



## Coronary Artery Dominance in Western Maharashtra Population by Angiographic Method

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### ABSTRACT

Coronary artery disease (CAD) is going to become a significant cause of death in the world. The CAD is increasing day by day because of the changing lifestyle of people. The responsible factors for CAD are diabetes, hypertension, addiction and heredity also. So, the present work is undertaken to study the dominant pattern of coronary artery in the Maharashtra population. The present study was a hospital-based, prospective and observational study of 360 patients who have coronary artery disease undergoing coronary angiography. This study carried out from May 2018-November 2019 of both genders of 25 years of age and above [Male-215(59.72%) and female was 145(40.27 %)]. Out of that, the youngest patient below 40 years male was 30(73.17%), and the female was 11(26.82%). While above 40 years males were 185(57.99%) and females was 134(42%). The patients with a history of by-pass surgery and angioplasty were excluded. Invasive angiography was performed by either femoral or radial artery using radio-opaque dye (OMNIPCK-50ml) that is visible by an x-ray machine (GE. INNOVA). The socio-demographic Proforma of patients, the pattern of coronary arterial dominance were recorded. Right coronary artery was dominant in 273(75.83%) patients observed in this study. While LCx was dominant in 49(13.6%) and co-dominant in 38 (10.55%) patients. Knowledge of study can be helpful to cardiologists for anatomical assessment of coronary arteries for diagnostic purposes and invasive studies.

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### INTRODUCTION

There are two main coronary arteries-Right (RCA) and Left coronary artery (LCA). Left artery supplies left atrium and left ventricle except for a strip along the posterior and inferior surface of the heart and also supplies anterosuperior 2/3 of the ventricular septum. LCA usually divide into two branches (Datta, 2000). Left anterior descending (LAD) or anterior interventricular artery (Goldberg et al., 2007). The circumflex artery (LCx). Right artery supplies the right atrium and ventricle and parts of the left chambers and atrioventricular septum. RCA divides posterior interventricular branch or posterior descending (PDA) and Right marginal

artery (Datta, 2000).

The term dominance to coronary anatomy describes whether the RCA or LCx reaches the crux of heart and supplies- posterior descending artery (PDA) and postero-lateral branches (Goldberg *et al.*, 2007). The artery supplies -the diaphragmatic surface of the heart called the posterior descending artery (PDA) refers the coronary dominance.

Coronary artery disease (CAD) is one of the most common types of diseases around the world. It is appreciated that obesity, blood pressure, smoking, diabetes, exercise, diet, cholesterol and depression were associated with, the incidence of CAD (Yan *et al.*, 2018).

Coronary artery diseases are responsible for over 70% of sudden cardiac deaths. In the young, the primary cause of death is non-atherosclerotic coronary abnormalities. Schlesinger first proposed the right and the left dominant idea in 1940. This term used to refer to a coronary artery that gives, the posterior descending artery which supplies- the diaphragmatic surface of the heart (Shukri *et al.*, 2014). The main aim of this study is to define the pattern of coronary arterial dominance in Maharashtra population and the relationship of coronary dominance with Coronary artery diseases.

## MATERIALS AND METHODS

The study was hospital-based prospective and observational, carried out in the Cath lab in the cardiology department in Krishna hospital, Karad, Satara (Maharashtra).

Three hundred and sixty (360) patients [below 40 age-41(11.38 %) and, above 40 ages were 319(88.61%) suffering from coronary artery disease undergoing angiography was collected for this study [Male-215(59.72%) and female was 145(40.27 %).

Angiography was recommended to patients who have chest pain (angina), Pain in jaw, neck or arm, unstable angina, Congenital heart disease, abnormal heart stress test, heart attack, cardiac arrhythmia (abnormal heart rhythm).

Out of 360 patients were divided into normal (who do not have any coronary artery disease) and diseased (coronary artery disease) groups.

The patients who had a previous history of Bypass grafting and angioplasty were excluded from this study. Invasive coronary angiography was performed by either femoral or radial artery, using radio-opaque dye (OMNIPOK-50ml) that is visible by an x-ray machine (GE.INNOVA).

The procedure of research was explained to the patients, and the consent form was taken from them. The socio-demographic Proforma of all patients, the pattern of coronary arterial dominance was taken and recorded.

Cardiologists performed angiography. The cardiologist reported the dominance pattern of the artery, i.e. right dominance left dominance, and co-dominance was recorded. The data obtained were analyzed in SPSS, and the result was shown.

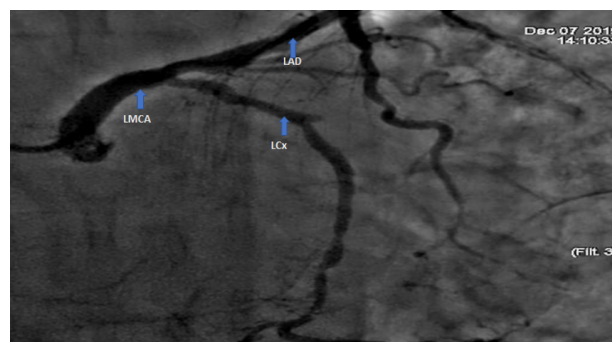
If posterior descending artery arises from the RCA and if at least one other branch of RCA extends in the atrioventricular groove, giving of one or more posterolateral branch to the inferior surface of Left ventricle, then the system is said - right dominant.

Suppose posterior descending artery and all postero-lateral branches arise from LCx. Then the system is said to be left dominant. In this instance, the main LCA supplies the infero- septal and inferior segment of the left ventricle.

In co-dominant circulation, the RCA gives off the PDA only, while LCx provides all the posterolateral branches (Fakhir *et al.*, 2012).

## RESULTS

The Table 1 showed the proportion of males with affected coronary artery - moderately high as compared to the proportion of females with the affected coronary artery (Chi-square=3.544, P=0.0598). However, the proportion of normal (46.38%) and affected (53.61%) is similar.



**Figure 1: Photographs showing patient with Left dominant pattern**

Table 2 showing Gender- wise distribution in  $\leq 40$  and  $> 40$  years. The proportion of male patients with age below 40 years was double than those of female patients. However, overall patients with age below 40 years were less as compared to patients above 40 years undergoing coronary angiography.

Table 3 showing Gender-wise distribution of affected coronary artery. The proportion of Affected

**Table 1: Gender-wise distribution of affected coronary artery**

Affected coronary artery	Gender		Total No. (%)
	Male No. (%)	Female No. (%)	
Normal	91(54.49)	76(45.50)	167(46.38)
Diseased	124(64.24)	69(35.75)	193(53.61)
Total No (%)	215(59.72)	145(40.27)	360(100)

Chi-square=3.544,P=0.0598

**Table 2: Showing gender-wise distribution in  $\leq 40$  and  $> 40$  years**

Age	Gender		Total No. (%)
	Male No. (%)	Female No. (%)	
Below 40 yrs.	30(73.17)	11(26.82)	41(11.38)
Above 40 yrs.	185(57.99)	134(42.00)	319(88.61)
Total NO (%)	215(59.72)	145(40.27)	360(99.99)

**Table 3: Showing Gender-wise distribution of affected coronary artery**

Age	Affected coronary artery				Total No. (%)
	Normal		Diseased		
	Male	Female	Male	Female	
Below 40 yrs.	22(24.17)	6(7.89)	8(6.45)	5(7.24)	41(11.38)
Above 40yrs.	69(76.82)	70(92.10)	116(93.54)	64(92.75)	319(88.61)
Total No (%)	91(25.27)	76(21.11)	124(34.44)	69(19.16)	360(100)

**Table 4: Showing Gender-wise distribution of patients according to the dominant vessels**

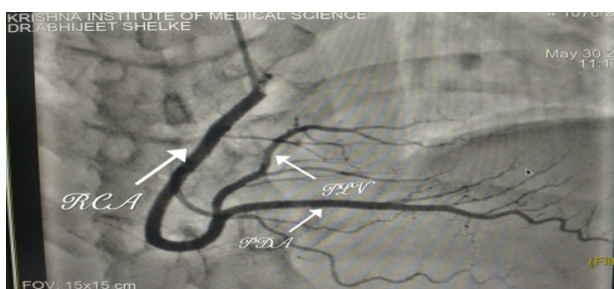
Sr. No.	Origin of PDA	Gender		Total (%)
		Male No. (%)	Female No. (%)	
1	RCA	161(74.19)	112(78.32)	273(75.83)
2	LCA	26(11.98)	23(16.08)	49(13.61)
3	CO-DOMI	30(13.82)	8(5.59)	38(10.55)
Total no (%)		217(60.27)	143(39.72)	360(99.09)

**Table 5: Showing relation between dominant coronary pattern and the number of affected vessels**

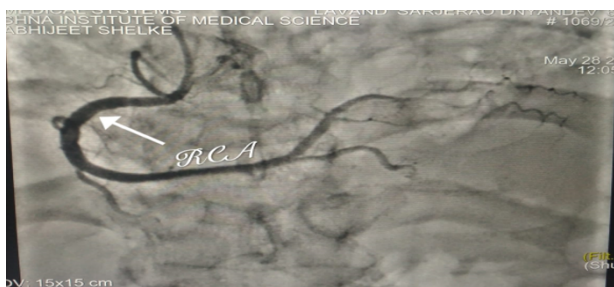
Coronary dominance	Affected Coronary artery(CAD)				Total No. (%)
	Normal (CAD absent) No (%)		Diseased (CAD present) NO. (%)		
	Male	Female	Male	Female	
RCA	62(39.74)	55(50.92)	94(75.80)	53(76.81)	264(73.33)
LCx	10(40)	14(18.42)	15(12.09)	12(17.39)	51(14.16)
CO-DOMI	19(55.88)	7(63.63)	15(12.09)	4(5.79)	45(12.5)
Total No (%)	91(25.27)	76(21.11)	124(34.44)	69(19.16)	360(100)



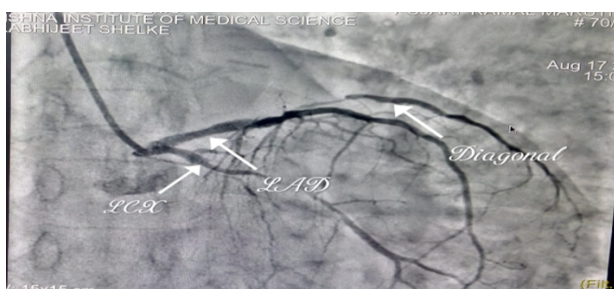
**Figure 2: Coronary angiogram Showing Patient with a co-dominant pattern**



**Figure 3: Coronary angiogram Showing Patient with a right dominant pattern**



**Figure 4: Coronary angiogram Showing Normal (non affected artery) Coronary artery**



**Figure 5: Coronary angiogram of a patient with diseased (Affected artery) Coronary artery (CAD)**

coronary artery patients with age above 40 years is significantly high as compared to non-affected patients. Chances of the affected artery are 2.789 times more in patients, age above 40 years as compared these with age below 40 years (Chi-square test=8.926, P=0.0028 OR:2.789(1.393-5.584). However, the proportion of affected coronary artery in males & females with age above 40 years as well as below 40 yrs. is similar (Chi-square=0.04457, P=0.8328)

Table 4 showing Gender-wise distribution of patients according to the dominant vessels. Percentage of the right dominant circulation was 161(74.19%) in male patients and 112(78.32%) in female patients. While the percentage of left dominant circulation was 26(11.98 %) for males & 23(16.08%) for females. The most common pattern was right dominance, followed by a left dominant pattern and then co-dominant pattern.

Table 5 showing relation between dominant coronary pattern and the number of affected vessels, showed in Figures 1, 2, 3, 4 and 5. Proportion of posterior descending of right coronary artery(RCA), Left circumflex(LCx) & CO-dominant is similar in both affected coronary artery & normal (non -affected coronary artery Chi-square=2.811, P=0.2452).

## DISCUSSION

Many authors did the study of Morphology and Morphometry of the coronary artery in different population. They used different methods for the study of dominant coronary pattern in different population in the world. Angiography is one method used in this study. We had taken other measurement like the diameter & length of the main trunk of LCA, the angle between the left anterior descending(LAD) and left circumflex artery(LCx), termination of the LAD etc. In the present study right, the dominant pattern was observed in 75.83%, which is closely similar to another study (Abdellah *et al.*, 2012). While left dominant pattern in our study reported 13.6%, which is closely related to Co-dominant pattern was seen 10.55% closely similar to Hussein Ali Fakhir (Fakhir *et al.*, 2012) and (Kulkarni, 2013). Our results are against results of the studies done by Damor in which the right dominant pattern was more than in the present study, i.e. .83%,88.18%,90%& 90.6 respectively (Bhavana *et al.*, 2015). There was a higher percentage of LCx dominant pattern with value 19.5% by Rehman *et al.* (2011). The result of co-dominant pattern in this study was higher (Abdellah *et al.*, 2012). In the present study, the proportion of right dominance

pattern is observed 3/4<sup>th</sup> (79.70%) of the patients with affected coronary artery, which is similar to the study done by Yan *et al.* (2018). In comparison, it is mainly with Triple vessel disease (88.33%) in this study & 87.19% in a study of Dr Hussein Ali Fakhir (Fakhir *et al.*, 2012).

## CONCLUSION

The present study provides information to physicians, anatomist the knowledge of coronary dominance. The study reported that patients with the right coronary dominant pattern were higher proportion in western Maharashtra. Right coronary dominant was associated with the severity of CAD, and the proportion of males with affected coronary artery is moderately high.

## ACKNOWLEDGEMENTS

Nothing to report.

## Conflict of Interest

The authors declare that there is no conflict of interest for this study.

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