

# Prevalence of Dermatologic Features in Patients With Ischemic Heart Disease

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**Background:** Ischemic heart disease (IHD) is among the most important and top ranked causes of death in the world. An early and accurate diagnosis of IHD is necessary to improve outcomes.

**Objectives:** We assessed the prevalence of dermatologic signs associate with the risk of ischemic heart disease among the hospitalized IHD patients.

**Materials and Methods:** This descriptive-analytic and cross-sectional study was conducted on IHD patients during 6 months in Kamkar Hospital in Qom and Shaheed Beheshti Hospital in Kashan. Participants were assessed for the presence of male pattern baldness, hair graying, diagonal earlobe crease (DELIC), and xanthoma.

**Results:** A total of 366 patients with IHD (52.5% male and 47.5% female) with a mean age of  $58.5 \pm 7.5$  years were evaluated. IHD was more prevalent between people 60-69 years old. Prevalence and occurrence of alopecia, hair whitening, DELC, and xanthoma were 79.2%, 78.7%, 34.1%, and 18.6%, respectively. Hyperlipidemia was seen in 70.5% of individuals with xanthoma. Alopecia was more prevalent in subjects with family history of baldness ( $P < 0.0001$ ). Family history of hair whitening had a significant effect on its prevalence ( $P < 0.0001$ ). Bilateral DELC was more prevalent than unilateral one (22.4% vs 12.5%).

**Conclusions:** Male pattern baldness, hair graying, xanthoma, and earlobe crease are associated with increased risk of ischemic heart disease. These dermatologic signs can be considered as CVD risk factors for screening.

**Keywords:** Myocardial Ischemia; Alopecia; Graying of Hair, Precocious; Xanthomatosis

## 1. Background

Today, cardiovascular disease (CVD) is the most common cause of death, disability, and serious illness. Ischemic heart disease (IHD) is caused by inadequate oxygen delivery to supply the metabolic demands of the heart muscle. IHD can be the result of a failure to sufficiently perfuse myocytes with oxygenated blood, to increase myocyte oxygen need, or a collection of acute and chronic conditions such as coronary artery spasm, anemia, arrhythmia, coronary embolism, hypertension, or hypotension (1). In IHD, atherosclerosis usually causes progressive obstruction of one or more of the three main coronary arteries supplying oxygen and nutrients to the heart muscle. Acute myocardial necrosis, fatal arrhythmia, stable angina pectoris or heart failure can occur consequently (2). IHD was the leading cause of deaths in 2010, which affects adults of working age and is a growing problem in low- and middle-income countries (3-5). In terms of disability, ischemic heart disease problems include chest pain (angina) accompanying with physical or emotional stress, heart failure, and fear of engaging in normal activities. Early detection of ischemia is extremely important to prevent sudden death. The term IHD, often used synony-

mously with coronary heart disease (CHD), or coronary artery disease, which is most often due to atherosclerosis of coronary arteries.

The common clinical manifestations of IHD are myocardial infarction (MI), angina, and sudden death. CHD can be asymptomatic and its screening may fail to prevent cardiovascular events (6, 7). Several recent studies have shown that some hair and skin features are associated with the risk of CHD. These features include male pattern baldness or androgenic alopecia, hair graying, diagonal ear lobe crease (DELIC), and xanthoma. As some individuals are free of classical risk factors such as hypertension, hyperlipidemia, diabetes, tobacco use, obesity, or sedentary a lifestyle (8), elucidating the relationship between hair and dermal signs and CHD could lead to the early detection of cardiac disease. Accordingly, it might let physicians identify persons at risk, thereby applying the most appropriate therapy to improve patients' prognosis.

## 2. Objectives

This study was undertaken to test whether androgenic alopecia, hair graying, DELC, and xanthoma are more prevalent in subjects with IHD.

### 3. Patients and Methods

#### 3.1. Participants

This study had a descriptive-analytic cross-sectional design and was conducted on middle-aged and elderly men and women ( $\geq 40$  year age) at Kamkar Hospital in Qom and Shaheed Beheshti Hospital in Kashan. We used easy nonrandomized method for sampling in which all patients with IHD diagnosis referred at Kamkar and Shaheed Beheshti hospitals were enrolled. Informed consent was obtained from all patients prior to conducting the study. The study was performed in accordance with the principles stated in the Declaration of Helsinki and approved by the Isfahan University of Medical Sciences Ethics Committee. Patients were diagnosed by residents of internal medicine based on IHD history and clinical examination. Electrocardiogram and biochemical tests were used to confirm the diagnosis and a cardiologist verified them. The patients were evaluated in terms of age, history of hypertension, hyperlipidemia, and diabetes mellitus, and smoking habits. Hypertension was defined by a systolic and diastolic blood pressure over 140 and 90 mm Hg, respectively. Patients under drug therapy for hypertension were considered as hypertensive. Hyperlipidemia was defined by history of abnormal values of cholesterol or triglycerides.

#### 3.2. Dermatologic Features Assessment

Norwood's androgenic alopecia classification was used to collect standardized information (9). We used a gray/white-hair proportion (more than 50% and less than 50%) to determine the percentage of hair whitening. The presence of a diagonal ear lobe crease was assigned to a person with a crease stretching obliquely from the outer ear canal towards the border of the ear lobe of both the ears; examiners were guided to diagnose the ELC, by comparing the features with the standard photograph provided to them. Xanthoma was determined by careful visual examination.

#### 3.3. Statistical Analysis

Statistical analyses were conducted using SPSS 15.0 (SPSS Inc, Chicago, IL, USA). The chi-square and Fisher exact test were used for categorical variables. P values  $< 0.05$  were considered as significant.

### 4. Results

A total of 366 patients with IHD were studied (192 men and 174 women). IHD was more prevalent between 60-69 year old cases. Table 1 shows the prevalence of androgenic alopecia, hair graying, DELC, and xanthoma in IHD patients. There were no meaningful differences between age, sex, underlying disease and the prevalence of dermatologic signs ( $P > 0.05$ ). Prevalence of diseases such as diabetes mellitus, hypertension, and hyperlipidemia were 36.0%, 55.7%, and 43.1%, respectively. Smoking was seen in 29.5% of patients. Sex differences were found between hypertensive and smoker subjects ( $P < 0.0001$ ). Alopecia was more prevalent in subjects with family history of baldness ( $P < 0.0001$ ). Hair loss progression was less than 6 years in 38.1% and more than 6 years in 61.8% of patients (Data are not shown). Hyperlipidemia was seen in 70.5% of individuals with xanthoma. Family history of hair whitening had a significant effect on its prevalence ( $P < 0.0001$ ). Bilateral DELC was more prevalent than unilateral (22.4% vs 12.5%) (Data are not shown). Table 2 illustrates joint prevalence of IHD risk factors based on dermatological indicators. As it shows, there is no difference in joint prevalence of IHD risk factors based on dermatologic signs ( $P > 0.05$ ).

**Table 1.** Prevalence of Dermatologic Features in Ischemic Heart Disease Patients by Sex<sup>a, b</sup>

Sign	Sex		Total	P Value
	Male	Female		
<b>Male pattern baldness</b>				NS
with	152 (79.2)	-	152 (79.2)	
without	40 (20.8)	-	40 (20.8)	
<b>Xanthoma</b>				NS
with	40 (20.8)	28 (16.1)	68 (18.6)	
without	152 (79.2)	146 (83.9)	298 (81.4)	
<b>Gray hair</b>				NS
with	152 (79.2)	136 (78.2)	288 (78.7)	
without	40 (20.8)	38 (21.8)	78 (21.3)	
<b>DELC<sup>c</sup></b>				
with	68 (35.4)	60 (34.5)	128 (34.1)	NS
without	124 (64.6)	114 (65.5)	238 (65.9)	

<sup>a</sup> Abbreviations: DELC, diagonal ear lobe crease; NS, non significant.

<sup>b</sup> Data are presented as No. (%).

<sup>c</sup> DELC, diagonal ear lobe crease.

**Table 2.** Joint Prevalence of Ischemic Heart Disease Risk Factors by Dermatologic Features<sup>a, b</sup>

Risk factors	Male Pattern Baldness	Hair Graying	DELCN	Xanthoma	P Value
Hypertension and hyperlipidemia	46 (23.9)	88 (24.0)	44 (12.0)	34 (9.3)	NS
Hypertension and diabetes mellitus	20 (10.4)	66 (18.0)	28 (7.6)	20 (5.5)	NS
Hypertension and smoking	40 (20.8)	44 (12.0)	24 (6.6)	16 (4.4)	NS
Hyperlipidemia and diabetes mellitus	30 (15.6)	82 (22.4)	38 (10.3)	22 (6.0)	NS
Hyperlipidemia and smoking	32 (16.7)	44 (12.0)	20 (5.5)	12 (3.3)	NS
Diabetes mellitus and smoking	28 (14.6)	40 (10.9)	20 (5.5)	8 (2.2)	NS

<sup>a</sup> Abbreviations: DELC, diagonal ear lobe crease; NS, non significant.

<sup>b</sup> Data are presented as No. (%).

## 5. Discussion

This study was conducted to evaluate the prevalence of androgenic alopecia, hair graying, DELC, and xanthoma in 366 IHD patients admitted to Kamkar and Shaheed Beheshti hospitals. Our findings suggest that these dermatological signs, especially baldness and hair whitening can be considered as CVD risk factors. Male pattern baldness in the study showed a high prevalence of 79.2% in men. Positive association between heart diseases and baldness has been demonstrated in some previous studies too (10, 11). In a retrospective cohort study among 22071 male physicians relative risk (RR) CHD was 1.36 for severe vertex baldness, which remained unchanged after adjustment for risk factors such as age, diabetes mellitus, hypertension, and hyperlipidemia (12). A meta-analysis on risk of CHD and alopecia in observational studies confirmed this association but only for vertex baldness (13). Nevertheless, this relationship was not seen in some case-control and cross-sectional studies, which can be related to their design, selection and information biases. Cardio-metabolic risk factors like hypertension, hyperlipidemia, fibrinogen, CRP, and insulin are higher in bald individuals (10, 12, 14-16), which are in contrast with our results. This discrepancy can be attributed to small sample size. As hormones like aldosterone and testosterone are greater in this group, peripheral sensitivity to androgens can explain the elevated levels of risk factors like blood pressure (14).

Several studies have shown an association between premature hair whitening and CHD (17-20). In the present study, prevalence of this indicator was noticeably high. Schnohr et al. found RR of 1.9 for myocardial infarction (MI) in men with completely gray hair in comparison with men who had no gray hair; in women there was a similar but non-significant weak relationship (17). It has also shown a positive relationship between risk factors that can be involved in this phenomenon through mechanisms like impaired DNA repair, inflammatory processes, and antioxidant reactions (21-26). However, some researchers could not find a correlation (27), which can be explained by their poor methodology and lack of determination of diseases severity.

When disturbance in lipoprotein metabolism exists, lipid containing foam cells appear in dermis or tendons which led to premature detection of atherosclerosis (28). In our study, the prevalence of xanthoma in IHD patients was 18.6%. Elevated levels of serum lipids, especially total cholesterol (TC) and LDL-c has been shown in patients with xanthomas (29-31). Even normolipidemic individuals with xanthelasma may have abnormal lipoprotein composition (32). There is a relationship between this sign and IHD or MI even after adjustment for other CVD risk factors (33). A meta-analysis showed that xanthoma in persons with familial hypercholesterolemia is associated with CVD risk (34). Hazard/odds ratio of MI, IHD, and ischemic cerebrovascular disease was respectively 1.48, 1.39, and 1.69 in participants with xanthelasma irregard-

less of plasma lipids (35). It can be explained by cholesterol leakage from vessels, its deposition in connective tissues, and its uptake by macrophages (36). Civeira et al. also found that tendon xanthoma (TX) is associated with hypertension (37).

There are numerous studies, which have demonstrated the very strong relationship between DELC and coronary artery atherosclerosis (CAA) (38-42). We found a 34.1% prevalence of DELC among our patients. Lichstein et al. showed that unilateral or bilateral DELC was significantly more common (47%) among patients hospitalized in an USA coronary-care unit than among age-matched control subjects (30%) (39). There was a relationship between DELC, arterial hypertension, and hypercholesterolemia (43). Degeneration of elastin, supplying ear lobe and heart by end arteries, skin aging, and shortened telomeres are some proposed mechanisms (44). In conclusion, male pattern baldness, hair graying, xanthoma, and earlobe crease are associated with increased risk of ischemic heart disease. These dermatologic signs can be considered as CVD risk factors for screening.

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