The Relation between Severity of Coronary Artery Disease and Body Mass Index

Aseel N. Hadi
Shahid AL- Mehrab Catheter center
dr.aseelhadi99@yahoo.com
Amir S. Al Mumin
Babylon University College of Medicine Department of Internal medicine, interventional cardiologist
dr_amir_sahib@yahoo.com

Abstract

Atherosclerosis remains one of the major causes of death and premature disability in developed countries. It is a chronic inflammatory disease which may cause obstructions of the coronary, cerebral and peripheral arteries. The goal of this study to establish association age, body mass index and smoking with severity of coronary artery disease. Seventy eight patients (39 males & 39 females) were studied. Seventy eight healthy volunteers match in age and sex were enrolled and accepted as a control group, their age range between (45-75 years). All patients were admitted to our hospital for elective coronary angiography with negative medical history (hypertension and diabetics mellitus).

Keywords: Relation between severity of coronary artery disease and body mass index.

Introduction

Cardiovascular disease (CVS) is the leading cause of mortality worldwide, atherosclerosis is the most common form of cardiovascular disease; it usually is clinically as the coronary artery disease, peripheral arterial disease (PAD) and cerebrovascular disease. The major risk factors are ageing, smoking, alcohol intake, hyperlipidemia, diabetes, hypertension, obesity, positive family history. Unhealthy diet, sedentary and stressful lifestyle [1].Age is the most potent independent risk factor for atherosclerosis. Aging causes changes in the walls of blood vessels, affecting the transport of oxygen and nutrients to the tissues. These changes make vessels stiffen, resulting in increased peripheral resistance [2]Over 85% of cardiovascular deaths occur in the elderly [3] The most clinically significant alterations in cardiovascular physiology with aging are [4]**:**

    a. increased myocardial stiffness.
    b. increased vascular stiffness.
    c. blunted-adrenoceptormediated modulation of inotropy. chronotropy and vasomotor tone, autonomic reflex dysfunction.

Hyperlipidemia is a condition when abnormally high levels of lipids often due to diet and life style. This condition is also called hypercholesterolemia/ hyperlipoproteinemia [5and6] Most commonly, changes of the serum levels is taken as a base in hyperlipidemia diagnosis. The parameters taken into consideration in hyperlipidemia diagnosis are total cholesterol(TC), low density lipoprotein-cholesterol(LDL-C), triglyceride, high density lipoprotein-cholesterol (HDL-C) and (very low density lipoprotein)VLDL [7].Smoking is probably the most important preventable cause of atherosclerotic vascular disease. There is a strong dependable and dose linked, relationship between cigarette smoking and ischemic heart disease, Cigarette smoking also acts with other risk factors to greatly increase the risk for CHD and exposure to second hand smoke increases the risk of heart disease even for nonsmokers [8]. It has a 3 times greater relative risk of developing IC and experience symptoms 10 years earlier than their non-smoking counterparts [9].Cigarette smoke includes more than 4,000 chemical substances most of which exert a cardiotoxic effect [10]. It increases the risk of cardiovascular disease by damaging the endothelium lining of the blood vessels, enhancing coagulability and atherogenesis, increasing cholesterol plaques and LDL-cholesterol and lowers the HDL-cholesterol [11 and 12]. Obesity is a chronic health problem, increasing in the number of people worldwide and is now recognized as a global epidemic [13].It is always associated with increases in plasma triglycerides. Dyslipidemia includes hypertriglyceridemia, reduced HDL cholesterol, and increased numbers of small, dense LDL particles [14] It is a true risk factor for cardiovascular disease, whether its impact on vascular risk derives solely from interrelations with glucose intolerance, insulin resistance, hypertension ,physical inactivity, and dyslipidemia [15].The overweight was defined as BMI 25.30 kg/m² for males and females but the obesity was defined as BMI ≥ 30 kg/m².(BMI) is calculated by dividing the subject's mass by the square of his or her height [16and 17].Body mass index is an independent risk factor for CVD, with a risk increase of 13% per 5 units increase of BMI [18].Weight control must play a fundamental role in all preventive cardiology practices, preferably in conjunction with advice regarding diet and exercise

Material and Methods

Study population: A case-control study, was conducted in Shahid AL- Mehrab Catheter center. The total number was 156 participants (78 patients with chronic artery disease (patients with acute coronary syndrome excluded from the study) , and underwent elective coronary artery angiography(CAG) in the Catheter Center was performed by standard techniques, based on angiographic finding ,the cardiologists evaluated each coronary angiography, the patients were classified to the three groups according to the number of obstructed vessels (1, 2&3vessels disease) each group consists of 26 patients:13 males &13females, (78) healthy control consists of (39 males and 39 females) and the all participants gave informed consent. Clinical carchatarestics, the severity, and angiographic findings of coronary artery disease were reviewed. Clinically a questionnaire was used to collect participant's data that includes: name, age, gender, history of ischemic heart disease, history of PAD, tobacco abuse, past medical history (diabetes mellitus and hypertension).

Coronary Angiography:

This was done by specialist interventional cardiologist to appraise extent and severity of coronary artery disease, after screening for renal function& hepatitis, C,B and human immunsuprreser virus (HIV) virus, via the femoral approach with 5F or 6F catheter Omnipaque 300 (iohexol 647mg,trometamol 1.2 mg) was a contrast used in all of the cases [20].Significant coronary disease was defined as at least a 70% reduction in the internal diameter of coronary arteries or ≥50% reduction in the internal diameter of left main coronary artery [21]

Methods

All the patients and control groups were assessed clinically, heamatologically and biochemically as fallowing:
Assessment:
History

Full history was taken from each patient regarding personal data like name, age, gender, history of IHD.

Body Mass Index(BMI)Measurement:

Weight and height of patients were measured by the employ of the well calibrated digital weight and height scale measuring device, BMI was calculated by dividing weight in kilograms by the square of the height in meters as in the equation: weight/height (kg/m² [22]. BMI 18.5 to <25 kg/m² considered normal. The overweight was defined as BMI 25.30 kg/m² for males and females but the obesity was defined as BMI ≥ 30 kg/m²[23]..

Risk factor assessment

We examined the following risk factors: hypertension was either self-reported or defined as having a systolic blood pressure > 140 /90mmHg or use antihypertensive drugs . [24].Diabetic patients in which already on insulin or oral hypoglycemic drugs or random plasma glucose >200mg/dl (11.1mmol/l) or fasting plasma glucose >126mg/dl(7.0mmol/I) [25].Smoking history was established in patients with at least a 10 pack-year history of tobacco use[26] .
ANOVA test. A p value < 0.05 is considered to be statistically significant and a p value < 0.01 considered being highly significant

The Result

According to the age per years, the patients were classified in to three groups: 19 patients (45-55) 24.4%, 25 patients(>55-65) 32% and 34patients(>65-75) 43.6%,the height percentage of obstructed vessel disease was seen in patients age (>65-75) (48.7%) of total patient as shown in table(1).Figure (1) describes the relationship between CAD and BMI. There is an association of CAD and elevated BMI, highly significant (p<0.01) in comparison with the control group for both gender. While in the subgroup analysis there is no association between BMI and the number of vessels in CAD patients for both gender, P value statistically insignificant(p>0.05). Smoking was an important risk factor in CAD, figure (2) illustrates that out of 78 patients with obstructed vessel CAD,(43) 55% patients were smokers and (35) 45% patients were nonsmokers as shown in figure(2). According to the result of this study, smoking was important risk factors in CAD. There no significant difference between tobacco abuse and increase in total cholesterol (TC) and triglyceride (TG) , on other hand , there is high significant association in increase

low density lipoprotein-cholesterol (LDL-C) level and decrease high density lipoprotein-cholesterol HDL-C level in CAD patients when compared smoker with nonsmoker with (p<0.01) as shown in figure (3).

Table (1):Relation between number of obstructed vessels and age per years in coronary artery disease patients

| Number of obstructed vessel	Age per years			
	45-55	**>55-65**	**>65-75**	**Total**
1 vessel (Group 1)	5(22.72%)	7(31.8%)	10(45.4%)	22(28.2%)
2 vessel (Group2)	5(20.8%)	8(33.3%)	11(45.8%)	24(30.7%)
3 vessel (Group3)	3(9.3.%)	12(37.5%)	17(53%)	32(41%)
Total	13(16.6%)	27(34.6%).	38(48.7%)	78

VD=Vessel Disease
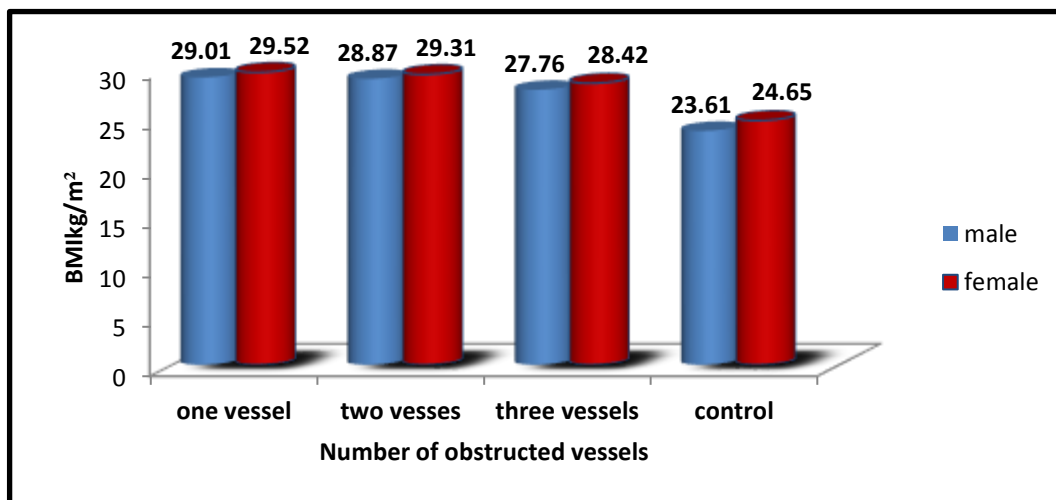
Figure(1): Relation between Severity of Coronary Artery Disease and body mass index(BMI)
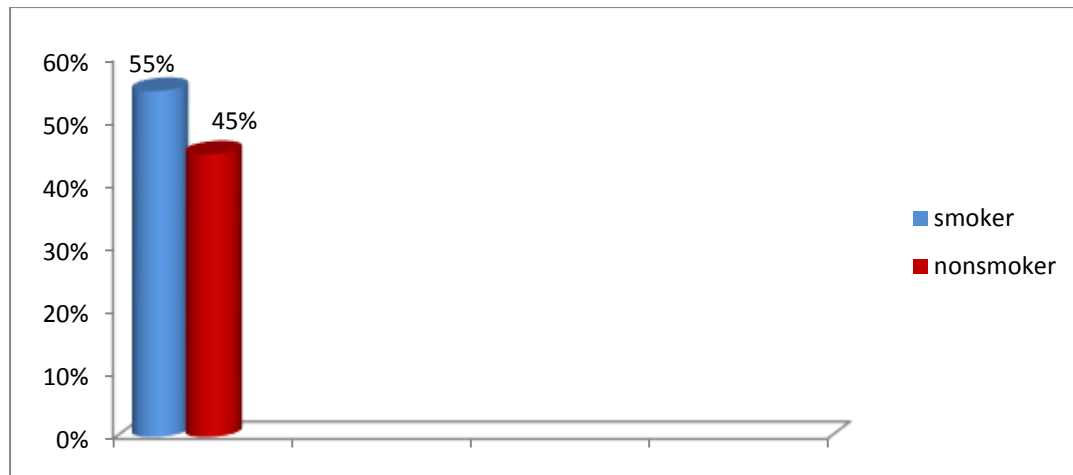
Figure 2: Percentage of tobacco abuse in coronary artery disease patients
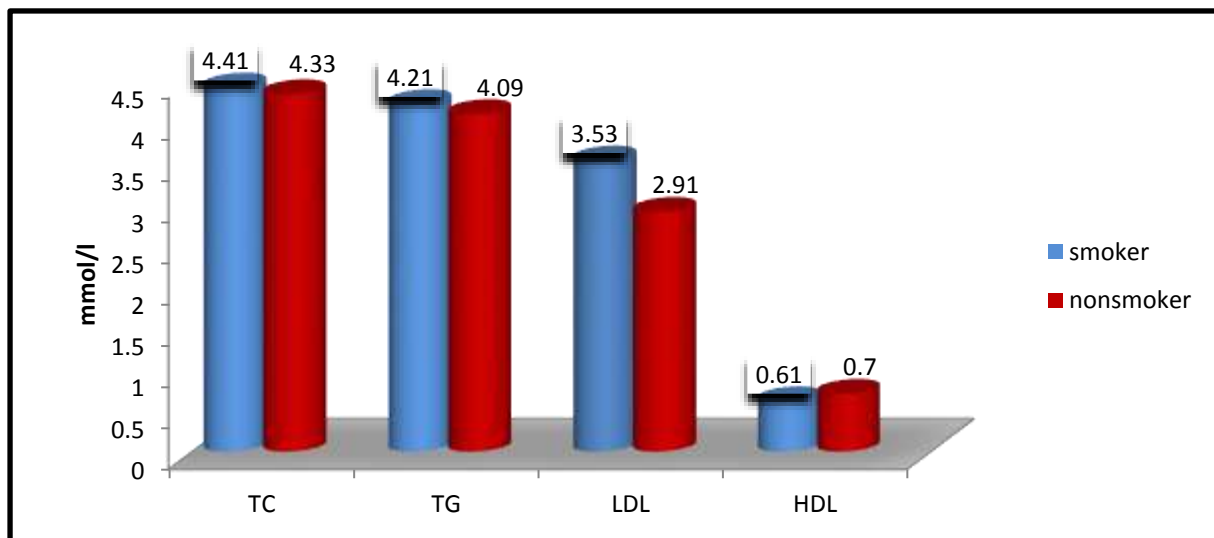
Figure 3:The relation between tobacco abuse and lipid profile in coronary artery disease patients TC: Total cholesterol, TG: Triglyceride, LDL: Low density lipoprotein and HDL: High density lipoprotein

Discussion

The data illustrated in table (1) shows a strong relation between age and severity of coronary artery disease(CAD).Same results was reported [27,28 and 29].Over 85% of cardiovascular deaths occur in the elderly[30].Aging is the potent independent risk factor for atherosclerosis. It causes changes in the walls of blood vessels, affecting the transport of oxygen and nutrients to the tissues. These changes that make vessels thicken, results in an increase in peripheral resistance[2]

In the present study, there is high significant association between body mass index (BMI) and coronary artery disease patients(p<0.01) for both gender when compared with the control group as presented in figure (1).This result was supported by[31, 32and 33].

As a consequence of previous the result, obesity is considered an independent cardiovascular risk factor that is associated with poor clinical outcomes[31].It is

always associated with increases in plasma triglyceride. Dyslipidemia includes hypertriglyceridemia, reduced High density lipoprotein- cholesterol(HDL-C), and increased numbers of small dense low density lipoprotein(LDL)particles [34]**.** The most worrisome long-term effect of obesity is the increase of atherosclerotic cardiovascular disease (ASCVD) and its inherent physical consequences [35].Higher body mass index is associated with an increased risk of CAD, cardiovascular events, and new-onset heart failure (HF) [36 and 37].The result of this study revealed that a high significant decrease in high density lipoprotein-cholesterol(HDL-C) level in smoker CAD patients in comparison with non smoker CAD patients figure [43]. Similar data were seen in other studies[35,38,39),40,41and 42]. Contrary to the above finding smoking is unrelated to CAD[43 and 44]. Epidemiological data have provided broad evidence that low concentrations of HDL-C increased cerebrovascular events. [45]Thus, raising high density lipoprotein-cholesterol has become a therapeutic target in CAD [46].Smoking increases the concentration of serum low density lipoprotein-cholesterol (LDL-C), and decreases the levels of antiatherogenic HDL-C cholesterol[47,40 and 48]**.** Cigarette chemical has acrolein, often used in pesticides, which affects the way the body processes cholesterol, allowing greater amounts to remain in the blood system[49]that leads to damaging vascular endothelium, increasing LDL-C oxidation, and lowers the HDL-C[50]**.** Thus, smoking may exert its atherogenic effects through blood lipid levels [51].

Conclusion

Aging is the potent independent risk factor for atherosclerosis .Tobacco abuse with low high density lipoprotein-cholesterol (HDL), increases cardiovascular events in compare with non- smokers, therefore induced dyslipidemia and increase risk of atherosclerosis. Dyslipidemia (High triglyceride with low HDL levels) surrogates markers of atherosclerosis. Body mass index(BMI) above normal value was an independent risk factor associated with CAD.

Conflict of Interests.
There are non-conflicts of interest

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الـخـلاصـــة

إن مرض تصلب الشرايين أصبح مشكلة كبيرة في كافة أنحاء العالم، وله علاقة بزيادة المرضية والفناء.إن الهدف من هذه الدراسة هو تحديد مدى العلاقة بين مؤشر كتلة الجسم بين المدخنين وانخفاض HDL وارتفاع LDL لمرضى الشرايين التاجية.
العدد الكلي لمجموعة الدراسة(158)مشارك .منهم(78) مريض مصاب بانسداد الشرايين التاجية, مقسمين إلى مجاميع حسب عدد الشرايين المغلقة (1,2,3 أمراض الشرايين) . كل مجموعه ثابتة تتكون من 26 مريض ,13 رجال و13 نساء و (78) أصحاء كمجموعة سيطرة تتكون من (39   رجال و 39 نساء) .الصفات السريرية ,الشدة ونتائج فحص أشعة اكس لأمراض الشرايين التاجية التي تم تحديدها .سريريا تم عمل استبيان لجمع بيانات المشاركين والتي تتضمن : الاسم ,العمر ,الجنس ,تاريخ مرض القلب الاقفاري, التدخين المفرط ,تاريخ المريض الطبي(مرض السكري وارتفاع ضغط الدم).هنالك ترابط ما بين أمراض الشرايين التاجية و ارتفاع مؤشر كتلة الجسم, هنالك علاقة قويه ما بين المدخنين وانخفاض HDL وارتفاع LDL لمرضى الشرايين التاجية.