

# Hemoglobin: Emerging marker in stable coronary artery disease

## Abstract

Coronary artery disease is a common health problem worldwide, and some studies have pointed out the relationship between CAD and anemia. To diagnose anemia, the criteria is hemoglobin (Hb) <12 g/dL in women and <13 g/dL in men. Although anemia is pathophysiologically associated with myocardial ischemia, there are scarce data to substantiate it. It was a cross-sectional study with cases of stable coronary artery disease and healthy controls in Puducherry. Whole blood samples were collected from 50 cases and 50 controls in ethylenediaminetetraacetic tubes. Hemoglobin was estimated using automated hematology analyzer. Hemoglobin values of the cases and controls were compared using Student's *t* test. Hemoglobin values were found to be reduced significantly in cases compared with controls.  $P < 0.0001$  (statistically significant). Almost all the cases were found to be anemic. Our study shows that hemoglobin might also play a significant role in pathogenesis of coronary artery disease. Further detailed studies may provide clues to boost this emerging biomarker.

### Key words:

CAD, hemoglobin, Puducherry

## Introduction

Hemoglobin is critical for normal oxygen delivery to tissues; it is also present in erythrocytes in such high concentrations that it can alter red cell shape, deformability, and viscosity. Anemia is a condition in which the body does not have enough healthy red blood cells. Red blood cells provide oxygen to body tissues. It is a decrease in the number of red blood cells (RBCs) or less than the normal quantity of hemoglobin in the blood. Coronary heart disease (CHD) is a narrowing of the small blood vessels that supply blood and oxygen to the heart. CHD is also called coronary artery disease (CAD). CAD after Diabetes Mellitus and Tuberculosis is a major health issue all over the world, including India.<sup>[1]</sup> Treatment of CAD is a long-term management with costly surgical interventions as well as medical treatment, which add up to more difficulties for the poor and villagers of Indian population. Very few studies have pointed out the relationship between CAD and anemia.<sup>[2,3]</sup>

As per the WHO guidelines, the criteria for diagnosing anemia is hemoglobin (<12 g/dL in women and <13 g/dL in men). Although anemia is pathophysiologically related to myocardial ischemia, very few data are available to substantiate it.

Our study aimed to find out the significance of hemoglobin concentration in stable CAD.

## Materials and Methods

Patients of both genders of different age groups were taken for this case-control cross-sectional study in and around Puducherry. Cases were defined as patients who attended the cardiology or general medicine department at A.V. Medical College, Puducherry, with physician's diagnosis as CAD.

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**Table 1: Shows the analysis of different variables between cases and controls. P value calculated using Student's t test with acceptance of statistical significance value <0.05**

Variables	Cases (mean±SD)	Controls (mean±SD)	P value	r value
Age (years)	52±7.1	53±7.3	0.73	0.03
Duration (years)	1.25±0.9	Not applicable	Not applicable	Not applicable
Systolic (mmHg)	128±8.5	127±9.3	0.87	0.21
Diastolic (mmHg)	78±7.1	79±6.3	0.79	-0.12
Pulse (per min)	78±4.4	79±4.5	0.88	0.08
Body mass index (kg/m <sup>2</sup> )	25±1.1	24±1.1	0.99	-0.03
Hemoglobin (g/dL)	10.1±0.8	13.7±0.7	<0.0001	-0.04
Fasting plasma glucose (mg/dL)	83.3±7.2	82.5±7.5	0.63	-0.1

A detailed history was taken to establish cardiovascular risk factors, including diabetes, smoking ( $\geq 20$  cigarettes/day for more than 5 years), hypertension (systolic blood pressure  $\geq 140$  mmHg or diastolic blood pressure  $\geq 80$  mmHg at repeated measurements or a known history of hypertension and treatment with antihypertensive drugs), body mass index (BMI), and a family history of cardiovascular disease. CAD patients were selected based on physician diagnostic criteria, which are as follows: (a) a previous history of treatment for CAD-like percutaneous transfemoral coronary angiography or angioplasty; (b) electrocardiograph diagnosis with ST segment depression more than 0.1 mV; (c) echocardiograph diagnosis with decreased ejection fraction stating cardiac ischemia or right wall motion abnormalities; (d) any previous episode of myocardial infarction/unstable angina with current decreased ejection fraction stating cardiac ischemia or right wall motion abnormalities; and (e) any previous episode of myocardial infarction/unstable angina with current duration of the disease were included. Patients with known history of liver disease, hypoproteinemia, viral hepatitis, chronic smokers, alcoholics, worm infestations, and menorrhagia were excluded. Blood samples were collected from 50 patients diagnosed with CAD attending both the inpatient and outpatient of general medicine or cardiology department.

Whole blood samples were collected in EDTA tubes and hemoglobin was estimated using Mind ray BC-2800 Automated Hematology Analyzer by flow cytometry method. Fifty controls were selected based on the age- and sex-matched cases; 25 males and 25 females in cases as well as in controls. The results were analyzed by standard statistical methods.

## Results and Discussion

Whole blood hemoglobin values were significantly lower ( $P < 0.0001$ ) in stable CAD cases than in healthy controls.

Moreover, most of the cases were found to be anemic based on their hemoglobin values. Fasting plasma glucose estimation also was done to the study population to exclude diabetics and was statistically not significant ( $P = 0.63$ ). There was no significant statistical variations in any other variables except hemoglobin [Table 1]. The duration of the onset of the CAD in cases was just more than a year, which points out that the early onset of anemia might lead to the further progress of the disease, although blood pressure ( $P > 0.5$ ) and body mass index ( $P = 0.99$ ) are within the reference range.

Our study thus shows that hemoglobin may also play a significant role in the pathogenesis of CAD. Further detailed studies are required to substantiate these findings with more sample size and of course a prospective study also may help. By this one parameter alone, we cannot come to any significant conclusion, but it can be added up to batteries of tests to derive the diagnosis. Also, anemia is more common in people with CAD in comparison to healthy controls in our setting. Previous studies have shown that the presence of anemia in CAD is associated with poor outcomes.<sup>[2]</sup> Thus, we conclude that people with CAD should be routinely screened for anemia.

## References

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