

# Comparison of traditional risk factors, natural history and angiographic findings between coronary heart disease patients with age <40 and ≥40 years old

*Koroner arter hastası olan genç ve yaşlı hastaların risk faktörleri, klinik ve anjiyografi bulguları açısından karşılaştırılması*

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## ABSTRACT

**Objective:** In this study we aimed to examine the angiographic findings, traditional risk factors and natural history of Turkish patients <40 and ≥40 years old with coronary heart disease (CHD).

**Methods:** The records of 491 patients with stable angina pectoris or acute coronary syndrome (ACS), who had undergone coronary angiography (CAG) were reviewed. The patients <40 years (group 1) and ≥40 years (group 2) were compared.

**Results:** The study population was classified as group 1 with 240 patients (mean age 35.7±3.4 years) and group 2 with 251 patients (mean age 61.0±9.7 years). Smoking, family history, hypercholesterolemia, hypertriglyceridemia and low levels of high-density lipoprotein cholesterol were more prevalent in group 1 while diabetes mellitus, hypertension was higher in group 2. The common presentation among <40 years patients was ACS whereas stable angina was the most common presentation in patients ≥40 years old. Patients in group 1 showed a preponderance of single-vessel disease whereas patients of group 2 showed dominance of multivessel disease. Early clinical course of patients with ACS in group 1 was better than in group 2.

**Conclusion:** Our study shows a significantly different clinical, angiographic and biochemical profile in <40 years patients with CHD compared with ≥40 years patients. Dominance of smoking and dyslipidemias that are the preventable risk factors in premature CHD patients is an important threat for our community health. Healthy life styles should be encouraged beginning from young ages and new precautions about smoking must be taken. (*Anadolu Kardiyol Derg 2007; 7: 124-7*)

**Key words:** Coronary heart disease, young adults, old adults

## ÖZET

**Amaç:** Bu çalışmamızdaki amacımız, ülkemizdeki 40 yaş altı ile 40 yaş ve üzerindeki koroner arter hastalarındaki konvansiyonel risk faktörleri, koroner anatomi ve erken klinik seyri incelemektir.

**Yöntemler:** Akut koroner sendrom (AKS) veya kararlı anjina pectoris tanılılarıyla kliniğimizde yatırılarak koroner anjiyografisi (KAG) yapılmış olan toplam 491 hasta geriye dönük olarak incelendi. Kırk yaş altındaki hastalar (grup 1) ile ≥40 yaş hastaların (grup 2) demografik ve KAG verileri karşılaştırıldı.

**Bulgular:** Hastaların 240'ı grup 1'de (ortalama yaş 35.7±3.4 yıl); 251'i grup 2'de (ortalama yaş 61.0±9.7 yıl) yer almaktaydı. Grup 1'de sigara kullanımı, aile öyküsü, hiperkolesterolemi, hipertrigliseridemi ve düşük yüksek yoğunluklu lipoprotein kolesterol düzeyi daha sık iken; Grup 2'de hipertansiyon ve diyabet sıklığı. Kırk yaş altı hastalar sıklıkla AKS nedeniyle, ≥40 yaş hastalar ise stabil angina ile hastaneye başvurmaktaydılar. Grup 2'deki hastalarda ciddi ve yaygın koroner arter hastalığı, Grup 1'deki hastalarda ise tek damar hastalığı yaygındı.

**Sonuç:** Koroner arter hastalığı risk faktörleri ve yaygınlığı yaşa göre farklılık göstermektedir. Kırk yaş altı koroner arter hastalarında engellenbilir bir risk faktörü olarak sigara kullanımı ve dislipideminin görece fazlalığı toplum sağlığımız için ciddi bir tehdit oluşturmaktadır. Sigara kullanımı konusunda yeni tedbirler alınması ve sağlıklı yaşam biçiminin genç yaşlardan itibaren özendirilmesi önem taşımaktadır. (*Anadolu Kardiyol Derg 2007; 7: 124-7*)

**Anahtar kelimeler:** Koroner arter hastalığı, genç erişkinler, yaşlı erişkinler

## Introduction

Coronary heart disease (CHD) is the single most common cause of death in the developed world (1). There is a general agreement on a multifactorial etiology of CHD and that the incidence of disease increases with age (2). Nevertheless, it has

been recognized in young age groups more frequently in recent years (3-4).

Clinical studies have shown that compared with older patients, patients with early-onset CHD show a preponderance of single-vessel disease (5), and of risk factors such as hypercholesterolemia (5-6), positive family history (5-6) and cigarette

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smoking (3,6). Epidemiologic data also suggest that risk factors may be different in young vs. older patients and the clinical presentation of CHD may also vary in these populations (7-8). While there are several studies from developed countries on the coronary angiographic (CAG) profile and risk factor analysis of CHD patients at all ages, there are not enough published data from Turkish subcontinent addressing this problem. The present study examined the angiographic findings, coronary risk factors and natural history of Turkish patients <40 and ≥40 years old with CHD.

### Methods

From May 2005 to March 2006, the records of 240 patients younger than 40 years old admitted to Türkiye Yüksek İhtisas Hospital and Zonguldak Karaelmas University who had catheterization documented CHD (Group 1) were reviewed. This group was compared with 251 consecutive patients 40 or older (Group 2). One hundred and fifty eight patients of group 1 were admitted or referred to our institutions for acute coronary syndrome (ACS) whereas 172 patients of group 2 were admitted or referred to our hospitals with stable angina pectoris for CAG. Conventional cardiovascular risk factors and CAG findings were compared between the groups.

The recorded traditional risk factors were: 1) hypertension (HT) (HT was considered to be present if the patient was on antihypertensive medicine at admission or the past medical history reflected a prior physician diagnosis of HT or blood pressure that was measured in several separate occasions at the hospitalization period greater than 140/90 mmHg); 2) diabetes mellitus (DM) (DM was considered to be present if the patient was on antidiabetic medicine or had fasting glucose level ≥126 mg/dl or two causal plasma glucose readings of ≥200 mg/dl) (9); 3) cigarette use (any amount within the past 3 years); 4) family history of CHD (any first degree relative younger than 50 years who had angina pectoris or myocardial infarction); 5) body mass index (BMI) ≥25 kg/m<sup>2</sup>; 6) hypercholesterolemia (total cholesterol ≥200 mg/dl and/or low-density lipoprotein (LDL) ≥130 mg/dl) (10); 7) hypertriglyceridemia (triglyceride ≥150 mg/dl) and 8) low levels of high-density lipoprotein (HDL) (HDL <40 mg/dl in male and HDL <50 mg/dl in female).

Left ventriculography and CAG were performed in all of the patients in the study group. The reasons for CAG were inadequate control of symptoms with optimal medical therapy, high risk determined with exercise or pharmacologic stress testing, prior myocardial infarction, admission with an ACS, ejection fraction <40% on echocardiogram and history of coronary artery bypass grafting surgery (CABG) or percutaneous intervention (PCI) in the past. A 70% or greater decrease in diameter of a major epicardial coronary vessel or greater than 50% decrease in diameter of the left main coronary artery was defined as significant coronary obstructive disease. Acute coronary syndrome was diagnosed on the basis of typical chest pain, diagnostic electrocardiographic findings and cardiac enzyme evolutionary patterns.

Statistical analysis was conducted using SPSS 10.0 for Windows software (Chicago, IL, USA). Categorical data were expressed as number or percentages, and parametric data were expressed as mean ± standard deviation. Parametric data were evaluated by independent sample t test, and categorical data were evaluated by Chi square test as appropriate. Significance was defined as a p value <0.05.

### Results

The study population was consisted of 491 patients. Two hundred and forty patients (216 male) with mean age 35.7±3.4 years were in group 1 and 251 patients (176 male) with mean age 61.0±9.7 years were in group 2. Smoking, family history, hypercholesterolemia, hypertriglyceridemia and low levels of HDL were more prevalent in group 1 while DM, HT and female gender were more common in group 2. There was no statistical difference in overweight and obesity prevalence between the groups. Clinical characteristics of the study patients are shown in Table 1. Type 1 DM (insulin-dependent DM) was more common in group 1 (64.7%) while most of the patients in group 2 had type 2 DM (noninsulin-dependent DM) (81.3%) who frequently used oral antidiabetics compared to insulin therapy or diet alone. Besides, plasma glucose levels of diabetic patients in our study population were commonly not under control. Comparison of the fasting glucose, total cholesterol, HDL, LDL and triglyceride levels of the patients are shown in Table 2. In group 1 most of the patients (65.8%) presented with ACS whereas in group 2 (68.5%) stable angina pectoris was the common first presentation (p<0.0001). Fibrinogen levels were higher in younger patients with ACS while HDL levels were lower in older patients with ACS.

Eight patients (3.3%) of group 1 had normal coronary arteries and 15 patients (6.3%) had noncritical coronary lesions in case of

**Table 1. Clinical characteristics of study patients with premature coronary heart disease (Group 1) and late onset of coronary heart disease (Group 2)**

Variables	Group 1 (n=240)	Group 2 (n=251)	p
Age, years	35.7±3.4	61.0±9.7	<0.05
<b>Clinical presentation</b>			
Stable angina, n	82	172	<0.0001
ACS, n	158	79	<0.0001
<b>Risk factors</b>			
Smoking, n	168	53	<0.005
HT, n	54	119	<0.005
DM, n	18	59	<0.005
Family history, n	141	109	<0.005
Hypercholesterolemia, n	145	94	<0.005
Hypertriglyceridemia, n	106	57	<0.005
Low levels of HDL, n	175	118	<0.005
BMI ≥25 kg/m <sup>2</sup> , n	140	170	NS
ACS- acute coronary syndrome, BMI- body mass index, DM- diabetes mellitus, HDL- high density lipoprotein, HT- hypertension, NS- nonsignificant			

**Table 2. Comparison of fasting glucose and lipid levels of the groups**

Variables	Group 1 (n=240)	Group 2 (n=251)	p
Fasting glucose, mg/dl	90±25	96±34	NS
Total cholesterol, mg/dl	242±24	182±23	<0.05
LDL-cholesterol, mg/dl	138±28	121±12	<0.05
HDL-cholesterol, mg/dl	34±12	43±15	<0.05
Triglyceride, mg/dl	157±19	124±14	<0.05
HDL- high density lipoprotein, LDL- low density lipoprotein, NS- nonsignificant			

ACS. Normal coronary arteries and noncritical coronary lesions were not found in any of the older patients with ACS. Besides multivessel disease was detected more frequently in older patients (63.8% vs 36.5%,  $p<0.05$ ). Patients in group 1 showed a preponderance of single-vessel disease compared with patients in group 2 ( $p<0.05$ ). The prevalence of critical left anterior descending artery involvement was not different between the two groups ( $p>0.05$ ). However right ( $p<0.0001$ ) and circumflex artery significant stenoses ( $p<0.0001$ ) were more common in group 2. There was no statistically significant difference between the two groups in the frequency of left main coronary artery stenosis. Coronary angiographic findings between the two groups are shown in Table 3.

Coronary artery bypass surgery was the preferred therapy in both of the groups. Early clinical course of patients with ACS in group 1 was better than in group 2. Death at the time of hospitalization period was not observed in any of the younger patients and most of them were free of complications. Aneurysm of left ventricle, arrhythmias, embolism and recurrent angina were more common in older patients. Early mortality and morbidity in the two groups are shown in Table 4.

**Table 3. Coronary angiography findings of the study patients with premature coronary artery disease (Group 1) and late onset of coronary artery disease (Group 2)**

Variables	Group 1 (n=240)	Group 2 (n=251)
<b>Extent of luminal narrowing</b>		
Significant, n	217	251
Noncritic*, n	15	0
Normal*, n	8	0
<b>Number of arteries significantly involved</b>		
Single vessel*, n	115	101
Multivessel*, n	92	150
<b>Involvement of coronary arteries</b>		
Left anterior descending artery, n	167	172
Right coronary artery*, n	86	151
Circumflex artery*, n	75	151
Left main coronary artery, n	3	3
* $p<0.05$ - for comparison of the groups		

**Table 4. Early mortality and morbidity in the course of acute coronary syndrome in patients with premature coronary heart disease (Group 1) and late onset of coronary heart disease (Group 2)**

Variables	Group 1 (n=158)	Group 2 (n=79)
Congestive heart failure (bibasilar rales, S3 gallop, cardiogenic shock or JVD) , n	36	37
Arrhythmias (sustained atrial or ventricular arrhythmias and atrioventricular blocks that require intervention)* , n	5	20
Aneurysm*, n	1	19
Embolism (peripheral or central)* , n	1	12
Recurrent angina* , n	2	9
* - $p<0.05$ for comparison of the groups JVD- jugular vein distention		

## Discussion

Premature CHD has been defined as having an age of onset ranging from 30 to 56 years in various studies. We selected an age cut-off of 40 years to define a premature CHD based on previous epidemiologic studies (9).

Our findings that cigarette smoking, positive family history and dyslipidemias are the most common risk factors in younger patients with CHD (5-6) as well as HT and DM are more common in older ones, are in agreement with earlier observations (10,12). Low level of HDL was the main predisposing risk factor for premature CHD and the second most common risk factor among older patients in our study. This result was different from various studies that found smoking to be the most common risk factor in young CHD (3-4). This distinction may be due to inconsideration of low level of HDL as being a major risk factor for atherosclerosis by previous investigators or possible ethnic differences including obesity, physical inactivity, less alcohol consumption and increased hepatic triglyceride lipase activity (13-14). TEKHARF; an epidemiologic study conducted over 10 years investigating heart health in Turkish adults mentioned that low level of HDL was more common among Turkish people with CHD regardless of age compared to European people (15). As National Cholesterol Education Program's third report (NCEP ATP III) defines LDL-cholesterol as the main goal of lipid-lowering therapy and determines no goal for increasing HDL-cholesterol levels (10), further therapy for raising HDL level may be considered for Turkish people regardless of age.

The present study indicates that <40 years patients have unheralded acute onset of symptoms, a higher frequency of angiographically less extensive disease and single vessel disease compared with their counterparts. Similar results have been reported by other authors (16-18). Histopathologic studies have demonstrated that atherosclerotic plaques in young patients with CHD are characterized by a large amount of lipid-containing foam cells and relative lack of a cellular scar tissue (19). This data suggest that soft plaques seen in young patients may have been present for a shorter time of period than plaques in older patients, which have a large content of fibrous tissue and are responsible for most episodes of major coronary thrombosis (20). The less extensive CHD observed in younger patients in our study might suggest that premature CHD is associated with rapid disease progression rather than with a gradually evolving process. This is in agreement with the finding that ACS is the common first presentation in younger patients (17-18).

Most of our patients with premature CHD were free of any complications during hospitalization period. Early death with the time of ACS was not observed in any of them. Most series have shown a favorable short-term prognosis for young patients with an ACS (21-22). Furthermore, prognosis was found to be inversely related to age (23). It has been suggested that the reason of better prognosis in young patients is less severe CHD. These results confirm our data. However, it may also partly be due to the referral nature of our institution; patients who may have died at an outlying hospital have not been transferred.

## Conclusion

Our study shows a significantly different clinical, angiographic and biochemical profile in <40 years patients with CHD compared

with  $\geq 40$  years ones. Patients with premature CHD commonly have unheralded acute onset of symptoms, less extensive CHD and better short-term prognosis than the older ones. Consistent with epidemiologic studies; positive family history, smoking, elevated total cholesterol, LDL-cholesterol and triglyceride levels and low HDL-cholesterol level were also associated with premature CHD.

Dominance of smoking and dyslipidemias that are the preventable risk factors in premature CHD patients is an important threat for our community health. Healthy life styles should be encouraged beginning from young ages and new precautions about smoking must be taken.

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