

The clinical profile and angiographic characteristics of patients with coronary artery disease at Saint Peter's Specialized Hospital, Addis Ababa, Ethiopia

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Abstract

Background: Coronary artery Disease (CAD) is a pathologic process that affects the coronary vessels and characterized by imbalance in myocardial oxygen supply and demand. The diagnosis of CAD through angiography is a recent experience in Ethiopia. The objective of the present investigation was therefore to find out the burden and associated factors of CAD in Addis Ababa.

Method: Hospital-based cross-sectional descriptive study was conducted. Patient record review was carried out at St. Peter's coronary care unit. All Patients who underwent coronary angiogram from December 1, 2017 to June 30, 2019 were included. Data were collected using standardized checklist then entered and analyzed using Statistical Package for Social Sciences (SPSS) version 25.

Results: A total of 290 patients were included into the study. Male patients represent for 75.2% of the total. The mean age of patients in our study was 55.16±12.67.190 (65.5%) patients were hypertensive while 122 (68.5%) and 110(38.3%) patients were dyslipidemic and diabetic respectively. Angiography proven Coronary artery disease was diagnosed in 217(74.8%) patients of those 79.3% has significant obstruction and 123(42.4%) of them have single vessel disease involvement.

Conclusion:

This study has confirmed a high proportion of SVD involvement in the majority of post MI patients. Dyslipidemia, hypertension and diabetes were the three most important risk factors identified. Hence, it is imperative to increase public awareness, promote screening services for early detection and management of these risk factors. Moreover, the utility of angiograph in these patient groups were found to be high. Hence, the expansion of this service can improve management of patient with coronary heart diseases..

Key words: Coronary Artery Disease, Angiography, Pattern, Addis Ababa

Introduction

Coronary artery Disease (CAD) is a pathologic process that affects the coronary vessels and characterized by imbalance in myocardial oxygen supply and demand. Its most commonly caused by atherosclerotic disease of the epicardial coronary arteries (Yusuf et al. 2004). CAD is the single most frequent cause of death in the world, responsible for 7,249,000 deaths in 2008, contributing to 12.7% of total global mortality (Onen 2013). The global burden of cardiovascular disease (CVD) death has shifted to low-and-middle income countries as the life expectancy improves and their lifestyles changes. It was further estimated that age-standardized mortality rates for ischemic heart disease (IHD) to rise to 70% and 74%, among men and women in Africa, respectively, by 2030 (Onen 2013). Currently low and middle income countries account for more than 80% of global IHD deaths.

More than 90% of the risk factors for the development of CAD are attributable to modifiable risk factors, such as hypertension, obesity, dyslipidemia, insulin resistance, Diabetes Mellitus and smoking. Other important risk factors include age >45 for men > 55

for women and family history of premature CAD (<55 for male, <65 for female) (Go et al. 2014; Fihn et al. 2012). Population growth and increase in the average age of the world's population contribute to the increase in incidence and prevalence of risk factors (Fihn et al. 2012). Even though population based prevalence studies are not available in Ethiopia, from the earlier studies done in the late 1960s and 1970s in general CVD accounted for only 4-13% of medical admissions to hospitals in Addis Ababa (Maru 1993) (Pavlica 1970). An angiography based study in Addis Ababa revealed that 75.7 % of them had CAD where 43.2% of them had single vessel disease and 40.5% had multi vessel disease. Dyslipidemia and hypertension were the two leading risk factors accounting 63%, 61.2% respectively followed by diabetes mellitus in 41.4% (Shashu and Ayele 2007). This is a single study and as angiography service is expanding in the country and additional evidence could be generated from the available data. This study aimed at determining the burden and determinants of obstructive coronary disease in Ethiopia through angiographic characterization of patients with coronary artery disease.

Materials and Methods

Study Design and setting: A hospital based cross-sectional descriptive study was done at St. Peter's Specialized Hospital. St. Peter's specialized hospital is a public hospital located in Addis Ababa. It's one of the few hospitals in Ethiopia that has a coronary care unit with a catheterization laboratory. Coronary angiography is being done twice weekly since September 19, 2017 and percutaneous coronary intervention on campaign basis. The activities are performed primarily by a team of clinical staffs that includes medical residents, cardiology fellows and cardiologists. The coronary care unit (CCU) is also staffed by nurses who had a special training on CCU and Catheterization laboratory procedures.

Data collection and data Analysis: All patients that have under gone coronary angiography from December 1, 2017-Jun 30, 2019 were included in the study. A list of patient medical records was taken from the registers in the catheterization lab and the patient charts were collected from the medical records office. A structured checklist was used to retrieve data from the medical records .The data were collected by trained residents at saint peter's specialized hospital. The data was coded, entered into SPSS version 25 statistical software, cleaned and then prepared for analysis. Frequency distributions were used to summarize descriptive statistics of the data. Tables and graphs are used for data presentation.

Ethical considerations: The proposal was approved by the Institutional Review Board (IRB) of Saint Paul's Hospital Millennium Medical College (SPHMMC) and St. Peter academic and research committee. Support Letter was obtained from both institutions and delivered for the respective responsible bodies during the study. Names and identifiers were not used and all information obtained is kept confidential and accessed only by the principal and co-investigators.

Definition of Obstructive/significant CAD: Obstructive/significant CAD was defined as 50% luminal diameter narrowing in epicardial coronary arteries >50% luminal diameter narrowing in epicardial coronary arteries (Fihn et al. 2021).

Result

Socio-demography: A total of 357 patients underwent diagnostic coronary angiogram at St. Peter coronary care unit from December 1, 2017 to June 30, 2019, of which records of only 290 patients were available. Most of them, 218/290 (75.2%) were male. The mean age $\pm$ SD was 55.14 $\pm$ 12.992 and 55.22 $\pm$ 11.704 for men and women respectively. Majority of patients were from Addis Ababa 215(74.1%) whereas 75

(25.9%) patients came from outside of Addis Ababa (Table 1).

Table 1: Baseline characteristics and distribution of risk factor for coronary artery disease, n=290.SPSH 2019.

Clinical Characteristics		N (%)
Mean age	Overall	55.16 $\pm$ 12.7
Sex	Male	218(75.2)
	Female	72(24.8)
Residence	Addis Ababa	215(74.1)
	Outside Addis Ababa	75(25.9)
Age category	Female $\geq$ 55	38 (52.8)
	<55	34(47.2)
	Male $\geq$ 45	171(78.4)
	<45	47(21.6)
Smoking		51(17.7)
HTN		190(65.5)
DM		110(38.3)
Positive Dyslipidemia		4(1.37)
HIV	Negative	282(97.9)
	Positive	6(2.1)
Identified risk Factor in individual patients	No Risk Factors	9(3.1)
	One Risk Factors	23(7.9)
	Two Risk Factors	48(16.6)
	Three or more than Three Risk Factors	210(72.4)

Obstructive CAD: From the total 290 patients who underwent coronary angiography 217 (74.8%) had evidence of CAD where 172(79.3%) had significant obstruction and 73(25.2%) patients were normal.

Anatomic characteristics of CAD: From the 217 patients with abnormal angiography, 123(56.7%) have single vessel disease while 52(24 %) had double vessel disease, and 42(19.3%) had triple vessel disease.. Left anterior descending (LAD) artery was involved in 158(44.8%) of the lesions followed by right coronary artery (RCA) in 102 (28.9%), left circumflex in 89(25.2%) and left main artery (LM) in 4 (1.8%).

Indications for angiography test: Post-acute myocardial infarction (AMI) was the common indication for angiography 137(47.2%) where, 104(76%) of these patients had ST segment elevation MI (STEMI) and 33(24%) had Non-ST elevation MI (Non STEMI). The other indications were: Stable angina 98(33.8%), progressive heart failure (HF), 37(12.8%), positive stress test 9(3.1%) and other indications like post sustained ventricular arrhythmia and as part of pre op evaluation for patients undergoing cardiac surgery.

Identified traditional risk factors: Hypertension and dyslipidemia were the major identified risk factors found in 190 of the total 290 patients (65.5%) and 122 of the 178 patients who have their lipid profile determined (68.5%) followed by diabetes mellitus 110/290(38.3%) and smoking 51/220(23.2 %). Majority of the patients 210 (72.4%) have at least three identifiable risk factors, while 48(16.6%) have two and 7.3% have single risk factor. Only 4 of the 9 participants with no identifiable risk factor have abnormal angiography, while 135 of the 210 patients with three and more risk factor (62.2%) have evidence of CAD including two of the 4 patients with left main disease.

Discussion

A total of 290 patients who underwent angiography and had full record were included in the study. Among the study subjects 74.8% of them had evidence of CAD and significant obstruction was observed in 59.3% of them. Double and triple vessel involvement was observed in 24% and 19.3% of the patients respectively. The most common indication for angiography was acute myocardial infarction (42%); hypertension and dyslipidemia were the common risk factors identified in the study.

The frequency of angiography positivity (74.8%) was comparable to the result recorded from a private cardiology center in Addis Ababa, Ethiopia (75.7%) (Shashu and Ayele 2007), but significant CAD was lower in our study by 5 percent. This could possibly be due to early access to angiographic procedures. Angiography positivity was also comparable with results of Akanda et al. (1970) from Bangladesh (74.4%), but much lower than Shah et al. (2020) from Pakistan (93.1%).

Similar to Bekele et al. (2014) single vessel disease is by far is the commonest pattern of involvement (43.2% vs.42.4% in our study) and left main disease was also comparably identified (Shashu and Ayele 2007). Dominance of DVD is found in COURAGE trial with prevalence of 35%, 40%, and 25% for SVD, DVD, and TVD respectively this could mainly be due to the chronicity of the indication for the angiography unlike our patients who had prior MI as a leading indication (Boden et al. 2007). On the other side three vessel disease is the dominant feature in Asian countries which might be explained by higher prevalence of DM in such group of population (Khan et al. 2014; Akanda et al. 1970). Left main obstruction was high in Pakistan (3.2%) as compared to our study (1.8%) and least in the study by Akanda et al. (1970) from Bangladesh (0.47%). LAD was found to be the commonest diseased vessel in Pakistan (42% vs.44.8% in our study) followed by disease of RCA

and LCX (Khan et al. 2014). This finding consistent with courage trial as well (Boden et al. 2007). Almost half of our patients (46.5%) had survived ACS of which 75 % had STEMI before they underwent the angiography. Same is true with the other study in Ethiopia from which one third of them had STEMI at presentation (Shashu and Ayele 2007). This is unlike the data from the other parts of the world where most patients present with stable angina except in Bangladesh where 47.3% presented with MI (Boden et al. 2007). Hypertension, dyslipidemia and diabetes mellitus were found to be the three leading risk factors for the development of angiographically proven CAD. This is consistent with the find in a private hospital in the same setting where dyslipidemia was the leading risk factor (63%) followed by hypertension in 61.2% and DM in 41.4% (Shashu and Ayele 2007). Studies from Asia have also showed dyslipidemia as the common risk factor which accounts for 60% in Bangladesh, and 42% in Pakistan and 71% in courage trial (Essien et al. 2014; Shah et al. 2020). On the other hand, hypertension prevalence is lower in Asian studies 36%, and 35% in Pakistan and Bangladesh as compared to studies in Europe (Shah et al. 2020) (Akanda et al. 1970). Hypertension was present in 67% patients according to the COURAGE trial followed by DM in 34% (Boden et al. 2007). Smoking, while reported only in 23.2 % in this study, it is comparable with 19.4% of Bekele et al. (2014) of Ethiopian (Shashu and Ayele 2007). However it is highly prevalent among Asian CAD patients particularly in Bangladesh present in 60% and Pakistan in 37% (Shah et al. 2020) (Akanda et al. 1970).

Limitation of the study: This study is based on medical records which are often incomplete. As a result, the study suffers from missing data. In addition, taking the design of the study into consideration, it is difficult to ascertain the temporal relationship of the risk factors and angiographic findings of the study participants. As this study has been conducted in one of the few centers with angiographic facility, it may be affected by a referral bias.

Conclusion

This study has confirmed higher proportion of SVD involvement in the majority of post MI patients. Since coronary angiography with subsequent angioplasty is the standard of care for patients with AMI with significant mortality reduction, non-interrupted coronary angiography service along with angioplasty should be given due emphasis to decrease both mortality and morbidity of patients with coronary artery disease.

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References

- Akanda Mak, Ali S, Islam A, Rahman M, Parveen A, Kabir MK, et al. (1970). Demographic Profile, Clinical Presentation & Angiographic Findings in 637 Patients with Coronary Heart Disease. *Faridpur Medical College Journal*, 6(2): 82–85.
- Bekele A, Shashu M & Amogne A (2014). The pattern of coronary artery diseases as diagnosed by coronary angiography and the outcome of Percutaneous Coronary Intervention (PCI) in Ethiopia. *Ethiopian Journal of Health Development*, 28(1):11-16.
- Boden WE, Rourke RAO, Teo KK, Hartigan PM, Maron DJ, Kostuk WJ, et al. (2007). The evolving pattern of symptomatic coronary artery disease in the United States and Canada: baseline characteristics of the Clinical Outcomes Utilizing Revascularization and Aggressive Drug Evaluation (COURAGE) trial. *The American Journal of Cardiology*, 99(2): 208-212.
- Essien OE, Andy J, Ansa V, Out AA & Udoh A (2014). Coronary Artery Disease and the Profile of Cardiovascular Risk Factors in South South Nigeria: A Clinical and Autopsy Study. *Cardiology Research and Practice*,: 804751.
- Fihn SD, Gardin GJ, Abrams J, Berra K, Blankenship JC, Dallas AP, et al. (2012). Practice guidelines: 2012 ACCF / AHA / ACP / AATS / PCNA / SCAI /STS Guideline for the Diagnosis and Management of Patients With Stable Ischemic Heart Disease. *Circulation*, 126(25): e354-e471.
- Go AS, Mozaffarian D, Roger VL, Benjamin EJ, Berry JD, Blaha MJ, et al. (2014). AHA Statistical Update Heart Disease and Stroke Statistics — 2014 Update A Report From the American Heart Association WRITING GROUP MEMBERS. *Circulation*, 129(3): e28-e292. Available at: <https://doi.org/10.1161/01.cir.0000441139.02102.80>.
- Khan HU, Khan MU, Noor MM, Hayat U & Alam MA (2014). Coronary artery disease pattern: a comparison among different age groups. *Journal of Ayub Medical College*, 26(4): 466–469.
- Maru M (1993). The changing pattern of cardiovascular diseases in Ethiopia. *East African Medical Journal*, 70(12): 772–776.
- Onen CL (2013). Epidemiology of ischaemic heart disease in sub-Saharan Africa. *Cardiovascular Journal of Africa*, 24(2): 34–42. Available at: <https://doi.org/10.5830/CVJA-2012-071>.
- Pavlica D (1970). Analysis of medical admissions to the armed forces hospital in Addis Ababa from January 1966 to January 1970. *Ethiopian Medical Journal*, 8(4): 193–200.
- Shah IA, Faheem M, Shahzeb R, Hafizullah M, Muhammad Shah, Hafizullah M, et al. (2020). Clinical Profile, Angiographic Characteristics and Treatment Recommendations in Patients with coronary artery disease. *Journal of Pioneering Medical Sciences*, 3(2): 94–100.
- Shashu BA & Ayele MA (2014). Original article The pattern of coronary artery diseases as diagnosed by coronary angiography and the outcome of Percutaneous Coronary Intervention (PCI) in Ethiopia. *Ethiopian Journal of Health Development*, 28(1):11-16.
- William EB, Robert AO'R, Koon KT, Pamela MH, David JM, William JK, et al. (2007). Optimal medical therapy with or without PCI for stable coronary disease. *New England Journal of Medicine*, 356(15):1503-1516.
- Williams B, Mancia G, Spiering W, Rosei EA, Azizi M, Burnier M, et al. (2018). ESC/ESH Guidelines for the management of arterial hypertension. *European Heart Journal*. 39(33): 3021-3104.
- Yusuf S, Hawken S, Ôunpuu S, Dans T, Avezum A, Lanas F, et al. (2004). Inter Heart study. *The Lancet*, 364(9438):937–952. Available at: [https://doi.org/10.1016/S0140-6736\(04\)17018-9](https://doi.org/10.1016/S0140-6736(04)17018-9).