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Original article

Demographic, Clinical and Angiographic Real-life Pattern in a Contemporary Cohort of Egyptian Patients Scheduled for Coronary Angiography at Banha University Hospital

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Abstract:

Background: Cardiovascular diseases cause approximately one-third of deaths worldwide. This study aimed to evaluate the burden of risk factors, demographic data and in-hospital outcome of patients undergoing coronary catheterization with or without intervention in Benha university hospital. **Methods:** This cross-sectional study included 600 patients undergoing coronary catheterization with or without intervention at Benha University Hospitals, during the period from February 2023 to February 2024. **Results:** <50% occlusion in 77.1% of patients, and >70% occlusion in 74% of participant, however bifurcation occlusion was seen only 4.6% of participants, however total occlusion was reported in 29.8% of them. Age difference revealed that many risk factors were significantly higher among elderly ≥71 years including HTN, class 3 obesity, Hyperlipidemia, and DCM, DM was high in both 41-70 years and 71 years groups (50.0, and 46.2% respectively). Participants aged < 40 years old were more prone to >70% occlusion (90.9%), or occlusion at bifurcation (18.2%), however patients whose age >71 years old were more prone to occlusion < 50% (83.3%). **Conclusions:** Abnormal coronary angiography (CA) was more prevalent in older, male, and less-educated patients. Key risk factors such as diabetes, smoking, dyslipidemia, and prior cardiac history were strongly associated with abnormal CA. Additionally, systolic blood pressure (SBP) and serum creatinine levels were significantly higher in this group, while heart rate (HR) and left ventricular ejection fraction (LVEF) were lower.

Keywords: Demographic, Clinical and Angiographic Real-life pattern; Coronary Angiography

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Introduction

Coronary artery disease (CAD) is a major cause of death and disability among both women and men globally [1]

Coronary angiography is the reference standard for CAD diagnosis and percutaneous coronary intervention (PCI) remain the major revascularization strategy for patients with CAD, with an estimated five million procedures performed worldwide each [2]

Coronary angiography has become an established first-line non-invasive imaging modality for the evaluation of patients with suspected, but not yet confirmed, CAD. Current guidelines highlight the high negative predictive value of CCTA to exclude obstructive coronary stenosis. Moreover, identification of atherosclerosis at coronary angiography provides prognostic information that can be used to stratify cardiovascular risk and guide medical therapy [3]

This study aimed to evaluate the burden of risk factors, demographic data and in-hospital outcome of patients undergoing coronary catheterization with or without intervention in Benha University hospital.

Patients & Methods

This observational, cross sectional, single center study, was conducted on all patients undergoing coronary catheterization in "Benha University Hospitals" in the period from February 2023 to February 2024. The study was done after approval from the Ethical Committee of Benha University Hospital.

Approval code: MS 28-5-2023

Ethical considerations:

Informed consent from these patients was taken. There were adequate provisions to maintain privacy of participants and confidentiality of the data are as follows:

- The patients were given the option of not participating in the study if they did not want to.
- We put code numbers to each participant with the name and address kept in a special file.
- We hided the patients' names when we use the research.
- We used the results of the study only in a scientific manner and not to use it in any other aims.

Inclusion Criteria

- Patients aged 18 years and older.
- Patients scheduled for elective or urgent coronary catheterization.
- Patients who provided informed consent to participate in the study.

Exclusion Criteria

- Patients with a history of allergic reactions to contrast agents.
- Patients with severe renal impairment (e.g., eGFR < 30 mL/min).
- Patients unable to provide informed consent due to cognitive impairment or language barriers.
- Pregnant women or nursing mothers.

Methods:

The following data was recorded in all patients

1) Baseline evaluation:

All patients had review of medical history including:

Age, sex, Risk Factors of coronary artery disease (DM-HTN-Dyslipidemia-smoking), prior history of coronary artery disease, prior history of intervention, other comorbidities, drugs.

2) Clinical examination

With particular emphasis on the pulse and blood pressure of the patients, as well as auscultation of the back to elicit the presence of any clinically detectable pulmonary venous congestion, auscultation of the heart for the presence of third heart sounds or audible murmurs.

3) Laboratory investigations:

Laboratory parameters, kidney function, complete blood count, bleeding profile, PT, INR, testing for HCV, HBV and HIV.

4) Electrocardiography:

Twelve leads ECG was done for each patient

5) Echocardiography:

All patients were evaluated by echocardiography for the assessment of

regional wall abnormalities and overall left ventricular systolic function.

6) Pre-catheterization noninvasive tests if available

- Stress electrocardiography.
- Stress echocardiography.
- CT coronary angiography.
- Myocardial perfusion stress imaging.

7) Coronary angiography

Quantitative angiographic measurements were done to:

- Detect the number of diseased vessels.
- Detect the severity of the coronary lesions.
- Detect the presence or absence of calcification.
- Detect the diameter of the diseased vessel / vessels.
- Detect the length of each lesion groups
- All patients received low osmolar nonionic contrast

Statistical Analysis

Statistical analysis was done by SPSS v27 (IBM©, Chicago, IL, USA). The Shapiro-Wilks test and histograms were used to evaluate the normality of the distribution of data. Quantitative parametric data were presented as mean and standard deviation (SD) and were analyzed by ANOVA (F) test with post hoc test (Tukey). Quantitative non-parametric data were presented as median and interquartile range (IQR) and were analyzed by Kruskal-Walli's test with Mann Whitney-test to compare each group. Qualitative variables were presented as frequency and percentage (%) and were analyzed utilizing the Chi-square test. A two tailed P value < 0.05 was considered statistically significant.

1. Mean value (X):
2. Standard Deviations (SD)
3. The unpaired student t-test
4. Chi-square (x^2)

Results

❖ **Demographics**

The median age of the studied patients was 55.0 (IQR=47.0-62.0) years. Patients with abnormal CA findings was significantly older that normal group (57.0, and 46.0 respectively; p<0.001). ***(Table 1).***

A significant difference between normal and abnormal patients regarding gender distribution (p<0.001). The highest percentage of normal group were females (73.7%), while the highest percentage of abnormal group were males (55.0%).***(Table 1).***

Similarly, there was statistically significant difference between different groups regarding educational level (p=0.017). Normal group patients were mainly university educated (47.4%), while abnormal patients were mainly basic or secondary educated (50.0%).***(Table 1).***

However, no significant difference between both groups regarding residence (p=1.0) **(Table 1).**

❖ **Clinical history (risk factors)**

Thirty-six (47.4%) of normal group suffered from HTN and 276 (52.7%) of abnormal group suffered from it and the relation was non-significant (P=0.387).

No significant difference was detected between normal and abnormal patients regarding classes of obesity (p=0.156), moreover the highest percentage of total studied patients were class 1 (43.3%).

DM was found in 16 (21.1%) of normal groups and 268 (51.1%) of abnormal groups and the observed difference was of significant value (p<0.001).

Similarly, a statistically significant difference was observed between the two groups regarding smoking (p<0.001). Abnormal groups reported higher prevalence of smoking (45.0%) compared with normal group (10.5%). Dyslipidemia prevalence was higher in abnormal patients (58.8%) compared with normal group (26.3%), and the relation was significant (P<0.001).

No statistically significant difference between the two groups regarding DMC (p=0.247)

However, none of normal patients had previous history of MI, while 21.4% of abnormal group had prior MI (p<0.001).

No difference was seen between groups

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regarding Valvular HD or PAD (p>0.05). Regarding previous PCI and CABG, none of normal group had prior PCI, while 13.6% of abnormal patients had at least previous one PCI (0.003), however no difference between groups regarding previous CABG (p=0.202) ***(Table 2).***

Table (1) : Demographics of the studied patients stratified by current CA results

Parameters			**Current CA results**		**Total participants n=600**	**p-value**
			Normal n=76, 12.7%	**Abnormal n=524, 87.3%**		
Age (years)		Median (IQR)	46.0(43.0-53.0)	57.0(48.0-64.0)	55.0(47.0-62.0)	**<0.001*** ⊦
		Range(Min-Max)	22.0-85.0	31.0-83.0	22.0-85.0	
Gender	**Males**	n (%)	20 (26.3)	288 (55.0)	308 (51.3)	**<0.001*** ⊦⊦
	Females	n (%)	56 (73.7)	236 (45.0)	292 (48.7)	
Residence	**Rural**	n (%)	72 (94.7)	499 (95.2)	571 (95.2)	1.0⊦⊦⊦
	Urban	n (%)	4 (5.3)	25 (4.8)	29 (4.8)	
Educational level	**None**	n (%)	8 (10.5)	92 (17.6)	100 (16.7)	**0.017*** ⊦⊦
	Basic and secondary education	n (%)	32 (42.1)	268 (51.1)	300 (50.0)	
	University education	n (%)	36 (47.4)	164 (31.3)	200 (33.3)	
	Post-graduate studies	n (%)	0 (0.0)	0 (0.0)	0 (0.0)	

CA=Cardiac catheterization, IQR=Interquartile range (25th percentile-75th percentile), ⊦Mann-Whitney U test, ⊦⊦Chi-square test, ⊦⊦⊦ Fisher exact test, *Significant p value

Table (2) Risk factors among the studied patients stratified by current CA results

Variables			**Current CA results**		**Total participants n=600**	**p-value**
			Normal n=76, 12.7%	**Abnormal n=524, 87.3%**		
HTN		n (%)	36 (47.4)	276 (52.7)	312 (52.0)	0.387 ⊦
Obesity	**Overweight**	n (%)	16 (21.1)	128 (24.4)	144 (24.0)	0.156 ⊦
	Class 1	n (%)	40 (52.6)	220 (42.0)	260 (43.3)	
	Class 2	n (%)	20 (26.3)	156 (29.8)	176 (29.3)	
	Class 3	n (%)	0 (0.0)	20 (3.8)	20 (3.3)	
DM		n (%)	16 (21.1)	268 (51.1)	284 (47.3)	**<0.001*** ⊦
Smoking		n (%)	8 (10.5)	236 (45.0)	244 (40.7)	**<0.001*** ⊦
Hyperlipidemia		n (%)	20 (26.3)	308 (58.8)	328 (54.7)	**<0.001*** ⊦
DCM		n (%)	0 (0.0)	12 (2.3)	12 (2.0)	0.247⊦⊦
Prior MI		n (%)	0 (0.0)	112 (21.4)	112 (18.7)	**<0.001*** ⊦
Valvular HD		n (%)	4 (5.3)	24 (4.6)	28 (4.7)	1.0 ⊦⊦
PAD		n (%)	0 (0.0)	4 (0.8)	4 (0.7)	0.661 ⊦⊦
Prior PCI	**None**	n (%)	76 (100.0)	452 (86.3)	528 (88.0)	**0.003*** ⊦
	One or two	n (%)	0 (0.0)	48 (9.2)	48 (8.0)	
	Three or more	n (%)	0 (0.0)	24 (4.6)	24 (4.0)	
Prior CABG	**None**	n (%)	76 (100.0)	513 (97.9)	589 (98.2)	0.202 ⊦⊦
	Yes	n (%)	0 (0.0)	11 (2.1)	11 (1.8)	

DM=Diabetes Mellitus, HTN=Hypertension, DCM= Dilated cardiomyopathy, MI=Myocardial infarction, Valvular HD=Valvular Heart Disease, PAD=Peripheral arterial disease, ⊦Chi-square test, ⊦⊦Fisher exact test. For patients who underwent PCI, 24 cases had two previous PCI and 24 more had previous PCI, 23 cases had three previous PCI, and only one patient had previous 6 PCI. For CABG, seven cases had previous one CABG, and four cases had previous two CABG

- **Current Coronary angiography findings for abnormal cases**

Among the 600 studied participants, 524 patients were found to have abnormal CA findings.

404 out of 524 (77.1%) had occlusion less than 50%, while 55.5% of had their lesion I LAD., in addition to that, no mortalities were reported among studied patients.

Regarding, DCA recommendations, almost half of participants (50.8%) were advised for intervention, 29.8% of them were advised for medical treatment, however 19.5% of patients were recommended for CABG. **(Table 3)**

- **Current Coronary angiography intervention**

270 patients who proceeded to angiography intervention out of 524 patients with abnormal CA.

Regarding number of stents, 49.6% had only one stent, and only 3.0% had no stent needed. Also, 16.3 of participants had an overlapping stent, and 83.7 did not need any overlapping stent.

Only 3% of participants had bifurcation stent, and the intervention was successful in 97.0% of cases, while 80.4% of them exhibited complete revascularization, and 19.6% needed 2nd session. No mortalities were recorded among all studied participants **(Table 4**

Table (3): Current Coronary angiography findings for abnormal cases

Variables			**Participants with current abnormal CA (no=524)**
Extent of occlusion	**<50%**	no (%)	404 (77.1)
	>70%	no (%)	388 (74.0)
	Bifurcation	no (%)	24 (4.6)
	Total occlusion	no (%)	156 (29.8)
Site of occlusion	**LM**	no (%)	42 (8.0)
	LAD	no (%)	291 (55.5)
	Diagonal	no (%)	12 (2.3)
	LCX	no (%)	200 (38.2)
	OM	no (%)	72 (13.7)
	RCA	no (%)	194 (37.0)
DCA mortality		no (%)	0 (0.0)
Recommendation of DCA	**Medical**	no (%)	156 (29.8)
	Interventional	no (%)	266 (50.8)
	CABG	no (%)	102 (19.5)

LA=Left main coronary artery, LAD= left anterior descending artery, LCX= circumflex artery, OM= obtuse marginal arteries, RCA= right coronary artery, DCA= directional coronary atherectomy, CABG= Coronary artery bypass grafting

Table (4): Current Coronary angiography intervention among the studied patients

Variables			**Participants who underwent CA intervention (no=270)**
no. of stent	**0**	no (%)	8 (3.0)
	1	no (%)	134 (49.6)
	2	no (%)	100 (37.0)
	3	no (%)	28 (10.4)
Overlapping stent	**no**	no (%)	226 (83.7)
	Present	no (%)	44 (16.3)
Bifurcation stent		no (%)	8 (3.0)
Successful intervention		no (%)	262 (97.0)
Complete revascularization		no (%)	217 (80.4)
2nd session		no (%)	53 (19.6)
Mortality		no (%)	0 (0.0)

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Discussion

In our study, 524 out of 600 patients had abnormal CA with a percentage of 87.3%, the median age of the studied patients was 55.0 years. Patients who proved to have abnormal CA were significantly older (median =57.0 years) , males (55.0%) and less educated. Normal group patients were younger in age (46.0 years), females (73.7%) and higher educated.

In the same line of this current study, a study [4] conducted among 900 patients booked for angiogram, and proved that out of the 900 angiograms, 81(9%) were having normal coronary arteries. Also same to our current study, [4] analyzed the demographics of patients with normal CA and found that their mean age was 43±10 years. Females were 64.1%.

Ahsan and colleagues [5] in his study which was conducted mainly to investigate the clinical characteristics, risk factors and angiographic profile of patients undergoing coronary angiography, reported that DM was found in 18% cases and HTN was found in 17% cases which were noticeable. Besides these, smoking, family history and hypothyroidism were found among 10%, 2% and 1% participants respectively.

Another study reported similar finding to this study, Levitt and his colleagues [6] found that overall, patients with normal cardiac catheterization were younger, however still the median age in both groups in their study was higher than this current study, The median age reported before [6] was 61 for normal CA group vs 65 years for abnormal group. Levitt and his colleagues [6] added that normal CA group were more likely to be female (56.3% vs 31.0%)

Against our study, Levitt and his colleagues [6] found that among 2718 studied patients, 1579 (58.0%) were found to have abnormal angiogram.

On contrary Ahsan and colleagues [5] found that 35% patients were with normal coronary artery.

Studying risk factors in our study revealed that normal group had significantly lower prevalence of risk factors compared with abnormal group including DM (21.1% vs 51.1%), smoking (10.5% vs 45.0%), dyslipidemia (26.3% vs 58.8%), prior MI (0.0 vs 21.4%), and prior PCI (0.0%, vs 12.0%), In addition to that prevalence of HTN and higher classes of obesity, was relatively higher in abnormal group however the relation was non-significant**.**

Asghar and colleaguae, (4), reported that the clinical characteristic of normal group was as follows: smokers 32.09%, family history of premature coronary artery disease 51.8%, hyperlipidemia 60.4% and hypertension 19.7%. Diabetes was present only in 20.9%. Among females: 19.2% were current users of oral contraceptives pills and 13.4% were post-menopausal, and Mean BMI was 25.4±4.

Levitt and his colleagues reported similar finding to our study, in their study, the normal CA patient were nonsmokers (58.7% vs 48.2%) as compared with those with abnormal CA patients. The prevalence of risk factors in their study for DM was 22.1% for normal patients vs 29.7% for abnormal group, 59.2% hypertension for normal group vs 70.6% for abnormal group, hyperlipidemia 57.2% for normal group vs 70.9% for abnormal group, PVD 2.5% for normal patients vs 7.1% for abnormal group, and CVD 4.3% for normal group vs 6.6% for abnormal group. [6]

Sharma and colleaguaes [7] studied the risk factors among patients presented with ACS and clarified that smoking was present in 770 (49.3%), hypertension in 628 (40.2%), diabetes in 578 (37%), and obesity in (29.64%) patients.

Ouellette, and colleaguaes [8] recruited 925 consecutive patients over 24 months, and classified them to normal or near-normal coronary arteries (NNCAs) (≤20% stenosis), non-obstructive CAD (21–49% stenosis), or obstructive CAD (≥50% stenosis). 31.0% of participant had stenosis ≤20%, 13.5% had stenosis between 21-

49%, however more than half of participants had obstruction ≥50%.

Ouellette, and colleaguaes [8] added that patients with marked obstruction (≥50%) were found to be older in age (mean=65.5 years),more females (46.5%), higher prevalence of DM (38.8%), HTN (84.4%), hyperlipidemia (77.4%), smoker (34.3%), PVD (17.5), and CVDs (5.7%) compared with the patients with lower percentage of occlusion (<50%). Patients who had occlusion ≤20% were younger in age (mean=48.8 years), had the lowest percentage of DM (30.7%), HTN (68.3%), hyperlipidemia (55.8%), smoker (30.0), PVD (4.9), and CVDs (1.4%). Interestingly and unexpectedly, group with occlusion ≤20% were more obese (BMI ≥30 in 54.5%), and group f highest and more sever occlusion ≥50% were lese obese (BMI ≥30 was 43.5%) and the difference was of statically significant value (p=0.010).

Sharma and colleaguaes [7] reported angiographic findings for 1443 patients presented with ACS, and accordingly, their study reported that left anterior descending was most commonly involved, left main (LM) coronary artery was least common with near similar frequency of right coronary artery and left circumflex involvement among all three groups of ACS patients. Single-vessel disease was present in 168 (45.28%) UA, 94 (56.29%) NSTEMI and 468 (51.71%) STEMI patients. Double-vessel disease was present in 67 (18.08%) UA, 25 (14.97%) NSTEMI and 172 (19.01%) STEMI patients. Triple vessel disease was present in 28 (7.55%) UA, 16 (9.58%) NSTEMI, 72 (7.95%) STEMI patients. LM disease was present in 12 (3.23%) UA, 2 (1.19%) NSTEMI and 9 (0.99%) STEMI patients.

Conclusion

Our study demonstrates the significant burden of risk factors in patients undergoing coronary catheterization. Abnormal coronary angiography (CA) was more prevalent in older, male, and less-educated patients. Key risk factors such as diabetes, smoking, dyslipidemia, and prior cardiac history were strongly associated with abnormal CA. Additionally, systolic blood pressure (SBP) and serum creatinine levels were significantly higher in this group, while heart rate (HR) and left ventricular ejection fraction (LVEF) were lower. Our study also demonstrated that a considerable proportion of patients with abnormal CA required intervention, with a high success rate of revascularization. Furthermore, younger patients were more likely to present with severe occlusion (>70%), while elderly patients tended to have less severe (<50%) occlusion.

Conflict of interest

None of the contributor's declared any conflict of interest

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