

## Frequency of Carotid Artery Stenosis in Patients having Significant Coronary Artery Disease on Coronary Angiography

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### Article Details

### ABSTRACT

**Keywords:** Carotid Artery Stenosis, Coronary Artery Disease, Coronary Angiography

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**Objectives:** To determine the frequency of carotid artery stenosis in patients having significant coronary artery disease on coronary Angiography. **Materials and Methods:** Following approval from the ethical committee of LRH, Peshawar, 150 patients who met the inclusion criteria were enrolled after obtaining written informed consent. This study was conducted at department of cardiology LRH Peshawar from 23 Nov 2024 to 22 May 2025. Each patient underwent carotid artery ultrasonography using a tomographic ultrasound system with a 7.5 MHz linear transducer. Bilateral scanning of the extracranial carotid arteries was performed in three longitudinal views. Carotid artery stenosis was considered significant if there was  $\geq 50\%$  narrowing of the common carotid artery or its main branches, as determined by Doppler scan. Data were collected using a structured questionnaire. All data were analyzed using SPSS version 26. **Results:** The mean age of participants was  $51.11 \pm 8.18$  years. Of the 150 patients, 66% were male and 34% were female. Carotid artery stenosis was found in 36% of cases. Most stenosis cases were in the 41–60 age range, but the association with age ( $p=0.14$ ) and gender ( $p=0.62$ ) was not statistically significant. **Conclusion:** It was concluded that a notable frequency of carotid artery stenosis in patients with significant coronary artery disease was found, highlighting the coexistence of atherosclerosis in multiple vessels. Though not statistically significant, stenosis was more common in older patients and males. Routine screening in CAD patients, especially before interventions, may help prevent cerebrovascular complications and improve outcomes.

## INTRODUCTION

Coronary artery disease (CAD) and carotid artery stenosis (CAS) are both manifestations of systemic atherosclerosis, a progressive condition characterized by plaque buildup in arterial walls.(1) While CAD is a leading cause of morbidity and mortality worldwide due to myocardial infarction and heart failure, CAS is a major risk factor for ischemic stroke.(2-5) The coexistence of these conditions is common, as they share similar risk factors, including hypertension, diabetes mellitus, dyslipidemia, smoking, and advancing age. CAD primarily affects the coronary arteries supplying blood to the heart, carotid artery stenosis involves the narrowing of the carotid arteries that supply blood to the brain.(2, 6) CAD and cerebrovascular disease are the leading causes of death world over.(3, 7) The American Heart Association has outlined various risk factors for coronary heart disease. Some of these factors are modifiable, treatable, or controllable, while others are not. The risk of developing heart disease increases with the number of risk factors present in an individual.(8) Patients with significant CAD often undergo invasive procedures such as coronary angiography or coronary artery bypass grafting (CABG). In such high-risk individuals, the presence of undiagnosed CAS may increase the risk of perioperative cerebrovascular events. Therefore, evaluating the frequency of CAS in patients with CAD is crucial for early detection and preventive management.

This study was conducted to determine the frequency of carotid artery stenosis in patients with significant coronary artery disease confirmed by coronary angiography. Understanding this association can help in formulating appropriate screening protocols and improving overall cardiovascular care.

## OBJECTIVE

To determine the frequency of carotid artery stenosis in patients having significant coronary artery disease on coronary Angiography.

## MATERIALS AND METHODS

**Study Design:** Cross-sectional study.

**Study setting:** Department of Cardiology, Lady Reading Hospital, Peshawar.

**Duration of the study:** Duration of the study was 6 month. (23 Nov 2024 to 22 May 2025)

**Sampling Technique:** Non-probability Consecutive sampling was used for the recruitment of patients.

## SAMPLE SIZE

The sample size was calculated using the WHO sample size calculator with a 95% confidence level, an

absolute precision of 7.5%, and an anticipated population proportion of 32.7% (9) for carotid artery stenosis. Based on these parameters, the required sample size was 150 patients.

## **INCLUSION CRITERIA**

- Patients with significant coronary artery disease i.e.  $\geq 50\%$  stenosis in Left main stem or in any one of the three major epicardial vessels or their main branches (single vessel, double vessel or triple vessel disease), on conventional coronary angiography.
- Patients of age 20-70 years.
- Both gender (male and female).

## **EXCLUSION CRITERIA**

- Patients with history of previous carotid endarterectomy or any carotid procedure.
- Patients with known carotid artery disease or other significant comorbidities that could independently influence the development or progression of carotid artery stenosis.
- Patients with history of percutaneous coronary intervention prior to index coronary angiogram or coronary artery bypass grafting.

## **METHODS**

After obtaining approval from the ethical committee of LRH, Peshawar, patients who met the inclusion criteria were enrolled in the study after obtaining written informed consent from the patients or their guardians. A total of 150 patients were included. All enrolled patients underwent ultrasonographic scanning of the carotid arteries using a tomographic ultrasound system equipped with a high-frequency (7.5 MHz) linear transducer. Bilateral scanning of the extracranial carotid arteries in the neck was performed in three different longitudinal projections. Carotid artery stenosis was considered significant when there was  $\geq 50\%$  stenosis of the common carotid artery or its main branches, as determined by Carotid Doppler scan. Data were collected using a predesigned questionnaire.

## **DATA ANALYSIS PROCEDURE**

The collected data were entered and analyzed using the Statistical Package for Social Sciences (SPSS) Version 25. Results for all quantitative variables, such as age, were expressed as mean  $\pm$  standard deviation. Frequencies and percentages were presented for qualitative variables such as gender and carotid artery stenosis. Effect modifiers like age and gender were controlled through post-stratification. After stratification, the chi-square test was applied, and a p-value  $\leq 0.05$  was considered statistically

significant.

## RESULTS

The mean age of the participants was  $51.11 \pm 8.18$  years. Out of the total participants, 66.0% (n=99) were male and 34.0% (n=51) were female. Carotid artery stenosis was present in 36.0% (n=54) of the cases, while 64.0% (n=96) had no evidence of stenosis. Among patients with carotid artery stenosis, 3.7% were aged 20–40 years, 38.9% were between 41–50 years, 42.6% were 51–60 years, and 14.8% were over 60 years. In comparison, among those without stenosis, 11.5% were aged 20–40 years, 43.8% were 41–50 years, 38.5% were 51–60 years, and 6.3% were above 60 years. The association between age groups and carotid artery stenosis was not statistically significant ( $p = 0.14$ ). Regarding gender, 68.5% of patients with stenosis were male and 31.5% were female, while 64.6% of those without stenosis were male and 35.4% were female. This gender-based difference was also not statistically significant ( $p = 0.62$ ).

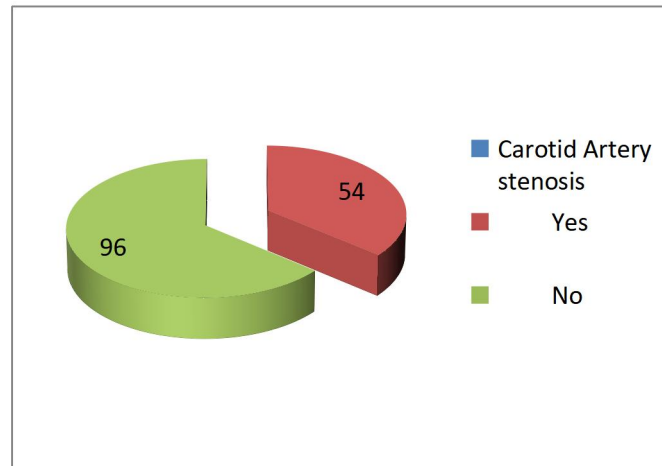
**TABLE 1: PATIENT CHARACTERISTICS OF ENROLLED PATIENTS (N=150)**

Variables	Mean $\pm$ SD
Age (Years)	51.11 $\pm$ 8.18

**TABLE 2: DISTRIBUTION OF GENDER AND CAROTID ARTERY STENOSIS AMONG STUDY PARTICIPANTS**

(n = 150)

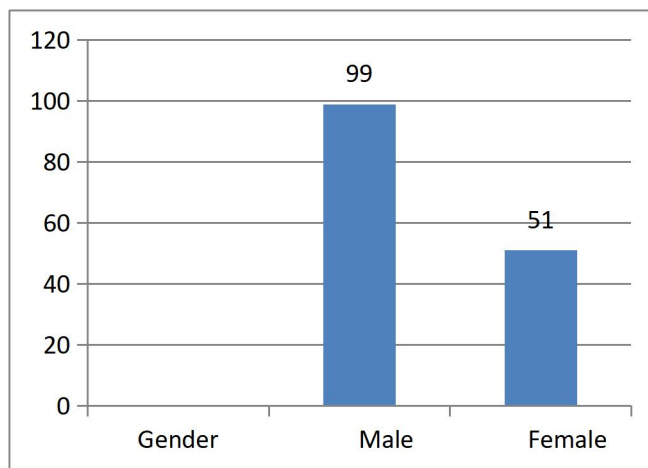
	Frequency	Percentage
<b>Gender</b>		
Male	99	66.0
Female	51	34.0
<b>Carotid Artery stenosis</b>		
Yes	54	36.0
No	96	64.0



**FIG 1: FREQUENCY OF PATIENTS ON THE BASIS OF CAROTID ARTERY STENOSIS.**

**TABLE 3: STRATIFICATION OF CAROTID ARTERY STENOSIS WITH RESPECT TO AGE GROUPS AND GENDER (n=150)**

Variables	Carotid Artery Stenosis		
Age Groups	Yes	No	P-Value
20 to 40 years	2(3.7%)	11(11.5%)	0.14
41 to 50 years	21(38.9%)	42(43.8%)	
51 to 60 years	23(42.6%)	37(38.5%)	
>60 years	8(14.8%)	6(6.3%)	
Gender			
Male	37(68.5%)	62(64.6%)	0.62
Female	17(31.5%)	34(35.4%)	



**FIG 2: FREQUENCY OF PATIENTS ON THE BASIS OF GENDER**

**DISCUSSION:** The present study aimed to determine the frequency of carotid artery stenosis (CAS) in patients with significant coronary artery disease (CAD) as confirmed by coronary angiography. The present study findings revealed that 36% of the participants had carotid artery stenosis, indicating a considerable overlap between carotid and coronary atherosclerotic disease. Our study was supported by the study conducted by Fouzia Goher et al.(9) stated that significant ultrasonographic carotid stenosis was observed in 32.7% of patients. The observed frequency of CAS in this study is consistent with previous literature that highlights the co-existence of atherosclerotic changes in multiple vascular territories. Several studies have reported that patients with CAD are at increased risk for extracranial carotid artery disease due to the systemic nature of atherosclerosis. Previous studies (10, 11), have reported a significant association between carotid artery stenosis and the severity of coronary artery disease in patients undergoing coronary bypass surgery. Our finding showed that CAS was more common in the older age groups, particularly among patients aged 51–60 years and those above 60 years, although the association was not statistically significant. This trend supports the established understanding that the prevalence of atherosclerotic disease increases with age. Gender-based analysis revealed a higher proportion of CAS among male patients compared to females; however, the difference was also not statistically significant, which is in line with some studies, though others have noted a stronger gender association. In the study by Protack,(12) the gender distribution included 64% males and 36% females. Similarly, De Weerd's study (13) demonstrated that the prevalence of carotid artery stenosis increases with age in both men and women, with men showing higher prevalence estimates across all age groups.

The clinical implication of this study is important, as the presence of CAS in patients with CAD may increase the risk of cerebrovascular events, particularly in those undergoing coronary artery bypass grafting (CABG) or other major cardiac interventions. Therefore, routine screening of the carotid arteries in patients with significant CAD may be beneficial in identifying high-risk individuals and preventing future complications such as stroke.

However, this study has certain limitations. Being a single-center study with a limited sample size, the findings may not be generalizable to the broader population. Additionally, the cross-sectional design does not establish causality or long-term outcomes related to carotid stenosis in CAD patients.

**CONCLUSION:** It was concluded that a notable frequency of carotid artery stenosis among patients with significant coronary artery disease was found, emphasizing the coexistence of atherosclerotic disease in multiple vascular territories. Although no statistically significant association was found between carotid stenosis and age or gender, the condition was more prevalent in older age groups and among males. These findings support the importance of routine carotid artery screening in patients diagnosed with significant CAD, particularly those undergoing coronary interventions, to help identify individuals at risk of cerebrovascular complications. Early detection and management of carotid artery stenosis in this high-risk population may improve overall clinical outcomes and reduce the risk of stroke.

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