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Prevalence of Coronary Artery Ectasia and its Association with Cardiovascular Risk Factors among Patients Undergoing Angiography at Shahid Mostafa Khomeini Hospital in Ilam, Iran

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ABSTRACT

Introduction: Coronary artery ectasia (CAE) is an abnormal dilation of coronary arteries that can contribute to ischemia and adverse cardiac outcomes. Reported prevalence varies widely, and there is limited data available from western Iran. This study aimed to determine the prevalence of CAE and assess its association with conventional cardiovascular risk factors.

Methods: In this cross-sectional study, 170 patients aged ≥18 years undergoing coronary angiography at Shahid Mostafa Khomeini Hospital, Ilam (May 2024–May 2025), were evaluated. CAE was defined as a coronary segment ≥1.5 times the diameter of an adjacent normal segment. Demographic characteristics, clinical risk factors, and lipid profiles were compared between patients with and without CAE using t-tests, Chi-square tests, and logistic regression.

Results: The mean age was 60.6 ± 11.6 years, and 62.4% were male. CAE was observed in 21.8% of patients. The left anterior descending artery was most frequently affected (62.2%), followed by the circumflex (54.1%), right coronary (40.5%), and left main arteries (10.8%). No significant associations were found between CAE and diabetes, hypertension, smoking, dyslipidemia, or opium use.

Conclusion: The prevalence of CAE in this population was higher than that reported internationally. The absence of significant links with traditional cardiovascular risk factors suggests distinct mechanisms, possibly inflammatory or genetic. Larger multicenter studies are needed to clarify the etiology and guide management strategies.

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Introduction

Coronary artery ectasia (CAE) refers to an abnormal dilation of the coronary arteries, defined as segments that exceed 1.5 times the diameter of the adjacent normal coronary artery (1). Although frequently asymptomatic, CAE is a clinically relevant finding identified during coronary angiography and is associated with myocardial ischemia, angina, thrombotic complications, and acute coronary syndromes, primarily due to altered hemodynamics and sluggish coronary blood flow (1,2).

The reported prevalence of CAE among patients undergoing coronary angiography varies considerably, typically ranging from approximately 0.3% to 5.3%, depending on definitions, population, and methodology (3, 4). In large cohort studies, prevalence rates around 0.8% have been observed in over 20,000 angiographies, while other series have reported rates up to 4.9% (1,3,5).

Although CAE frequently coexists with coronary artery disease (CAD), it can occur in isolation, suggesting potentially distinct pathophysiological mechanisms. Traditional cardiovascular risk factors—including hypertension, smoking, male sex, hyperlipidemia, and diabetes—have shown inconsistent associations with CAE across different populations (4, 6, 7). Specifically, diabetes often shows no direct association with CAE and may even correlate with its absence in some reports (4).

In Iran and neighboring regions, opium use is a prevalent cultural habit, sometimes believed to have cardiovascular benefits despite lacking scientific support. Recent studies, such as the Milano Iran (MIran) case–control study, have identified a significantly higher risk of CAD (adjusted OR ≈ 3.8) among habitual opium users—particularly men—even after controlling for traditional risk factors (8). Conversely, a propensity matched study by Shafie et al. found no significant difference in opium consumption between patients with isolated CAE and matched angiographically normal controls (OR 0.81, P = 0.45) (9). This discrepancy highlights the uncertainty surrounding opium's specific role in CAE pathogenesis.

Despite its clinical relevance, CAE remains under-investigated, especially in low- and middle-income countries where region-specific risk factors and vascular profiles may differ. There is a paucity of data from Iran regarding local prevalence rates and risk profiles of CAE, including potential contributions of opium, smoking, and metabolic factors.

Therefore, this study was designed to: 1. Estimate the prevalence of coronary artery ectasia among patients undergoing coronary angiography at a tertiary-care center in Ilam, western Iran; and 2. Evaluate the association of CAE with conventional cardiovascular risk factors—such as age, sex, hypertension, diabetes mellitus, dyslipidemia, cigarette smoking—and opium use in this population.

Methods

1. Study Design and Participants

This cross-sectional descriptive-analytical study was conducted at Shahid Mostafa Khomeini Hospital in Ilam, Iran, from May 2024 to May 2025. The study aimed to evaluate the prevalence of CAE among patients undergoing coronary angiography and to compare clinical and biochemical characteristics between patients with and without CAE. The study protocol was reviewed and approved by the Ethics Committee of Ilam University of Medical Sciences in Ilam, Iran (Approval Code: IR.MEDILAM.REC.1402.229).

2. Inclusion Criteria

- Age ≥18 years.
- Undergoing elective or emergency coronary angiography.
- Availability of complete angiographic and laboratory data.

3. Exclusion Criteria

- Previous coronary artery bypass graft (CABG) surgery.
- Inadequate angiographic images for vessel measurement.
- Known congenital heart disease other than CAE.

4. Angiographic Assessment

Coronary angiograms were reviewed

independently by two experienced cardiologists blinded to patients' clinical data. CAE was defined as dilatation of a coronary artery segment ≥1.5 times the diameter of an adjacent normal segment, according to the Markis classification (10). Patients were categorized into two groups:

1 .CAE group – patients with at least one ectatic coronary segment.

2 .Non-CAE group – patients without ectasia.

5. Variables and Data Collection

For all patients, the following data were collected:

- Demographic variables: age, sex.
- Clinical risk factors: hypertension (HTN), diabetes mellitus (DM), smoking.
- Laboratory variables: triglycerides (TG), total cholesterol, low-density lipoprotein (LDL), and high-density lipoprotein (HDL).

Hypertension was defined as systolic BP ≥140 mmHg, diastolic BP ≥90 mmHg, or use of antihypertensive drugs. Diabetes mellitus was defined as fasting plasma glucose ≥126 mg/dL, HbA1c ≥6.5%, or treatment with antidiabetic medications. Dyslipidemia was defined according to National Cholesterol Education Program (NCEP) criteria.

5. Statistical Analysis

Statistical analyses were conducted using SPSS version 29.0 (IBM Corp., Armonk, NY, USA). Continuous variables (age, TG, cholesterol, LDL, HDL) were presented as mean ± standard deviation (SD), and categorical variables (sex, DM, HTN, smoking, presence of CAE) as frequency and percentage. Comparisons between the CAE and non-CAE groups were performed using the independent t-test for continuous variables and the Chi-square test (or Fisher's exact test, if required) for categorical variables. A p-value <0.05 was considered statistically significant.

Results

A total of 170 patients who underwent coronary angiography were enrolled. The mean age of participants was 60.6 ± 11.6 years, and 62.4% were male. The prevalence of common cardiovascular risk factors included diabetes mellitus in 29.4%, hypertension in 50.6%, smoking in 13.5%, and opium use in 2.4%. Mean serum lipid levels were as follows: triglycerides 184.6 ± 120.3 mg/dl, cholesterol 164.9 ± 43.6 mg/dl, HDL 47.8 ± 15.5 mg/dl, and LDL 82.6 ± 32.3 mg/dl.

CAE was identified in 21.8% (n = 37) of patients. The left anterior descending artery (LAD) was the most frequently affected vessel (62.2%), followed by the left circumflex (LCX, 54.1%), right coronary artery (RCA, 40.5%), and left main coronary artery (LMCA, 10.8%). Multivessel involvement was observed in 24.3% of CAE cases, while 16.2% had three-vessel disease (Table 1).

When comparing patients with and without CAE, no statistically significant differences were observed in diabetes mellitus, hypertension, smoking, or opium use. Similarly, mean lipid profiles (triglycerides, cholesterol, HDL, LDL) were not significantly different between groups, although LDL levels (p = 0.073) and diabetes (p = 0.113) showed borderline trends (Table 1). Logistic regression analysis did not identify independent predictors of CAE (Table2).

Table 1. Angiographic findings of patients with CAE (n=37).

Finding	n (%)
Overall CAE prevalence	37 (21.8%)
LAD involvement	23 (62.2%)
LCX	20 (54.1%)
RCA involvement	15 (40.5%)
LMCA involvement	4 (10.8%)
Two-vessel involvement	9 (24.3%)
Three-vessel involvement	6 (16.2%)

Table 2. Comparison of clinical and laboratory characteristics between patients with and without CAE.

Variable	CEA (n=37)	No CAE (n=133)	p-value
Age (years, Mean ± SD)	60.8 ± 11.7	59.7 ± 11.5	0.835
Male sex, n (%)	23 (62.2%)	83 (62.4%)	0.981
Diabetes mellitus, n (%)	7 (18.9%)	43 (33.3%)	0.113
Hypertension, n (%)	19 (51.4%)	67 (50.4%)	0.916
Smoking, n (%)	6 (16.2%)	17 (12.8%)	0.598
Opium use, n (%)	0 (0.0%)	4 (3.0%)	0.286
Triglycerides (mg/dl)	167.0 (IQR 103.5–208.0)	144.0 (IQR 108.0–277.0)	0.156
Cholesterol (mg/dl)	158.7 (IQR 135.4–195.9)	163.8 (IQR 130.9–180.7)	0.488
LDL (mg/dl)	80.0 (IQR 62.4–104.6)	67.0 (IQR 49.7–94.1)	0.073
HDL (mg/dl)	47.0 (IQR 37.0–59.0)	44.0 (IQR 38.0–51.0)	0.509

Discussion

This study investigated the prevalence of CAE among patients undergoing coronary angiography at Shahid Mostafa Khomeini Hospital in Ilam and examined its relationship with conventional cardiovascular risk factors. The prevalence of CAE was 21.76%, which is considerably higher than the 0.3%–5% prevalence generally reported in the literature (4-6). The markedly higher prevalence of CAE observed in this study compared with global estimates may, in part, be explained by genetic and ethnic factors (10, 11). Previous research has indicated that certain populations in the Middle East and South Asia may possess genetic predispositions that affect vascular wall remodeling and connective tissue integrity (7). Variations in genes encoding matrix metalloproteinases (MMPs) and their inhibitors (TIMPs), as well as polymorphisms in inflammatory cytokine genes, have been implicated in increased susceptibility to coronary ectasia (9). Such genetic heterogeneity could contribute to the greater frequency of CAE in the western Iranian population studied here, particularly considering the unique ethnic composition of Ilam province.

A key finding of this research is that no significant association was observed between CAE and traditional cardiovascular risk factors such as hypertension, diabetes, dyslipidemia, smoking, or opium use. This result contrasts with CAD, where such risk factors are well-established contributors (12, 13). Similar findings were reported in Iranian and international studies, indicating that the etiology of CAE may diverge from that of atherosclerotic CAD (14, 15).

Another plausible explanation involves chronic low-grade inflammation and immune-mediated mechanisms. Elevated levels of proinflammatory cytokines such as IL-6, IL-8, TNF-α, and TGF-β have been reported in patients with CAE, supporting a link between inflammatory dysregulation and abnormal vascular dilation (1, 5). Environmental exposures, infections, or lifestyle factors unique to this region could amplify these inflammatory pathways, thereby promoting localized arterial wall degradation and aneurysmal remodeling independent of atherosclerosis (4). These findings support the concept that CAE should be viewed not merely as an extension of atherosclerosis, but as a potentially distinct pathological process (16, 17).

Environmental and lifestyle determinants may also play a contributory role. Western Iran, including Ilam province, exhibits distinct dietary patterns, socioeconomic conditions, and high prevalence of opium use—all of which may indirectly affect vascular health (15). Although opium consumption was not statistically associated with CAE in the present study, long-term exposure to opioids has been shown to influence oxidative stress and endothelial function, which might facilitate arterial dilatation in genetically predisposed individuals (8). Furthermore, factors such as chronic air pollution exposure, recurrent infections, and disparities in cardiovascular

healthcare access could also contribute to the observed higher prevalence.

Furthermore, longitudinal studies have shown that CAE may contribute to adverse outcomes, including higher risks of ischemic events and cardiac complications (8, 9). This reinforces the clinical importance of identifying CAE during angiography, even in the absence of conventional risk factors.

Taken together, these findings suggest that the high regional prevalence of CAE likely results from a multifactorial interaction between genetic background, inflammatory processes, and environmental influences. Future multicenter studies incorporating genetic analyses, inflammatory biomarkers, and regional lifestyle assessments are warranted to delineate the precise mechanisms behind CAE in Iranian populations and to determine whether preventive or management strategies should be region-specific.

Conclusion

This study highlights a relatively high prevalence of CAE in the studied Iranian population, exceeding international estimates. Importantly, the absence of significant associations with traditional risk factors such as diabetes, hypertension, smoking, or dyslipidemia suggests that CAE has a unique pathophysiology distinct from atherosclerotic CAD. Instead, inflammatory, immunologic, and possibly genetic factors may play a more central role.

Because of the cross-sectional design and limited sample size, the findings should be interpreted with caution. Nonetheless, the results are consistent with prior evidence that CAE is a clinically relevant condition with distinct mechanisms. Future research should focus on prospective, multicenter studies with larger populations to clarify causal pathways, evaluate long-term outcomes, and guide management strategies. Such studies would help determine whether CAE requires targeted therapeutic approaches, separate from those used in conventional CAD.

Interestingly, some of these findings contradicted with those of previous publications, especially regarding sinus bradycardia in cigarette smokers. In this cohort, we documented major and minor ECG findings in cigarette and hookah smokers, compared their significance, and discussed possible underlying mechanisms for these differences.

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Ethical Considerations

Written informed consent for the use of patients' data in studies was obtained from all participants or their first-degree relatives during their administration process and ethical approval was obtained from the Ethics Committee of Ilam University of Medical Sciences (IR.MEDILAM.REC.1402.229).

Conflicts of Interest

The authors declared no conflicts of interest.

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