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ORIGINAL RESEARCH

Predictors and Prevalence of Obstructive Coronary Artery Disease in Patients Who Underwent Elective Invasive Coronary Angiography for Chronic Coronary Syndrome at Catheterization Laboratory of Tikur Anbessa Specialized Hospital and Gesund Cardiac and Medical Center, Addis Ababa Ethiopia: Retrospective Study

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Background: Coronary angiography remains the standard diagnostic test for evaluating the extent of coronary artery disease (CAD). Guidelines for triaging patients for invasive coronary angiography (ICA) recommend risk assessment and non-invasive testing. The yield of ICA in patients undergoing elective ICA in Ethiopia is unknown.

Methods: The study involved patients who underwent elective ICA at catheterization laboratory of Cardiology unit of Tikur Anbessa Specialized Hospital and Gesund Cardiac and Medical Center between January 2019 and September 2022 G.C. Data on patient risk profile, Chest pain characteristics and ICA finding were collected from electronic medical record, patient's chart and procedure note with the aid of a structured questionnaire. Obstructive CAD was defined as stenosis of 50% or more of the diameter of the left main coronary artery or stenosis of 70% or more of the diameter of a major epicardial vessel. The data was analyzed using SPSS version 26.0.

Results: A total 232 patients, with mean age of 59.9 years, were involved. At catheterization 49.6% were found to have obstructive CAD and 43% of patients had normal epicardial coronary arteries. Hypertension and DM were the commonest comorbidity each occurring in 61% and 53% of the patients. The presence of DM, CKD, and smoking and typical chest pain were independently associated with obstructive CAD.

Conclusion: In this study only half of the patients undergoing elective ICA for suspected chronic coronary syndrome (CCS) have obstructive CAD. In consecutive patients undergoing elective ICA for suspected CCS in Ethiopian, obstructive CAD was found in 49.6% of patients despite high prevalence of atherosclerotic risk factors like hypertension and Diabetes mellitus. Diabetes, hypertension, typical chest pain and history of smoking were found to be strong predictors of obstructive CAD.

Keywords: chronic coronary syndrome, elective, invasive coronary angiography, ischemic heart disease, CCS, ICA

Introduction

Chronic coronary syndrome (CCS), also called stable ischemic heart disease, includes a wide spectrum of clinical conditions including chronic stable angina, asymptomatic ischemia, prior myocardial infarction, and prior coronary revascularization, as well as individuals with no obstructive coronary atherosclerosis, including microvascular disease.[1]

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Multiple pathophysiologic mechanisms are responsible for CCS. The most common pathology is atherosclerotic cardiovascular disease even though as many as one-third patients may not have epicardial coronary artery disease (CAD) and have microvascular dysfunction as underlying pathophysiologic mechanism.[2]

Clinically patient with CCS present with angina, angina equivalents, symptoms of heart failure as initial presentation or may be asymptomatic harboring "silent ischemia". Angina pectoris, when present, typically is retrosternal chest discomfort usually described as tightness, pressure or heaviness that can be felt anywhere from epigastrium to lower jaw or either arm, exacerbated by exertion and relieved with rest or administration of nitroglycerine. Angina may be atypical presenting with less characteristic symptoms such as dyspnea, faintness, fatigue, and frequent belching; which are usually common in the elderly, females and patients with diabetes. The dichotomous description of chest pain as typical or atypical is challenged by recently released guideline from American Heart Association (AHA), American College of Cardiology (ACC) and subspecialty societies, including the Society of Cardiovascular Computed Tomography, which emphasizes that the term atypical should not be used because it is not helpful in determining the cause and can be misinterpreted as benign in nature.[1,3–5]

The evaluations of patients with suspected CCS begins with detailed clinical characterization of presenting complaints, assessment of risk factors, looking for comorbidities and excluding other causes of presenting complaints including acute coronary syndrome. Once clinical evaluation points to CCS basic test including biochemical tests, resting ECG and echocardiography should be done. Further diagnostic tests are chosen based on pre-test probability (PTP) and clinical likelihood of CAD.[1,5]

Over years Several PTP scores have been used for symptomatic patients with CAD. Older predictive model, such as Diamond and Foster developed in 1979, results in significant overestimation of CAD in contemporary patients referred for CAD. Newer PTP scores have been developed using data from contemporary patient population and recommended by guideline from ESC and AHA.[1,4–6]

For patients with low PTP (<15%), further testing can be deferred as these patients have generally good outcomes with annual risk of cardiovascular death or MI being <1%. For patients with intermediate to high PTP, choice of subsequent testing is based on local availability and expertise. Ample data from well conducted clinical trial supports the safety and accuracy of coronary CT angiography (CCTA) in patients with intermediate PTP and is recommended by major society guidelines as first line test. In patients with high clinical likelihood, functional imaging like stress echocardiography, myocardial perfusion study or cardiac MRI followed by invasive coronary angiography (ICA), in patients with high risk finding, is recommended. ICA is also recommended in patients with non-conclusive finding on non-invasive tests, patients with high clinical likelihood non responsive to medical therapy and high risk finding on CCTA. Exercise ECG as initial test is no longer recommended because of inferior diagnostic accuracy compared to stress imaging tests and limited rule out or rule in power. However, it can be considered in setting where other tests are not available as it provides prognostic information.[1,4,5,7,8]

Multiple studies from western set up have reported different rate of CAD in patients undergoing elective ICA for CCS. Avery large US-based registry at 663 hospitals in the American College of Cardiology National Cardiovascular Data Registry found that only 37.6% of patients without known CAD who underwent elective ICA had obstructive CAD.[9]

The safety of ICA with subsequent PCI without onsite surgery has been proven safe in Ethiopia. One Hospital based retrospective coronary angiography study of 300 patients, majority of whom had ACS, reported evidence of CAD in 75.7% of patients while obstructive CAD occurred in 64%. A recently published single center retrospective study, which assessed factors associated with extent of CAD and attained outcome among 197 patients, also reported an impressive success rate.[8,10]

Both studies from Ethiopia quoted above included patients with all spectrum of CAD. There are no studies specifically dedicated to patients with CCS and rate of CAD with elective ICA in these groups of patients in Ethiopia is not known. Hence, this study looked into clinical characteristics, risk factor profile, and rate of CAD and predictors of CAD in patients with CCS.

Study Methodology: Design and Setting

We conducted a retrospective observational study at two centers on patient profile, predictors and rate of CAD in patients who underwent elective ICA for suspected CCS at catheterization laboratory of Tikur Anbessa Specialized Hospital and Gesund cardiac and Medical Center from January 2019 and September 2022 G.C.

The study was conducted at Tikur Anbessa Specialized Hospital (TASH) and Gesund cardiac and Medical Center. TASH is the largest referral hospital in Ethiopia. It is currently the main teaching Centre for both clinical and preclinical training of most disciplines. The cardiology unit of internal medicine is staffed by fellows, residents, interventional cardiologists and general adult cardiologists. Gesund Cardiac Medical and Center (GCMC) is a private cardiac facility in Addis Ababa, Ethiopia. It is equipped with state-of the-art catheterization laboratory and provides various cardiac services to the people of Ethiopia, Eritrea, Somalia and Djibouti.

Study Population

All patients with CCS will be source population and those who underwent elective ICA will be study population.

Inclusion Criteria

- Age >/=18 years.
- Diagnosis of CCS and underwent elective ICA.

Exclusion Criteria

- Known CAD (Previous MI, PCI, Coronary artery by bass graft [CABAG]).
- Elective ICA as part of preoperative evaluation for valve surgery.
- Non elective setting (acute coronary syndrome).
- Incomplete medical record.

After reviewing angiography log books and procedure notes, 378 consecutive patients who had elective ICA with diagnosis of IHD or stable angina were selected using census sampling. After extensive chart review and indications on procedure notes, 232 patients who fulfilled inclusion criteria were included. One hundred forty-six patients were excluded.

The patient selection of study participants is shown in Figure 1 below.

Data Collection Method

Data on Sociodemographic, clinical characteristics and CVD related factors, cardiovascular medications, comorbid disease, ECG and Echocardiography were retrieved by reviewing chart and electronic record using structured questionnaire. Data on angiographic finding was collected from procedure note and angiography log book.

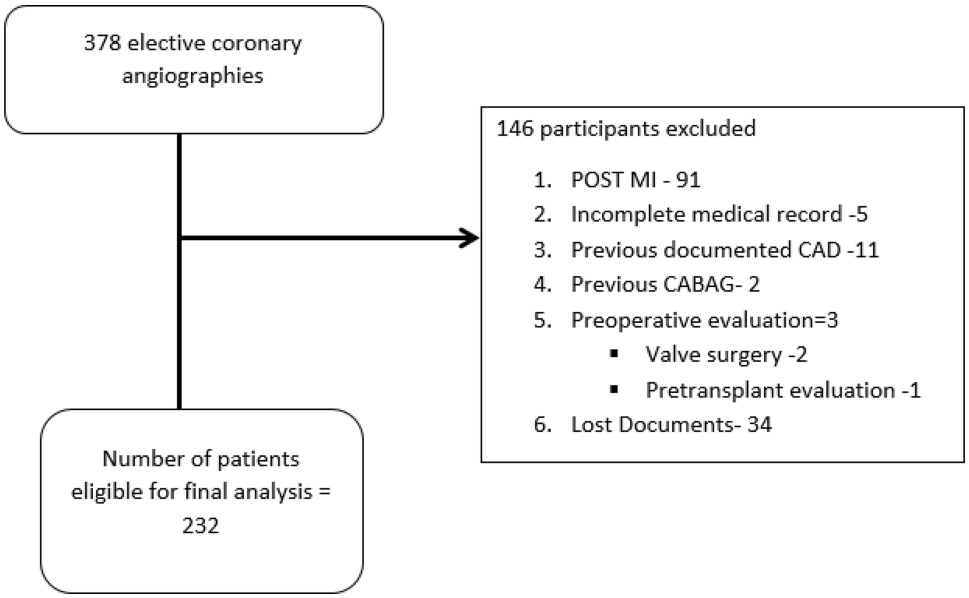


Figure 1 Patient selection of study participants at Tikur Anbessa Specialized Hospital and Gesund Cardiac and Medical Center from January 2019 and September 2022 G.C.

Operational Definitions

CCS is defined as patients with CAD other than acute coronary syndrome.

CAD as defined with angiography.

- No CAD is defined as stenosis of less than 20% in all vessels.
- Non obstructive CAD stenosis between 20% and 50% in any of the major epicardial coronary artery.
- Obstructive CAD stenosis of 50% or more of the diameter of the left main coronary artery or stenosis of 70% or more of the diameter of a major epicardial or branch vessel that was more than 2.0 mm in diameter.

Pretest Probability is the chance of having a disease as estimated before the test result is known and was retrospectively calculated based on age, sex and symptom using 2021 AHA/ACC chest pain guideline.

Atherosclerotic cardiovascular risk was calculated using Framingham risk score.

Data Analysis Procedures

Data was checked for completeness, edited, coded and entered into SPSS version 26.0 statistical software for cleaning and analysis. Descriptive statistics was used to describe study subjects and socio-demographic characteristics. Continuous variables were expressed as means ± standard deviation, minimum and maximum values and ranges. Categorical variables were presented as percentages. Results are presented using tables and graphs. Multicollinearity was assessed among independent variables using the variance inflation factor (VIF) and none was collinear. Univariable logistic regression analysis was performed to determine the association of each independent variable with obstructive CAD. Multivariate logistic-regression analysis was performed to identify factors associated with obstructive CAD from among candidate baseline clinical variables. A p value of less 0.05 was considered statistically significant in all the tests and odds ratio with a 95% confidence interval is used to determine the presence, strength, and direction of association between covariates and the outcome variable.

Ethical Clearance

Prior to data collection, ethical clearance was obtained from the institutional review board of Addis Ababa University College of health science and Gesund cardiac and Medical Center. Ethical approval was also obtained from the department of internal medicine before data collection. All collected data did not contain patient identifications like names and residence addresses and participant's identity remained confidential. No written consent from patients is required as the data was collected retrospectively from patient chart and electronic medical record.

Result

Sociodemographic Characteristics

The mean [± standard deviation] age of the study participants was 59.9 ± (10.969) with minimum and maximum ages of 35 and 86, respectively. Over half of patients were above the age of 60. Of the 232 participants, 189 (81.5%) were males. Most patients were from Addis Ababa 120 (51.7%) and there were 13 (5.6%) patients from Ethiopian neighbors (Eritrea, Somaliland, and Djibouti).

Clinical Characteristics

More than two-thirds of patients reported chest pain on initial presentation. Of the 161 patients with chest pain, 113 (70%) had typical angina, 34 (21%) patients had atypical angina, and a minority 14 (9%) reported non-angina chest pain. Shortness of breath was the next most common symptom presenting in 141 (60.8%) followed by fatigue in 105 (45.3%), and orthopnea in 29 (12.5%). Syncope was a rare complaint found in 3 (1.3%) of the study population.

More than 80% of the patients had at least one comorbidity. The most common comorbidity was hypertension which was found in 142 (61%) followed by diabetes in 123 (53%) and dyslipidemia in 53 (22.8%) of the patients. More than one-third had both DM and HTN. CKD was found in 11.6% of patients.

Most patients (80%) were classified as intermediate clinical PTP of IHD. Patients with low and high pre-test clinical probability constituted only 24 (10.3%) and 22 (9.5%), respectively.

Only 21 (9.1%) had a history of smoking of which 2.2% (5) and 6.9% (16) were current and ex-smokers, respectively.

Clinical characteristics are shown in Table 1 below.

Table 1 Clinical Characteristics of Study Participants at Tikur Anbessa Specialized Hospital and Gesund Cardiac and Medical Center from January 2019 and September 2022 G.C.

Characteristics (N = 232)		Number (n)	Percentage (%)
Chest Pain	No	71	30.6
	Typical	113	48.7
	Atypical	34	14.7
	Non-anginal	14	6
Shortness of breath	No	91	39.2
	Yes	141	60.8
Fatigue	No	105	45.3
	Yes	127	54.7
PND	No	206	88.8
	Yes	26	11.2
Orthopnea	No	203	87.5
	Yes	29	12.5
Syncope		3	1.3
Palpitation		7	3
Comorbidity	DM	123	53
	HTN	142	61
	CKD	27	11.6
	Cerebrovascular accidents	6	2.6
	PAD	4	1.7
	Dyslipidemia	53	22.8
Smoking	Ex-smokers	16	6.9
	Current Smokers	5	2.2
Pre-test probability	Low	24	10.3
	Intermediate	106	80.2
	High	22	9.5
Framingham risk category.	Low	120	51.7
	Moderate	60	25.9
	High	52	22.4

Pre-Angiographic Investigations

The most common abnormality on resting ECG was ST-T wave changes observed in 70 (30.2%) patients followed by left bundle branch block and right bundle branch block, which were found in 22 patients (9.5%) and 13 (5.6%) patients, respectively. Atrial fibrillation was found in 11 (4.7%) of the patients. More than one-third of the patients had normal resting ECG.

Stress ECG was done in 103 (44.4%) patients of whom 69 (66.9%) had inducible ischemia and 21 (9.1%) had negative stress ECG test.

On Echocardiography, ischemic changes were the commonest finding (42.2%, N = 98) followed by left ventricular hypertrophy (28%, N = 65). Majority (68%, N = 158) of the patients had preserved systolic function and less than one-fifth had dilated cardiomyopathy. Only minority (9.9%, N = 23) had normal echocardiographic studies.

Pre-angiographic Investigations are summarized in Table 2 below.

Table 2 Pre-Angiographic Investigations of Study Participants at Tikur Anbessa Specialized Hospital and Gesund Cardiac and Medical Center from January 2019 and September 2022 G.C.

Characteristics (N = 232)		Number (n)	Percentage (%)
ECG	Normal	84	36.2
	ST-T wave abnormality	70	30.2
	Pathologic Q-waves	9	3.9
	LBBB	22	9.5
	RBBB	13	5.6
	Sinus bradycardia	2	0.9
	Sinus tachycardia	4	1.7
	Atrial Fibrillation	11	4.7
	LVH	10	4.3
ECHO	Normal	23	9.9
	IHD	98	42.2
	LVH	65	28
	DCM	18	7.8
	DD	21	9.1
	VHD	11	4.7
EF	> 50	158	68.1
	40–50	19	8.2
	<40	55	23.7
Stress ECG	No	129	55.6
	Positive	69	29.7
	Equivocal	13	5.6
	Negative	21	9.1

Treatment-Related Characteristics

Only less than one-fifth of diabetic patients were not on treatment with anti-diabetic drugs. The most commonly used drug was metformin (31%, N = 70) followed by insulin (34, N = 14.6%). Nearly half of diabetic patients were taking combination of anti- diabetic drugs. Majority of hypertensive patients (84.5%, N = 120) were on at anti-hypertensive drugs. The most commonly used anti-hypertensive drugs were RAAS blockers (31.5%, N = 73) followed by CCB (26.3%, N=61). More than half of patients on treatment were using combination of anti-hypertensive with the most common combination being RAAS blockers with CCB (28.3%, N = 34).

Over one-third of the patients were not taking anti-angina drugs. The most commonly used anti-angina drugs were beta blockers (81%, N = 131) followed by CCB (27.6%, N = 64). Only 8.2% (19) were using nitrates and nearly one quarter were on combinations of drugs.

More than half of the patients were taking antiplatelet agents. One hundred twenty-two (44.8%) patients were on ASA, 2 (0.9%) patients were taking clopidogrel and 5 (2.2%) were on DAPT. Two thirds of patients were taking statin.

Invasive Coronary Angiography Findings

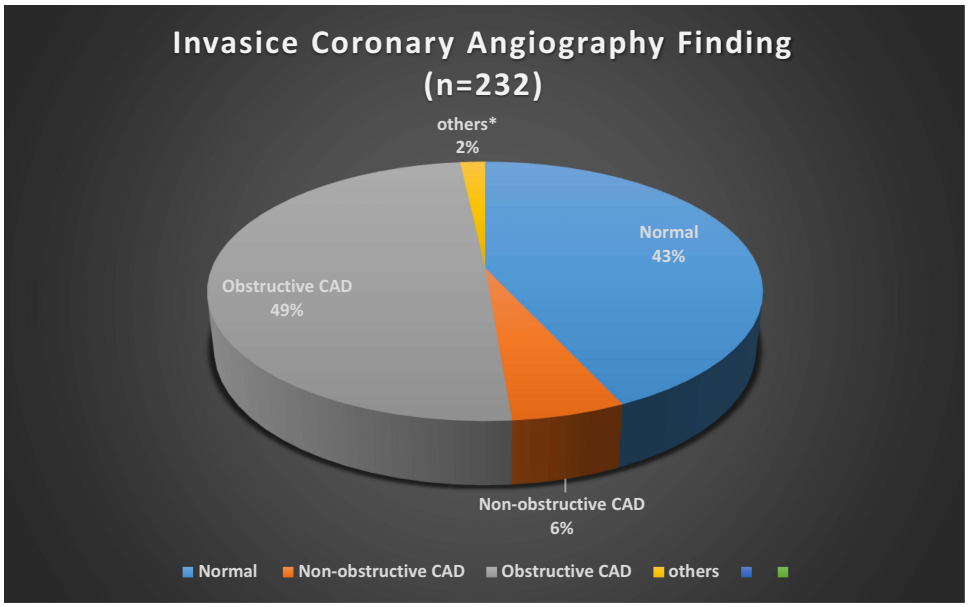
Among the 232 patients who underwent elective coronary angiography, obstructive CAD was observed in 49.6% (115) of patients. Normal coronary artery as per the protocol was found in 43.1% (100) patients. Thirteen patients (6%) had non-obstructive CAD. Multi-vessel disease was present in 66 patients representing 28.4% of the entire population and 57% of patients with obstructive CAD. Single vessel CAD other than LMD was seen in 46 (71.6%) of the patients and 1.3% (3) of patients had LMD.

Figures 2 and 3 below summarize invasive coronary angiographic findings.

Predictors of Obstructive CAD

Table 3 shows the logistic regression analysis of factors associated with obstructive CAD on angiography and odd ratio and a 95% confidence interval used to measure the degree of association between the independent variables and rate of obstructive CAD. Multicollinearity was assessed among independent variables using the VIF and none was collinear.

Initially, bivariate binary logistic regression was performed on selected sociodemographic, clinical, and comorbid conditions to identify variables that are candidate for multivariate binary logistic regression and a total of 9 variables



* Slow flow, myocardial bridge, congenital malformation

Figure 2 ICA findings of study participants at Tikur Anbessa Specialized Hospital and Gesund Cardiac and Medical Center from January 2019 and September 2022 G.C.

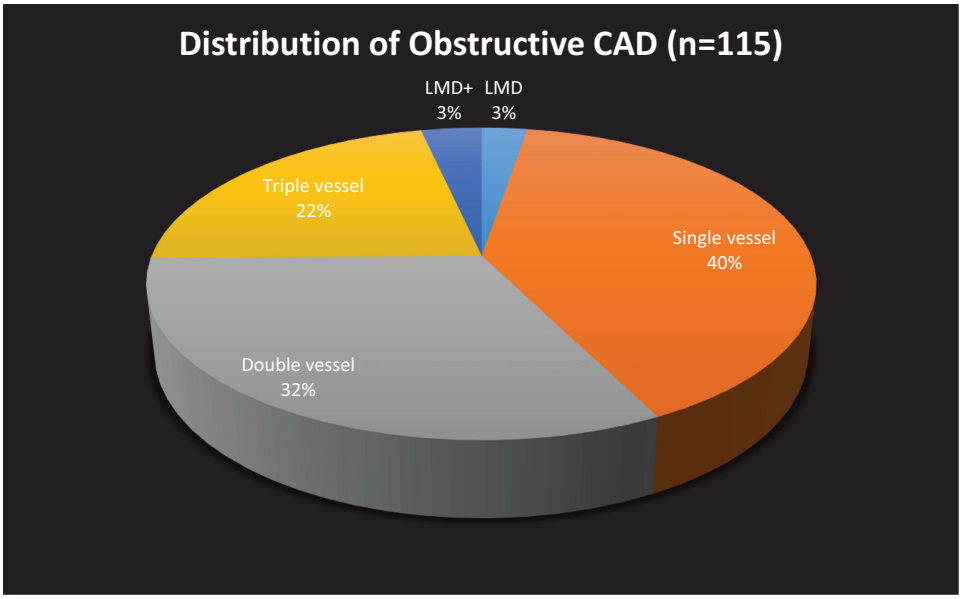


Figure 3 Distribution of obstructive CAD of study participants at Tikur Anbessa Specialized Hospital and Gesund Cardiac and Medical Center from January 2019 and September 2022 G.C.

were found to be candidates at a *P*-value of ≤0.2. These included age greater than or equal to 60 years (Crude odd ratio [COR] 1.699, 95% confidence interval [CI] [1.00–2.864]), male sex (COR 1.67, 95% CI [0.839–3.234]), Typical chest pain (COR 2.677, 95% CI [1.575–4.551]), intermediate PTP 3.967 (1.422–11.070), high PTP (COR 8.143, 95% CI

Table 3 Logistic Regression of Factors Associated with Obstructive CAD on Angiography of Study Participants at Tikur Anbessa Specialized Hospital and Gesund Cardiac and Medical Center from January 2019 and September 2022 G.C

Variables	Obstructive CAD		COR (95% CI)	*P* value	AOR (95% CI)	*P* value
	Positive	Negative				
Sex						
Male	98	91	1.647 (0.839–3.234)	0.147	0.916 (0.390–2.153)	0.840
Female	17	26	1	1		
Age						
< 60	44	60	1	1		
>/= 60	71	57	1.699 (1.007–2.864)	0.047	0.935 (0.417–2.094)	0.870
Typical Chest Pain						
No	45	75	1	1		
Yes	70	43	2.677 (1.575–4.551)	0.000	2.695 (1.468–4.950)	0.001*
Pre-test probability						
Low	5	19	1	1		
Intermediate	95	91	3.967 (1.422–11.070)	0.008	2.222 (0.672–7.343)	0.191
High	15	7	8.143 (2.148–30.863)	0.002	2.817 (0.520–15.260)	0.229

(*Continued*)

Table 3 (Continued).

Variables	Obstructive CAD		COR (95% CI)	*P* value	AOR (95% CI)	*P* value
	Positive	Negative				
Framingham risk score						
Low	46	74	1	1		
Intermediate	33	27	1.966 (1.050–3.684)	0.035	1.470 (0.662–3.263)	0.344
High	36	16	3.620 (1.807–7.248)	0.000	2.684 (0.961–7.500)	0.060
CKD						
No	93	112	1	1		
Yes	22	5	5.299 (1.931–14.537)	0.001	4.320 (1.405–13.286)	0.011*
DM						
No	35	74	1	1		
Yes	80	43	3.934 (2.277–6.796)	0.000	3.589 (1.920–6.709)	0.001*
Hypertension						
No	36	54	1	1		
Yes	79	63	1.881 (1.100–3.215)	0.021	0.809 (0.421–1.556)	0.525
History of Smoking						
NO	100	111	1	1		
YES	15	6	2.775 (1.037–7.428)		3.298 (1.097–9.915)	0.034

Note: *Variables showing a significant association with positive ICA.

[2.148–30.863]), High Framingham risk score (COR 3.620, 95% CI [1.807–7.248]), CKD (COR 5.299, 95% CI [1.931–14.537]), DM (COR 3.934, 95% CI [2.77–6.796]), Hypertension (COR 1.881, 95% CI [1.100–3.215]) and history of smoking (COR 2.775, 95% CI [1.037–7.428]).

However, in the final multivariate regression model, only 4 variables were found to have a statistically significant association with obstructive CAD at a *P*-value of ≤0.05. These included diabetes mellitus, chronic kidney disease, typical chest pain and history of smoking.

Patients with diabetes mellitus were more than 3 times more likely to have obstructive CAD compared to non-diabetic patients (adjusted odds ratio [AOR] 3.589, 95% CI [1.920–6.700], p<0.00). Patients with CKD were also 4 times more likely to have obstructive CAD compared to patients without CKD (AOR 4.320 95% CI [1.405–13.208], P <0.011). The study also found significant association between typical chest pain and the presence of obstructive CAD (AOR 2.695, 95% CI [1.468–4.950], p< 0.001). Patient with history of smoking were 3 times more likely to have obstructive CAD as compared to non-smokers (AOR 3.298, 95% CI [1.09–9.915], p<0.034).

Discussion

In this study involving 232 patients undergoing their first ICA for suspected CCS, obstructive CAD was found only in 49.6% patients despite high prevalence of cardiovascular risk factors. The figure is comparable to single center retrospective study from Portugal, which reported obstructive CAD in 48.8% of patients undergoing elective ICA. This result, however, is higher than the findings from a very large US-based registry, which found obstructive CAD in 37.6% of patients without known CAD who underwent elective ICA. The difference may be explained by the fact that patients with structural heart disease were excluded and as many as 30% of the patients were asymptomatic in the largest US-

registry based study. In European multicenter study involving 11 hospitals, the rate a rate of obstructive CAD was 58%, a result higher than found in this study.[9,11,12]

Important differences between our study and studies quoted above should be acknowledged. First, our study consisted of heterogeneous groups including patients with structural heart disease, which were excluded from the studies quoted above. Second, non- invasive stress tests were used in significant proportions of patients before ICA in those studies whereas stress ECG, the only available non-invasive test in Ethiopia, was used only 44% of our patients. Third, we have also included patients without chest pain in whom IHD was suspected based on patient risk profile. Fourth, the sample size of our study is significantly lower.

Several explanations have been given for the low yield of diagnostic angiography even though the optimal CAD rate at elective ICA is unclear including over estimation of CAD by clinical prediction tools, over testing because of Medical-legal concerns, patient and family preferences, the incontrovertible value of excluding CAD in a symptomatic patient. An emerging body of evidence also supports micro vascular dysfunction, which has been reported in as many as two third of patients with non-obstructive CAD, as possible explanation.[6,13–17]

Lack of adherence to guideline-based appropriateness criteria are also commonly proposed reasons for the variable diagnostic yield of ICA but studies that evaluated appropriateness criteria have shown that yield of ICA is low despite appropriate indication in the vast majority of patients.[18] Non-invasive functional tests like stress echocardiography have been suggested as gatekeeper test to select patients for ICA but has been superseded by anatomic tests like CCTA. Majority of patients in this study had an intermediate PTP, the population for which recent major society Guidelines recommend CCTA as first line test.[1,5] As stress ECG is the only non-invasive functional test available in Ethiopia and CCTA is at its infancy, it can be argued that ICA after optimal medical therapy appeared to be the most appropriate modality for patients in our study.

The low yield of ICA should be interpreted in the context of its limitations including unable to detect atherosclerotic plaques that do not protrude into the lumen, low sensitivity in identification of evolving pathological lesions, does not provide information about plaque composition, and non-atherosclerotic causes of chest pain including MINOCA.[18]

Consistent with other studies hypertension and diabetes are common comorbidity in our study. But contrary to reports from other studies, which reported rate as high as 60%, dyslipidemia was found only in 22.8%.[11] History of Smoking was found in only 9% of patients whereas rate as high as 42% have been reported in very large US-based registry.[9] Lower rate of smoking and dyslipidemia in our study may be related a differing patient demographic and lower sample size.

Previous single center retrospective study from Ethiopia, in patients with both ACS and CCS, showed that there was a lower frequency of cardiovascular drug use during initial patient visit.[10] A finding that is also supported by this study, in which only half and two-thirds of the patients were on ASA and statin, respectively.

Over one-third of the patients were not taking any form of anti-anginal medication and only one quarter of the patients were on combination therapy despite guideline recommendation for optimization of medical therapy before ICA especially in patients without high risk features. However, this finding should be interpreted in the context two important findings in our patients. First, up to 30% patients did not have chest pain at initial encounter. Second, there were patients who presented with symptom consistent with heart failure, a group that could potentially benefit from early diagnosis and intervention.

Similar to others studies, in present study chronic kidney disease, typical chest pain, diabetes mellitus and history of smoking are strong predictor of obstructive CAD with rates being 4, 3.5, 3.2, 2.6 folds higher for patients with CKD, diabetes, history of smoking and typical chest pain, respectively. However, dyslipidemia, high Framingham risk, increasing age, male sex and hypertension were not associated with obstructive CAD after adjustment for confounder on multivariate analysis contrary to other studies likely due to smaller sample size of our study.[9,11,12,14]

Conclusion

In consecutive patients undergoing elective ICA for suspected CCS in Ethiopian, obstructive CAD was found in 49.6% of patients despite high prevalence of atherosclerotic risk factors like hypertension and Diabetes mellitus. Diabetes, hypertension, typical chest pain and history of smoking were found to be strong predictors of obstructive CAD.

Recommendation

As this was a retrospective study chart review and procedure notes and involved only small number of patients, larger based study with prospective design should be undertaken to fully characterize and identify predictor of obstructive CAD. Attempts should also be made towards meticulous clinical evaluation and identification of high risk patients who will likely increase the yield of elective CAD. Better strategies for appropriate patient selection before ICA including positive treadmill test, positive regional wall motion abnormalities on echocardiography, calcium scoring on Coronary CT should be used more frequently before triaging patients for ICA. CCTA and stress functional imaging should be made available in the country.

Strength and Limitation of the Study

To our knowledge this is the first study that tries to provide the first piece of evidence in patients with CCS undergoing elective ICA in Ethiopia. However, our study has a number of limitations. First, this is retrospective analysis. Second, smaller sample size makes it difficult to identify other predictors of CAD. Third, Important traditional risk factors like family history, life style, BMI were not assessed as they were not documented for significant proportions of patients. Fourth, females are underrepresented in the study.

Abbreviations

ACC, American college of cardiology; AHA, American heart association; AMI, Acute myocardial infarction; BMI, Body mass index; CAD, Coronary Artery Disease; CABG, Coronary artery bypass graft; CCS, Chronic coronary syndrome; CCTA, Coronary CT angiography; CKD, Chronic kidney disease; CKD-EPI, Chronic kidney disease epidemiology collaboration; CVDs, Cardiovascular diseases; DD, Diastolic dysfunction; DM, Diabetes Mellitus; ECG, Electrocardiography; eGFR, Estimated glomerular filtration rate; ESC, European society of cardiology; GCMC, Gesund cardiac and Medical Center; HIV, Human immunodeficiency virus; ICA, Invasive coronary angiography; IHD, Ischemic heart disease; LBBB, Left bundle branch block; LVH, Left ventricular hypertrophy; NOCA, Non-obstructive coronary artery disease; PCI, Percutaneous coronary intervention; RBBB, Right bundle branch block; TASH, Tikur Anbessa specialized hospital.

Disclosure

The authors report no conflicts of interest in this work.

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