidemia, coronary angiography

INTRODUCTION

Coronary atherosclerosis is the most common cause of death in men and women worldwide. It is the main cause of coronary arterial disease (CAD), in which atherosclerotic changes occur within the walls of the coronary arteries. Coronary arterial disease is a progressive pathological process that generally begins in childhood and manifests itself clinically in mid to late adulthood.[1] The term “atherosclerosis” is of Greek origin and literally means focal accumulation of fat (athere: meaning fat) and thickening of the arterial endothelium (sclerosis: meaning hardening).

It is difficult, if not impossible, to determine the true and exact prevalence of atherosclerosis because it is often an asymptomatic condition. In the United States, approximately 18, 2 million people suffer from CAD and its various complications.[2] Cardiac mortality is lower in the United States and in regions where economies and health care systems are relatively advanced, but the experience is often different around the world. Ischemic heart disease is the leading cause of death in adults in low- and middle-income countries as well as in high-income countries.[3]

Since lipids are insoluble in plasma, they are bound in the bloodstream to lipoproteins and transported to various tissues. Lipoproteins are made of lipids (cholesterol, triglycerides, and phospholipids) and a protein component known as apolipoprotein. All lipoproteins that have apolipoprotein B (apoB) and a diameter up to approximately 70 nm, including low-density lipoprotein (LDL), very low-density lipoprotein (VLDL), and small lipoproteins rich in triglycerides can

cross the endothelium to the inner layer (intima) of the arterial blood vessel wall.[4]

The main event that initiates atherosclerosis is the retention of cholesterol-rich lipoproteins containing apoB within the arterial wall, particularly in the presence of vascular endothelial dysfunction.[5]

Dyslipidemia is a risk factor for developing coronary artery disease (CAD), and this has been demonstrated in numerous clinical and epidemiological studies.[6][7] High serum levels of LDL are directly related to the development of CAD, and low levels of HDL have been indicated as one of the strongest independent risk factors for atherosclerosis in the coronary arteries.

The relationship between the lipid profile and coronary artery disease is well known. However, studies on the role of serum lipoprotein levels as markers of CAD severity still yield contradictory results. The importance of this study is to seek the relationship between lipoprotein levels and CAD severity in our society, especially after the recent publication of several international studies that doubted the association of high LDL with cardiovascular events,[8] and after the classification of Syria as one of the countries with a very high cardiovascular risk by the European Society Of Cardiology.

Thus, the aim of this study was to assess the association between total cholesterol, LDL, and HDL with the severity of atherosclerotic coronary artery disease in patients undergoing coronary angiography in a sample taken by simple random sampling method from patients admitted and treated at Tishreen University Hospital in Latakia.

Research objective

1. Measurement of the serum concentration of total cholesterol, LDL, and HDL in patients undergoing coronary angiography.
2. Determine the results of coronary angiography in patients in terms of:
   Affected coronary arteries, and their number.
   Severity of the stenosis.
3. Study the relationship between the lipid profile and the findings of the coronary angiography.

The research sample

The study included patients who underwent coronary angiography at Tishreen University Hospital during the period between December 2019 and December 2020.

Inclusion criteria

- All patients over 18 years old.

Exclusion criteria

- Diabetics
- Chronic renal failure
- Patients treated with statins for more than two weeks
- Patients with chronic alcoholism

The final sample was composed of 225 patients who underwent coronary angiography.

RESEARCH MATERIALS AND METHODS

- Research design: observational analytical study.
- Research location: Cardiac Division, Cardiac Care, and Cardiac catheterization Unit at Tishreen University Hospital in Lattakia.
- Research period: December 2019 - December 2020.

The data in this study were collected prospectively. All patients were fully aware of the procedure and their informed consent to participate in the research was obtained after receiving sufficient information. This study did not face serious ethical challenges as lipid profile measurement, coronary angiography, are routine steps in the management of patients with acute coronary syndrome or patients with chest pain. Prior to coronary angiography, patients underwent clinical and laboratory evaluation as follows:

Clinical evaluation

It included taking a detailed clinical history and documenting the following information:

Gender, age, main complainant, medical history, surgical history, and personal habits. Diabetes is considered equivalent to the risk of coronary arterial disease, and there is a strong independent relationship between diabetes, low HDL and elevated triglycerides. Therefore, diabetic patients were excluded from this study. We also excluded patients treated with statins.

A thorough clinical examination was performed and the following physical measurements documented:
-Systolic blood pressure (mmHg)
-Diastolic blood pressure (mmHg)
-length (meters)
-Weight (kg)
- Body mass index (BMI): which is the result of dividing the weight (in kg) by the square of height (in meters) and expressing it in kg / m2. Patients were classified according to the WHO definition[9] into:

- Normal BMI: 18.5-24.9 kg / m2.
- Overweight: BMI between 25-29.9 kg / m2.
- Obesity: BMI ≥ 30 kg / m2.

Laboratory evaluation

Fasting venous blood samples (after fasting for 12 hours) were taken before coronary angiography and the following laboratory testss were performed:

- Total cholesterol
- LDL (mg / dl)
- HDL (mg / dl)
- Triglycerides (mg / dL)
- Blood sugar

Total cholesterol, triglycerides, LDL, and HDL were determined by an automated enzymatic technique using the mindray BS-380 Autolysis.

Dyslipidemia has been defined as having one of the following disorders:
HDL< 40 mg / dl in males and < 50 mg / dl in women, LDL ≥160 mg / dl, TG >200 mg / dl, or total cholesterol ≥ 240 mg / dl.

All participants in this research underwent coronary angiography. The research participants were divided into two groups:

1- Patients with significant coronary stenosis group: Obstructive coronary artery disease has been defined as 50% stenosis or more in the lumen of the left main coronary artery (LMA) or 70% stenosis or more in the lumen of other coronary vessels.
2- Patients without significant stenosis group: Patients with stenosis less than 50% in the LMA or less than 70% in the lumen of other coronary vessels were considered as a comparison group in the research.
We documented the affected arteries, and a multi-vessel disease was defined as stenosis of two or more of the following four arteries:

- Left main artery (LMA).
- Left Anterior descending artery (LAD).
- Left circumflex artery (LCX).
- Right coronary artery (RCA).

The severity of stenosis of the lumen of a vessel was evaluated and documented as percentage during angiography, and then classified into three categories as follow:

- Stenosis ≤ 50%
- Stenosis 50-75%
- Stenosis ≥ 75%

Statistical analysis
The analysis was performed using the Statistical Package for Social Sciences (SPSS) (version 20) (IBM Corporation, Armonk, New York, USA) and Excel 2010 program. A predictive value less than 0.05 (P value <0.05) was considered statistically significant.

Descriptive Statistics
- For categorical variables: We used frequency, percentages, and charts (Pie chart) and (Bar chart).
- For continuous variables: measures of central tendency were used (mean, standard deviation).

Inferential statistics
For the test of the statistical relationships between the basal properties, we used the following statistical methods:
- Student's t-test expressed as "t" to compare the mean between two groups.
- The chi-square test, expressed as "X2", for comparing categorical variables with normal distribution.
- One-way ANOVA test to compare the values of the averages between more than two groups.

RESULTS

The study included 225 patients who underwent coronary angiography, the average age of the patients was 55.9 ± 13.4 years, with a range of 28-79 years. Table (1) illustrates the clinical characteristics of patients.

Table 1: Clinical characteristics of patients.

	Properties	Number	Percentage
Age group			
	<35 years	21	9.3%
	36-50 years	59	26.2%
	51-65 years	77	34.2%
	>65 years	68	30.2%
Sex			
	Males	132	58.7%
	Females	93	41.3%
BMI			
	Normal(18.5-25 kg/m2)	42	18.6%
	Overweight (25-29.9 kg / m2)	104	46.2%
	Obesity (≥ 30 kg / m2)	79	35.1%
Risk factors			
	Smoking	138	61.3%
	Hypertension	117	52%
	Family history	74	32.8%

Table (2): mean and standard deviation of laboratory test results in patients.

Lab test	mean	Standard deviation
Total cholesterol (mg / dL)	197.8	48.2
LDL (mg / dl)	126.3	36.3

HDL (mg / dl)	41.7	13.5
Triglycerides (mg / dL)	161.2	69.6

Dyslipidemia has been defined as having one or more of the following disorders: HDL< 40 mg/dl in males and <50 mg/dl in women, LDL ≥160 mg/dl, TG >200 mg/dl, or total cholesterol >240 mg/dl. Dyslipidemia was found in more than half of the patients (52.8%) of the research sample, which illustrates the importance of this risk factor among other factors in increasing the prevalence of coronary artery disease in our patients. Table (3) and Figure (1) illustrate the details of dyslipidemia in this study.

Table (3): Details of dyslipidemia in studied patients.

Dyslipidemia	the number	Percentage
Low HDL	94	41.7%
TG >200 mg / dl	60	26.6%
LDL> 160 mg / dl	48	21.3%
Total cholesterol> 240 mg / dl	43	19.1%

The most prominent lipid disorder in our study was low HDL, followed by elevated triglycerides, elevated LDL, and finally elevated total cholesterol.

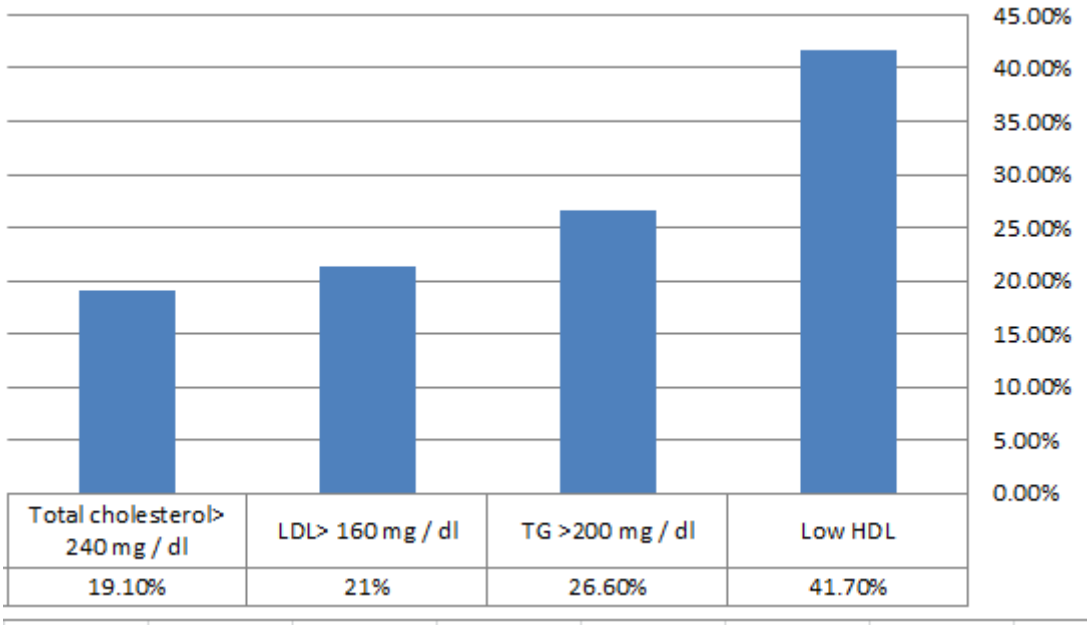

Figure (1): Prevalence of each lipid disorder among patients.

Coronary atherosclerotic stenosis (defined as 50% stenosis in the left main coronary artery lumen or 70% stenosis in the lumen of other coronary vessels) was found in 125 patients (55.6%) of the study sample. Table (4) shows the results of coronary angiography in the studied patients.

Table (4): Results of coronary angiography in studied patients.

Results		number	percentage
The number of affected arteries			
	No significant stenosis	98	43.6%
	Single artery	39	17.4%
	Two arteries	58	25.7%
	Three or more arteries	30	13.3%
The severity of stenosis			
	less than 50%	84	37.3%
	50 - 75%	89	39.5%
	Stenosis >75%	52	23.1%

Involvement of left anterior descending artery (LAD) was the most common injury in the studied patients (35.4% of the total number of affected arteries), followed by the circumflex artery (29.9%), the right coronary artery (26.4%), and finally the left main coronary artery (8.1%).

Table (5): Patient characteristics according to the number of arteries affected by coronary atherosclerosis.

Properties		No coronary artery atherosclerosis (98 patients)	Single coronary artery stenosis (39 patient)	Two or more coronary arteries narrowed (88 patients)	test	P-value
Age (years)		54.8 ± 9.3	58.6 ± 7.9	56.3 ± 10.2	2.246	0.108
Gender						
	Male	58 (59.1%)	26 (66.6%)	48 (54.5%)	1.65	0.43
	Female	40 (40.8%)	13 (33.4%)	40 (45.5%)		
BMI (kg/m2)		27.9 ± 3.6	29.2 ± 3.1	28.8 ± 3.8	2.377	0.09
BMI groups	Normal weight	19 (19.3%)	6 (15.3%)	17 (19.3%)	0.738	0.946
	Over weight	47 (47.9%)	18 (46.1%)	39 (44.3%)		
	Obesity	32 (32.6%)	15 (38.4%)	32 (36.3%)		
Risk factors						
	Smoking	51 (52%)	25 (64.1%)	62 (70.5%)	6,781	0.033
	Hypertension	55 (56.1%)	18 (46.1%)	44 (50%)	1.342	0.511
	Family story	21 (21.4%)	10 (25.6%)	43 (48.8%)	16.93	0.0002
Lipid profile						
	TC (mg / dl)	183.4 ± 43.7	197.8 ± 39.6	208.1 ± 47.6	7.164	0.001
	LDL (mg / dl)	121.2 ± 28.7	126.7 ± 35.1	135.4 ± 42.8	3.646	0.027
	HDL (mg / dl)	43.8 ± 13.2	43.6 ± 12.9	40.7 ± 11.6	1.582	0.208
	TG (mg / dl)	150.3 ± 59.2	156.8 ± 65.7	163.8 ± 71.5	0.988	0.373
Dyslipidemia						
	Found	42 (42.8%)	22 (56.4%)	55 (62.5%)	7.414	0.024
	Not found	56 (57.1%)	17 (43.5%)	33 (37.5%)		

There was no statistically significant difference in the mean age of the patients or the distribution of males and females when classified according to the number of arteries with atherosclerosis (P> 0.05). There was no statistically significant difference in the mean BMI between the three groups. There was no statistically significant difference in the distribution of BMI groups after classifying patients according to the number of arteries with atherosclerosis (P> 0.05).

Statistical analysis showed that an increase in the number of arteries affected by atherosclerosis was associated with an increase in the percentage of smoking (P = 0.033). There is also a statistically significant relationship between the increased number of arteries affected by atherosclerosis and the presence of a positive familial history of coronary heart disease (P = 0.0002). There was no statistically significant relationship between the presence of hypertension and the increased number of arteries affected by atherosclerosis (P = 0.511).

An increase in the number of arteries affected by atherosclerosis was associated with an increased level of total cholesterol (P = 0.001), spearman correlation coefficient value (r =0.19, p =0.002) figure(2), and elevated levels of low-density lipoprotein (LDL) cholesterol (P = 0.027), spearman correlation coefficient value (r =0.34, p =0.0001) figure(3). There was no statistically significant relationship between the number of coronary arteries with atherosclerosis and the serum level of either high-density lipoprotein (HDL) cholesterol (P = 0.208) or triglycerides (P = 0.373).

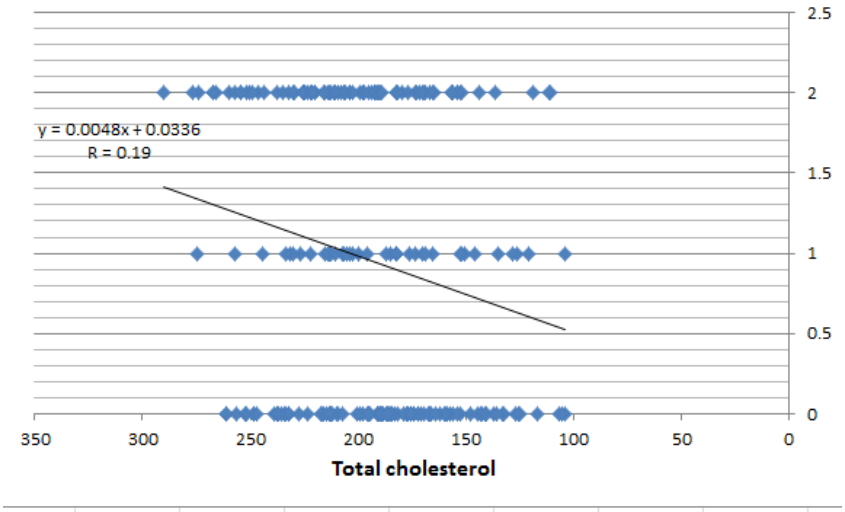

Figure (2): Correlation between total cholesterol values and the number of arteries affected by coronary atherosclerosis according to Spearman Correlation.

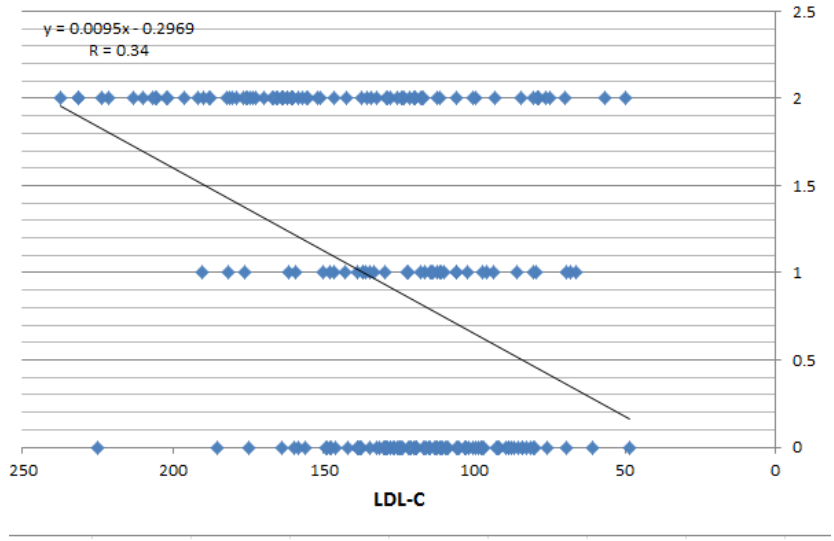

Figure (3): Correlation between LDL-C values and the number of arteries affected by coronary atherosclerosis according to Spearman Correlation.

Dyslipidemia was associated with the number of arteries affected by atherosclerosis, where the disorder was found in 62.5% of patients with narrowing of two or more arteries, in 56.4% of patients with narrowing of one artery, and in 42.8% of patients without significant stenosis (P = 0.024).

The mean blood lipid concentration were compared after classifying the patients according to the degree of coronary atherosclerosis, as shown in Table (6).

Table (6): Average lipid concentration according to the degree of atherosclerosis in coronary arteries.

Lab test	<50% (84 patients)	50-75% (89 patients)	≥ 75% (52 patients)	ANOVA	P-value
TC (mg / dl)	191.3 ± 43.2	196.6 ± 48.1	203.7 ± 46.8	1.169	0.312
LDL (mg / dl)	120.3 ± 28.8	128.9 ± 39.4	126.5 ± 37.8	1.324	0.267
HDL (mg / dl)	43.5 ± 12.7	39.9 ± 9.6	40.7 ± 13	2.196	0.113
TG (mg / dl)	153.2 ± 65.2	162.5 ± 78	165.3 ± 75.2	0.554	0.575

There was no statistically significant relationship between the degree of coronary stenosis and the serum level of either total cholesterol, HDL, LDL, or triglycerides (P> 0.05).

We studied the prevalence of dyslipidemia after classifying the patients according to the degree of atherosclerosis in the coronary arteries as shown in Table (7).

Table (7): Comparison of dyslipidemia prevalence according to degree of atherosclerosis in coronary arteries.

Dyslipidemia	<50% (84 patients)	50-75% (89 patients)	>75% (52 patients)	X2-test	P-value
Found	39 (46.4%)	46 (51.6%)	34 (65.3%)	4.717	0.094
Not found	45 (53.5%)	43 (48.3%)	18 (34.6%)		

Dyslipidemia was not a predictor of the degree of atherosclerosis (P> 0.05).

DISCUSSION

The relationship between the lipid profile and coronary artery disease is well known. However, studies on the role of serum lipoprotein levels as markers of CAD severity still yield contradictory results.

The aim of this study was to assess the relation between total cholesterol, LDL, HDL and the severity of atherosclerotic coronary artery disease in patients undergoing coronary angiography in Syrian population.

The study included 225 patients (58.7% of males and 41.3% of females). The average age of the patients was 56.6 years.

In our study, age did not affect the number of arteries affected by coronary atherosclerosis. Our study is therefore consistent with the study of (Khashayar et al),[10] which is a retrospective study that included 530 patients (61.3% of males and 38.7% Females) with an average age of 58.1 years, who have undergone coronary angiography.

The results of our study also agree with the study of (Sharhan et al),[11] which is a prospective study that included 223 patients (59% of males and 41% of females) with a mean age of 58 years who underwent coronary angiography, there was no relationship between patient's age and the number of arteries affected by atherosclerosis.

The results of our study differ from the study of (Alshehri et al),[12] which is a cross-sectional study that included 295 patients (77.6% of males and 22.4% of females) with a mean age of 55.12 years, where the patients with multiple coronary vascular disease were older in comparison (P <0.05).

The results of our study also differ from the study of (Penalva et al),[13] which is a retrospective study involved 107 patients (53.2% of males and 46.8% of females) who underwent coronary angiography. Mean age was higher in two and three vessels disease compared with single vessel disease.

With regard to sex, there was no statistically significant difference in the distribution of males and females when classifying patients according to the number of atherosclerotic coronary arteries (P> 0.05) in our study. Our results are consistent with the study of (Sharhan et al),[11] and with the study of (Penalva et al),[13] but disagree with the results of the study of (Alshehri et al),[12] which showed that males are more likely to develop atherosclerosis in a greater number of coronary arteries, it is worth noting that the sample of this study was mostly male (77.6%).

In our study, there was no statistically significant difference in the mean BMI after classifying patients according to the number of atherosclerotic coronary arteries, and obesity did not significantly affect the number of coronary arteries affected by atherosclerosis. Our results are thus consistent with the study of (Sharhan et al),[11] and with the results of the study (Niraj A. et al),[14] which included 770 patients who were referred to coronary angiography and concluded that obesity is not an independent indicator of the severity of coronary artery disease. The researchers noted negative associations between BMI and CAD burden, as well as negative correlations between BMI and age, indicating a possible bias, as physicians refer obese patients for coronary angiography early in CAD.

Our study showed that an increase in the number of arteries affected by coronary atherosclerosis was associated with an increase in the rate of smoking (P = 0.033). This is in agreement with the study of (Sharhan et al),[11] and with the study of (Mohammad et al),[15] which is a cross-sectional study of 220 patients who underwent coronary angiography. The study of (Penalva et al)[13] did not show a correlation between current smoking and the number of coronary arteries affected by atherosclerosis. It is worth noting that the percentage of smokers in that study was only 11.7%.

Endothelium dysfunction and sympathetic nervous system activation induced by cigarette smoking can lead to a decrease or failure to increase coronary blood flow in response to increased cardiac muscle requirements.[16]

In our study, there was no statistically significant relationship between the presence of hypertension and the increased number of arteries affected by coronary atherosclerosis (P = 0.511). This results differ from the study of (Penalva et al[13] which showed that hypertension is an indicator of the number of coronary arteries affected by atherosclerosis. While it agrees with the results of the study of (Sharhan et al).[11]

Our study showed a statistically significant relationship between the increase in the number of coronary arteries affected by atherosclerosis and the presence of a positive family history of coronary heart disease (P = 0.0002) and

is consistent with the study of (Sharhan et al),[11] and with the study of (Mohammad et al).[15]

In our study, dyslipidemia was found in more than half of the patients (52.8%) of the research sample. The mean values of LDL and total Cholesterol in our study were higher than their values in comparison studies, which explains the importance of this risk factor among other factors in the increased prevalence of coronary artery disease in our patients.

In the study of (Khashayar et al),[10] dyslipidemia was found in 45.5% of patients who underwent coronary angiography. In the study of (Alshehri et al),[12] dyslipidemia was found in 75% of patients who underwent coronary angiography. In the study of (Penalva et al) [13], dyslipidemia was found in 75.5% of patients who underwent coronary angiography.

The most prominent lipid disorder in our study was low HDL, which was found in 41.7% of the research sample.

The relationship between dyslipidemia and the number of coronary arteries affected by atherosclerosis

Dyslipidemia associated with the number of arteries affected by atherosclerosis. Dyslipidemia was found in 62.5% of patients with two or more narrowed arteries, 56.7% of patients with single artery stenosis, and 43% of patients without stenosis (P <0.05).

In the study of (Khashayar et al),[10] a low but positive association was reported between the presence of dyslipidemia and the positive findings during coronary angiography (r = 0.092, P = 0.035), and when compared to patients without stenosis, Dyslipidemia was, corresponding with the results of our study, more prevalent among patients with multiple coronary atherosclerotic stenoses.

In the study of (Alshehri et al),[12] dyslipidemia was an independent predictor of the number of coronary arteries affected by atherosclerosis.

In the study of (Penalva et al),[13] dyslipidemia was an independent predictor of the number of coronary arteries affected by atherosclerosis.

Total cholesterol

In our study, an increase in the number of coronary arteries affected by atherosclerosis was associated with an increase in the total cholesterol level (P = 0.001). Our results are consistent with the (Alshehri et al) study[12] and the (Sharhan et al) study.[11] The study (Penalva et al)[13] did not find a significant relationship between mean total cholesterol and the number of coronary arteries affected by atherosclerosis.

LDL

An increase in the number of coronary arteries affected by atherosclerosis was associated with an elevated LDL level (P = 0.027).

In the study of (Penalva et al),[13] the LDL analysis showed that this variable increased with an increase in the number of coronary arteries affected by atherosclerosis. Patients with single artery injury had a mean LDL of 85.5 mg / dl, while patients with multiple vessel injuries had a mean of 116 mg / dl although there was no statistical significance. In both the study of (Alshehri et al)[12] and the study of (Sharhan et al),[11] an increase in LDL was associated with an increase in the number of arteries affected by atherosclerosis.

HDL

There was no statistically significant relationship between the number of coronary arteries affected by atherosclerosis and the serum level of HDL (P = 0.208). This is in agreement with the study of (Sharhan et al)[11] and the study of (Penalva et al).[13] The study of (Alshehri et al)[12] showed a statistically significant relationship between a decrease in HDL and an increase in the number of arteries affected by atherosclerosis. Studies show that HDL is structurally and functionally diverse and is made up of numerous and highly dynamic subsets of particles that not all of them protect against atherosclerosis to the same degree.[17]

Triglycerides

There was no statistically significant relationship between the number of coronary arteries affected by atherosclerosis and the serum level of triglycerides (P = 0.373). This is in agreement with the study of (Sharhan et al),[11] the study of (Penalva et al),[13] and the study of (Alshehri et al).[12]

Relationship between dyslipidemia and degree of atherosclerosis

We compared the mean blood lipid concentration after classifying patients according to the degree of coronary atherosclerosis. There was no statistically significant relationship between the degree of coronary atherosclerosis and the serum level of any of total cholesterol, HDL, LDL, or triglycerides (P> 0.05). Dyslipidemia did not associate with the degree of coronary atherosclerosis.

The results of our study are consistent with the results of the study (Penalva et al),[13] in which the measurement of average blood lipids did not allow to distinguish between the degrees of coronary atherosclerosis. The Sharhan et al[11] study also reported similar results.

This may be explained by the fact that lesions potentially unstable and prone to rupture are often non-obstructive and not diagnosed by coronary angiography. On the other hand, these lesions have a large fatty nucleus with signs of active inflammation and phagocytosis at the site

of plaque rupture.[18] However, no relationship between serum LDL cholesterol and oxidized LDL cholesterol in plaque has been shown in acute coronary syndrome.[19]

CONCLUSIONS

- Age or gender did not affect the number of coronary arteries affected by atherosclerosis.
- Obesity did not significantly affect the number of coronary arteries affected by atherosclerosis.
- The increase in the number of coronary arteries affected by atherosclerosis was associated with an increase in smoking.
- The increased number of coronary arteries affected by atherosclerosis was associated with a familial history of coronary heart disease.
- Dyslipidemia was found in more than half of the patients (52.8% of the study sample).
- The most prominent lipid disorder in our study was low HDL, which was found in 41.7% of the research sample.
- Dyslipidemia associated with the number of coronary arteries affected by atherosclerosis, but it did not associate with the degree of atherosclerosis.
- As for the number of coronary arteries affected by atherosclerosis, the statistically significant lipid disorder was high total cholesterol and high LDL.

Recommendations

Our study showed a significant prevalence of dyslipidemia among patients undergoing coronary angiography. It also showed that dyslipidemia is associated with the severity of coronary atherosclerosis. Therefore, we stress the importance of early diagnosis and optimal treatment of these disorders, especially high LDL.

We recommend conducting studies to assess the prevalence of dyslipidemia in our community and the underlying causes.

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