# INDICATIONS AND FINDINGS OF CORONARY ANGIOGRAPHY: A DESCRIPTIVE CROSS-SECTIONAL STUDY

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## ABSTRACT

### Introduction

Coronary artery disease is an important subset of cardiovascular disease that requires timely, accurate, and cost-effective diagnosis. Among several modalities practiced to evaluate this disease; coronary angiography is the gold standard.

### Objective

The objective of this study was to identify indications and findings of coronary angiography among patients admitted at Birat Medical College Teaching Hospital.

### Methodology

A descriptive cross-sectional study conducted at Department of Cardiology, Birat Medical College Teaching Hospital from 1 September 2021 to 30 June 2022 after taking ethical approval from Institutional Review Committee (Ref No: IRC-PA-167/2078-79). A total of 202 patients were included through consecutive sampling. Data was collected on baseline characteristics, indications and findings of coronary angiography. Frequency, percentage, mean and standard deviation was calculated.

### Result

Maximum percentage of patients were in the age group 60-69 years (20.8% males and 16.3% females) with mean± S.D(60.1± 11.1). The most common indication for coronary angiography was angina (34.1%) and treadmill test positive (24.3%). Nearly 62% had abnormal findings. Single vessel disease was present in 25.2%, double vessel disease in 5.9% and triple vessel disease in 20.6%. Other findings were cardiac bridging (2.9%), non-critical coronary artery disease (1.9%) and in-stent restenosis (0.5%).

### Conclusion

The most common indication of coronary angiography was chronic stable angina and the majority had vessel diseases.

### KEYWORDS

coronary angiography; coronary artery disease; coronary vessels

## INTRODUCTION

Coronary artery disease (CAD) is a condition in which the blood supply to the heart muscles is partially or completely blocked. It is a preventable cardiovascular disease that requires timely, accurate, and cost-effective diagnosis.[1] It is the third leading cause of morbidity and mortality worldwide.[2-4] The most common cause of CAD is due to the gradual buildup of atheroma or other atherosclerotic plaque in the walls of coronary artery. Other causes are coronary artery spasm, endothelial dysfunction and coronary artery abnormalities. The non-modifiable risk factors for CADs are advancing age, family history of coronary artery disease and the modifiable risk factors are smoking, high blood pressure, obesity, sedentary lifestyle, dietary factors, dyslipidemia.[5] The clinical presentation of patient with coronary artery disease includes silent ischemia, angina pectoris, acute coronary syndrome(unstable angina, myocardial infarction) and sudden cardiac death.[5,6] Coronary artery disease are evaluated through blood tests, electrocardiography(EKG), echocardiography, chest X-ray, stress test and cardiac catheterization). The tests depend on the context in which the patients are present for treatment. Coronary angiography is the gold standard and most accurate procedure for diagnosing coronary artery disease.[1] In patients with acute coronary syndrome (ACS), all ST Elevation Myocardial Infarction (STEMI) patients and selected Non-ST Elevation Myocardial Infarction (NSTEMI) patients require emergent cardiac catheterization. The angiography procedure is done in a cardiac catheterization lab, is expertise dependent, and is done under sedation.[6] In order to facilitate early diagnosis and intervention, we conducted a study to identify indications and findings of coronary angiography among patients admitted at Birat Medical College Teaching Hospital.

## METHODOLOGY

This was a descriptive cross-sectional study carried out at the department of cardiology, Birat Medical College Teaching Hospital from 1 September 2021 to 30 June 2022 among patients underwent Coronary Angiography. Ethical approval was obtained from the Institutional Review Committee (Ref No: IRC-PA-167/2078-79) of Birat Medical College Teaching Hospital. Patients were informed about the objective of the study and informed consent was obtained prior to data collection. Patients undergoing coronary angiography at Birat Medical College Teaching Hospital and willing to participate in the study were included and those who refused to participate were excluded from the study. The consecutive sampling technique was used to enroll 202 patients who underwent for coronary angiography.

The indication for coronary angiography was operationalized as any of the signs and symptoms present in patients to be suspected of cardiac abnormalities. It included angina, abnormal results in echocardiography and electrocardiography, treadmill test positive (TMT), ventricular dysfunction, coronary artery abnormalities, myocardial ischemia, and heart block.

The coronary angiography findings were operationalized as

normal and abnormal. The abnormal findings were operationally defined according to the obstruction in vessels involvement single vessel disease (SVD), double vessel diseases (DVD), triple vessel diseases (TVD), non-dominant right coronary artery (ND-RCA), cardiac bridging, non-critical CAD (40%), in stent restenosis (<50%).[1,5] Single vessel disease is defined as stenosis ≥ 70% in one of three coronary arteries(right coronary artery, left anterior descending artery and left circumflex artery), double vessel and triple vessel disease is defined as stenosis of ≥ 70% in two and all three major epicardial coronary arteries (i.e., the right coronary artery, left anterior descending artery, and left circumflex artery respectively.[7-9]

Data were collected by using specifically designed proforma which includes baseline parameters such as age, sex, indication for coronary angiography and coronary angiography outcomes.

The collected data were entered in Microsoft Excel and transferred to Statistical Package for Social Sciences (SPSS) version 23 for further analysis. Frequency, percentage, mean and standard deviation were calculated.

## RESULTS

Out of 202 patients enrolled for the study, the majority (53.5%) were male. Maximum percentage of patients were in the age group 60-69 years (20.8% male and 16.3% female) followed by 50-59 years (14.4% male and 12.4% female) with Mean±SD (60.1±11.1) (Table 1).

**Table 1:** Age and sex distribution of patients (n=202).

| Age (In years) Mean± SD=60.1± 11.1 | Male n (%) | Female n (%) |
|---|---|---|
| 30-39 | 5 (2.5) | 5 (2.5) |
| 40-49 | 11(5.5) | 14 (6.9) |
| 50-59 | 29 (14.4) | 25 (12.4) |
| 60-69 | 42(20.8) | 33 (16.3) |
| 70-79 | 19 (9.4) | 14 (6.9) |
| 80-89 | 2 (0.9) | 3 (1.5) |

In the majority of patients (75.25%), angiography was performed via radial route (Figure 1).
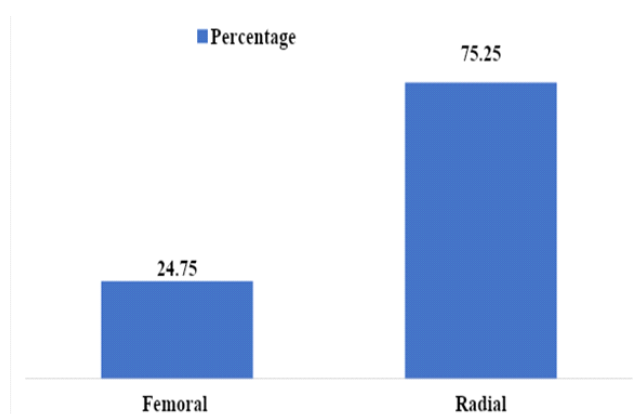


**Figure 1:** Route for coronary angiography (n=202).

The most common indication for coronary angiography was chronic stable angina (34.1%) and treadmill test positive (24.3%). Other indications were left ventricular systolic dysfunction (LVSD) (15.4%), Non-ST elevation myocardial infarction (NSTEMI) (12.4%), ST elevation Myocardial Infarction (STEMI) (11.4%) and so on (Table 2).

**Table 2:** Indication for coronary angiography (n=202).

| Categories | n (%) |
|---|---|
| Chronic Stable Angina | 51(25.2) |
| Treadmill test positive (TMT) | 49(24.3) |
| Left ventricular systolic dysfunction | 31(15.4) |
| NSTEMI | 25(12.4) |
| STEMI | 23(11.4) |
| Unstable angina | 18(8.9) |
| Valvular heart disease | 4(1.9) |
| Heart Block | 1(0.5) |

Nearly 62% had abnormal findings and 38.1% had normal findings. Single Vessel Disease was present in 25.2%, double vessels disease in 5.9% and triple vessels disease in 20.6%. Other findings presented were cardiac bridging (2.9%), non-critical coronary artery disease 4(1.9%) and in-stent restenosis 1(0.5%) (Table 3).

**Table 3:** Findings of coronary angiography (n=202).

| Categories | n (%) |
|---|---|
| Normal | 77 (38.1) |
| Single vessel disease (SVD) | 51(25.2) |
| Double vessel diseases (DVD) | 12 (5.9) |
| Triple vessel diseases (TVD) | 42 (20.6) |
| Cardiac bridging | 6 (2.9) |
| Non critical CAD (40%) | 4 (1.9) |
| In stent restenosis (<50%) | 1 (0.5) |

## DISCUSSION

We conducted a cross sectional study among 202 patients admitted at Birat Medical College Teaching Hospital for coronary angiography. More than half (53.5%) patients were male in our study. In this study, every one in five male patients (20.8%) and 16.3% female patients were in the age group 60-69 years. This was followed by the age group 50-59 years in both sex (14.4% male and 12.4% female). Even with increasing age the percentage of male patients was higher than female except in the age group 80-89 years in our study. A study done by A Shakya et al at Manmohan Cardiothoracic Vascular and Transplant Center (MCVTC), Kathmandu found a similar finding to our study which identified that the majority were male (75.7%) patients. The mean age of presentation was 59.3±12.8 years in their study which is

almost similar to this study (60.1±11.1).[10] Similar response were reported in a study by Prabin Khatri from a medical college at Bhairahawa, Nepal which had 64% male and 36% female patients with mean age of 60 ± 12.90 years.[11] Contrast to this study, study from Shrestha U, et al at B. P. Koirala Institute of Health Sciences, Dharan, Nepal, the majority (35%) were in the age group 51-60 years. But similarity was in the gender which reported that the maximum percentage of cases were males (61.4%).[7] A study done at Lumbini medical college teaching hospital found that the mean age of patients was 67±18 years and thirty patients (75%) were males (75%). A study done in Kerala and a COURAGE trial in the USA had similar findings about the mean age of presentation, which was 60±12 and 62±5 respectively.[12,13] In a study done at Iraq, even among age groups <40 years, male (85%) predominance was reported.[14] The findings across different parts of Nepal and in other countries correspond with the risk factors mentioned in the literature that the male population are more at risk than females. The risk of cardiac disease is high and coronary artery diseases become progressively more common with increasing age. Since the disease advanced with increasing age, it is essential to increase awareness targeting at risk groups to prevent morbidity, mortality and disability associated with it.

In this study, the most common indication for coronary angiography was chronic stable angina (25.2%), followed by Tread mill test positive where nearly one quarter (24.3%) were advised for coronary angiography after treadmill tests. The other indications were left ventricular systolic dysfunction (15.4%), non-ST elevation myocardial infarction (NSTEMI) (12.4%) and ST elevation myocardial infarction (STEMI) (11.4 %). Contrast to our study, A Shakya et al stated that the majority (60.1%) had ST elevation myocardial infarction(STEMI) followed by 23.4% non ST elevation myocardial infarction(NSTEMI) and unstable angina (16.5%).[10] Unstable angina was also the indication in our study but is relatively less compared to A. Shakya et al. A study from Dharan found that the most common indication was ST elevation myocardial infarction (46.3%) followed by stable angina.[7] This indication is different from our study. The increased indication of angina and positive for treadmill test in our study might be due to the differences in the clinician's diagnosis owing to the patient's safety and concern. Also, the presence of conventional risk factors among the study participants; and increased concern of their own health might have caused the indication for coronary angiography for cases with chronic stable angina and positive for treadmill test. The findings suggest that the patient's complaints should not be ignored especially if the modifiable or non-modifiable risk factors are present. Acute coronary syndrome (unstable angina, STEMI, NSTEMI) require immediate treatment as there is increased risk of mortality and morbidity associated with it. So, patients presented with NSTEMI, STEMI and unstable angina were also advised for immediate and timely coronary angiography to rule out the obstruction in the coronary arteries blood flow. Maximum patients (75.25%) were performed coronary

angiography via radial route in our study. Radial route access for coronary angiography has widely been accepted as it has few or no complications and favors early discharge compared to femoral access.[15] In our study, out of 202, 77(38.12%) had normal coronary arteries in angiography procedure. Nearly two third (61.9%) patients had abnormal findings in coronary blood vessels during angiography procedure. The findings show us the increasing pattern of coronary artery disease in our setting. Any abnormality in coronary blood flow increases the morbidity and mortality associated with it. Among 202 patients, every one in four (25.4%) had single vessel disease, every one in five patients (20.6%) had triple vessel disease and 12 patients had double vessel disease in our study. Triple vessel disease is a severe type of coronary artery disease as it involves significant stenosis in all the three coronary arteries and impedes blood circulation.[9] A Shakya et al study reported higher cases of single vessel disease(34.6%), double vessels disease (27.44%) and triple vessels disease (26.3%)[10] and few percentage (6.4%) had normal coronary angiography findings.[10] The percentage of having vessels involvement is higher compared to our study. A study from Dharan had relatively less percentage of cases with normal vessels (32.8%) compared to our study. In regards to the vessels involved, it reported a maximum percentage with two variation in vessel involvement. In a study done in Shahid Ganga National Heart center, Bansbari, Kathmandu by Regmi S et al.; the majority had single vessel disease (34.4%), 20.7% double vessel disease and 15.8% triple vessel disease in angiographic findings. Out of 450 patients, 182 (40.4%) had normal coronary angiography findings.[16] A study done in Norvic International Hospital, Kathmandu stated that single vessel disease was most common (69.06%) followed by double vessel disease (25.84%) and triple vessel disease (5.10%).[17] There is increased risk of morbidity and mortality with the increment in vessel involvement. However, a single vessel also impedes blood circulation in the affected coronary artery and its pathway leading to development of anginal pain, breathing difficulty and symptoms of heart attack.[18] Similar to our findings, the most common coronary angiography finding was single vessel disease in a hospital based prospective study in India

among women with coronary artery disease.[19] Contrast to our findings, in a study done in Dhaka by Mak Akhanda et al, 14.6% patients had SVD, 18.68% patients had double vessels disease, 40.66% had triple vessels disease and 25.59% had normal coronary angiogram.[20] The more the vessels is involved, the greater it is associated with worse prognosis and increased mortality as reported in a 5 years follow up MASS study.[17] The variations in patients with normal coronary artery angiography identified in different studies might be due to the differences in study setting, presenting complaints, patient's readiness of consultation to cardiologists, timely interventional test procedures. It also shows the variation in disease burden.

## CONCLUSION

The most common indication of coronary angiography was chronic stable angina and the majority had vessel diseases.

## RECOMMENDATION

The increased abnormal angiographic findings in our study indicates the coronary artery disease burden is significantly increasing and emphasis should be given on health promotion and disease prevention particularly focusing on educating and screening the targeted groups.

## LIMITATION OF THE STUDY

We were limited not to obtain the information of individual risk factors and follow-up after the procedure. It would be better to have a follow up for better outcome analysis.

## CONFLICT OF INTEREST
None.

## FINANCIAL DISCLOSURE
None.

## ACKNOWLEDGEMENTS

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