

## **Angiographic Characteristic of The Coronary Artery, In Patients with Type 2 Diabetes Mellitus with Coronary Artery Syndrome and It's Comparison with Non-Diabetics**

<sup>1</sup>Mohammad Junaid Kameli, Junior Resident, Department of Medicine, Dr Ulhas Patil Medical College, Jalgaon, Maharashtra, India.

<sup>2</sup>Paraji Ashokraobachewar, Associate Professor, Department of Medicine, Dr Ulhas Patil Medical College, Jalgaon, Maharashtra, India.

**Corresponding Authors:** Mohammad Junaid Kameli, Junior Resident, Department of Medicine, Dr Ulhas Patil Medical College, Jalgaon, Maharashtra, India.

**How to citation this article:** Mohammad Junaid Kameli, Paraji Ashokraobachewar, “Angiographic Characteristic of The Coronary Artery, In Patients with Type 2 Diabetes Mellitus with Coronary Artery Syndrome and It's Comparison with Non-Diabetics”, IJMACR- February - 2023, Volume – 6, Issue - 1, P. No. 54 – 61.

**Open Access Article:** © 2023, Mohammad Junaid Kameli, et al. This is an open access journal and article distributed under the terms of the creative commons attribution license (<http://creativecommons.org/licenses/by/4.0>). Which allows others to remix, tweak, and build upon the work non-commercially, as long as appropriate credit is given and the new creations are licensed under the identical terms.

**Type of Publication:** Original Research Article

**Conflicts of Interest:** Nil

### **Abstract**

**Background:** India has now become the diabetic capital of the world, with over 30 million diabetic individuals. Cardiac involvement in diabetes is commonly manifested as coronary artery disease. Invasive diagnostic modality like Coronary Angiography serves as a diagnostic as well as therapeutic aid in the management of coronary artery disease and it remains the gold standard technique.

**Objectives:** Present study is an attempt to find out how coronary artery involvement in diabetics differs from that of non-diabetics with special interest in their angiographic profile. **Methodology:** 60 patients having acute coronary syndrome undergoing coronary angiography, aged 18-60 years, were included in present study. We have excluded type 1 DM, GDM, prior

CABG, CHD. Subjects are grouped into 2; group A having diabetes (n=30) and group B without diabetes (n=30). Angiographic extent, type of vessel, number of vessels, severity involving coronary artery and its branches in patients with acute coronary syndrome (ACS) were studied and compared in both groups. **Results:** Significantly higher differences in age, sedentary lifestyle, and hypertension were seen among diabetics than non-diabetics. Diabetic patients had more multivessel, multi-lesion, extensive and small vessel disease than nondiabetic patients.

**Conclusion:** According to the present study, severe forms of coronary artery lesions were found common among diabetic patients as compared to non-diabetic patients.

**Keywords:** Coronary angiography; coronary artery disease; Diabetes mellitus.

### Introduction

India has now become the diabetic capital of the world, with over 30 million diabetic individuals. Population-based studies showing the prevalence of Type 2 diabetes in different parts of India have recently been reviewed and shows that the prevalence has risen five-fold from 2.1% in 1975 to 12.1% in 2000<sup>(1)</sup>.

According to Diabetes Atlas published by the International Diabetes Federation (IDF) and The World Health Organization (WHO) has predicted that by the year 2025, the maximum prevalence of diabetes would be in India and every 4th diabetic will be an Indian<sup>(1)</sup>.

Diabetes Mellitus, being a major risk factor for cardiovascular disease is associated with myocardial infarction (MI) and sudden death at a higher level. In diabetic patients, morbidity and mortality are higher following MI than non-diabetic subjects, with one-year mortality as equal to 50%. The rate of re-infarction is also higher. Diabetes has its impact on the short term as well as long term morbidity of myocardial infarction patients.

Cardiac affliction is by far the commonest cause of mortality in patients with diabetes<sup>(2)</sup>. According to GUSTO-I trial diabetic patients more often have three vessel disease and a more diffuse coronary artery involvement than their non-diabetic counterparts<sup>(3)</sup>.

Cardiac involvement in diabetes commonly manifest as coronary artery disease and less commonly as dilated cardiomyopathy and cardiac autonomic neuropathy<sup>(4)</sup>.

Although the patients history, physical examination and non-invasive techniques like resting ECG, Holter monitoring, Tread Mill Test (TMT), Stress echocardiography, Stress Thallium imaging are valuable

in establishing the diagnosis of myocardial ischemia in diabetes, the definitive diagnosis of coronary artery disease, its precise assessment and anatomic severity requires invasive diagnostic modality like Coronary Angiography which serves as a diagnostic as well as therapeutic aid in the management of coronary artery disease and it remains the gold standard technique.

Hence this study is an attempt to find out how coronary artery involvement in diabetics differs from that of non-diabetics with special interest in their angiographic profile.

### Materials and Method

The present study is a cross-sectional observational study. This study was conducted on 60 patients with ACS among which 30 patients who are diabetics and other 30 patients who are non-diabetics admitted in Dr. Ulhas Patil Medical College and Hospital's Cicu, Jalgaon, Maharashtra, India. Patients who matched the inclusion and exclusion criteria were selected randomly during period of approximately one year formed the study group. Angiographic extent, type of vessel, number of vessels, severity involving coronary artery and its branches in patients with acute coronary syndrome (ACS) were studied and compared in both groups.

Multiple laboratory investigation will be recorded ECG & CAG reports will be compared head-to-head & observations and conclusions will be recorded accordingly.

Patient is said to be diabetic-if:

They are known diabetics with definite history of treatment with OHA/insulin.

In the absence of diabetic history-patient is said to have 1st time detected diabetes with following criteria.

**American diabetic association (ADA) criteria 1997<sup>(5)</sup>.**

Fasting Plasma glucose (FPG)  $\geq$  126mg/dl.

2 hour post prandial plasma glucose (2 hours PPPG)  $\geq$  200mg/dl [Associated with glycosylated haemoglobin > 6.3%] [Fasting is defined as no calorie intake for at least 8 hours]

Patient is said to be non-diabetic if:

No history of diabetes

RBS < 200mg/dl and FPG < 126mg/dl

If admission blood sugar was high and glycosylated Hb < 6.3 and follow up if it comes to be non-diabetic range without treatment, such cases are deemed to be non-diabetic.

**ECG:** It allows initial categorization of the patient with a suspected MI into one of three groups based on the pattern:

ST elevation MI (ST elevation or new left bundle branch block)

Non-ST elevation ACS, with either NSTEMI or Unstable Angina (UA) (ST depression, T-wave inversions, or transient ST-elevation)

Undifferentiated chest pain syndrome (non-diagnostic ECG).

**Coronary angiography** will be performed with the standard institutional protocol.

Coronary artery disease will be defined as stenosis of a coronary artery of 50% or greater.

Multi-vessel disease will be defined as the involvement of any three or more of the following four arteries: the left main artery, the left descending artery, the left circumflex artery and the right coronary artery.

Multi-lesion disease will be defined as three or more lesions in a single vessel, whereas an extensive lesion will be defined as a stenosis of more than 10 mm in length.

Smaller vessel disease will be defined as a lesion with a diameter of less than 2.5 mm in the distant part of the left descending artery, the left circumflex artery, the right coronary artery or their septal branches, or in the obtuse marginal or posterior descending arteries

**Inclusion Criteria**

- Age group between 18-80 year
- Group 1(Diabetic): Previously known diabetic or first-time detected diabetic by American Diabetes Association (ADA) criteria presenting with ACS.
- Group 2(Non-Diabetic): Cases presenting with acute coronary syndrome that is non-diabetic or not fulfilling ADA criteria.

**Exclusion Criteria**

- Patients with Type 1 Diabetes Mellitus, Gestational Diabetes mellitus, Prior CABG (coronary artery bypass graft), prior angioplasty, congenital heart disease.

**Statistical Analysis**

Data will be entered and analysed using SPSS version 20 (IBM, USA). Data will be reported as mean and standard deviation for continuous variables, percentages for categorical variables and interquartile range for non-normally distributed data. Data will be analysed quantitatively and qualitatively. Variables will be compared using student t-test. P-value.

**Results**

Our study group consist of 60 patients, out of them 30 [50%] were diabetic and 30 [50%] were non diabetic. In our study the incidence of ACS in males was 66.66% in diabetics and 70% in non-diabetics. In females the incidence of ACS was 33.33% in diabetics and 30% in non-diabetics. In our study the majority of patients (43.33%) had a relatively shorter duration of diabetes up to 5 years, 26.66% patient had diabetes between 5-10

years, 30% had longer duration of diabetes of >10 years. 1 case was newly detected and diagnosed as T2DM.

Table 1: Age wise distribution of diabetic and non-diabetic groups

Year	Diabetic		Non-Diabetic	
	male	female	male	female
below 30	0	0	0	0
31-40	1	0	0	0
41-50	6	2	5	4
51-60	4	3	6	4
61-70	6	3	7	1
71-80	3	2	3	0
total	20	10	21	9
grand total	30		30	

Table 1: Age wise distribution of diabetic and non-diabetic groups

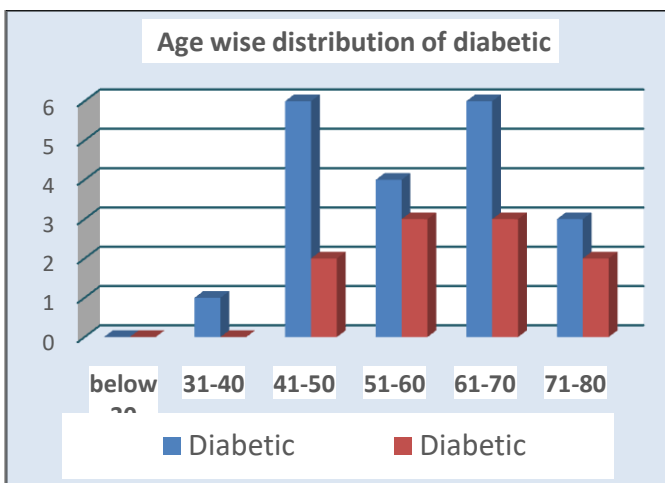


Figure 1: Age wise distribution of diabetic

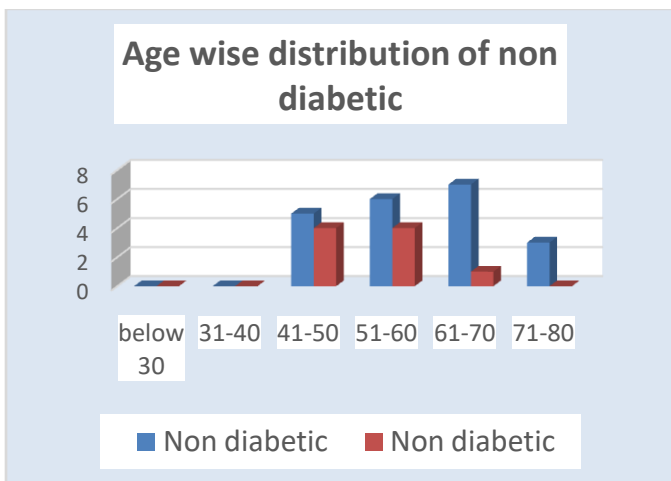


Figure 2: Age wise distribution of non diabetic

Almost 50% of patients in both groups were at the age between 51 to 70 years, hence, age is an independent common risk factor for CAD in both diabetic and non-diabetic patients [Table 1].

Table 2: Extent of coronary artery disease among diabetic and non-diabetic groups

Extent of CAD	Diabetic	Non-Diabetic	Total	Chi-Square	p value
SVD	11(36.66%)	23(76.66%)	34(56.66%)	12.55	0.002
DVD	12(40%)	7(23.33%)	19(31.66%)		
TVD	7(23.33%)	0(00%)	7(11.66%)		
total	30(100%)	30(100%)	60(100%)		

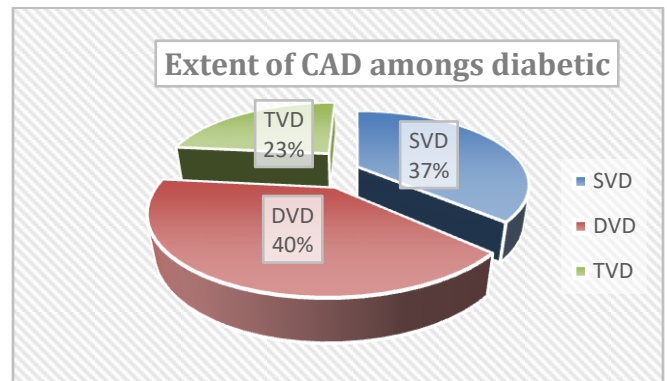


Figure 3: Extent of CAD amongst diabetic

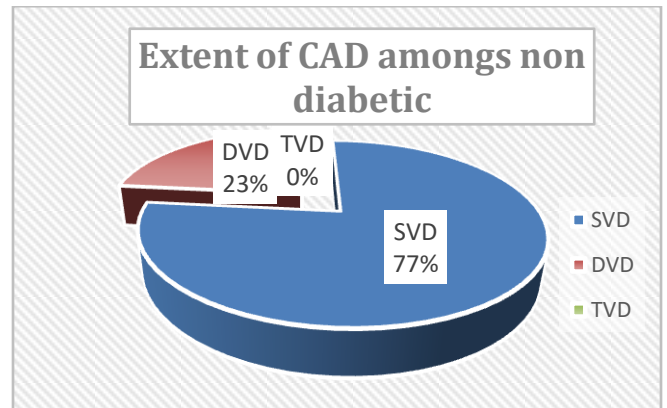


Figure 4: Extent of CAD amongst non diabetic

The incidence of Triple /multi/diffuse vessel disease in diabetics was higher (23.33%) compared to non-diabetics (00%) in our study. The incidence of double vessel disease (DVD) in diabetics was also higher (40%) compared to non-diabetics (23.33%). Single vessel

disease was much higher in non-diabetics (76.66%) compared to-diabetic (36.66%) [Table 2].

Table 3: Distribution of SVD among diabetic and non-diabetic patient

coronary artery	diabetic	non diabetic	total	p value
LAD	7(63.63%)	15(65.21%)	22	0.92
RCA	3(27.27%)	7(30.43%)	10	0.84
LCX	1(9.09%)	1(4.35%)	2	0.62
total	11(100%)	23	34	

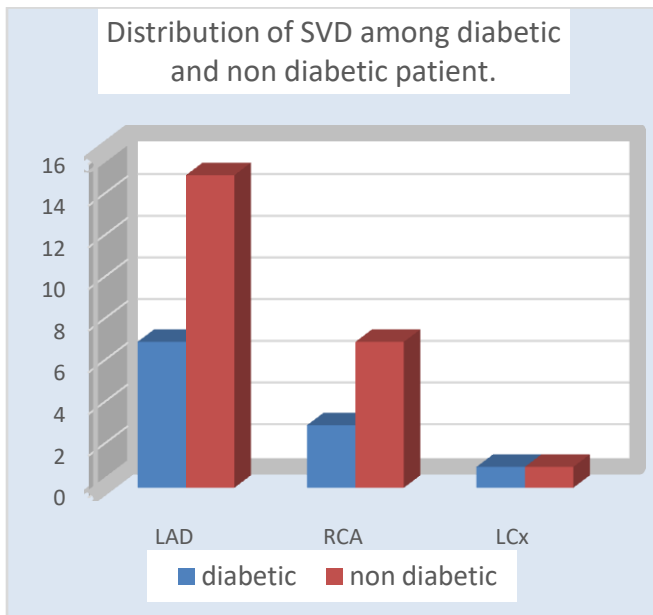


Figure 5: Distribution of SVD among diabetic and non-diabetic patient.

In SVD group more diabetic patients (9.09%) than non-diabetic patients (4.35%) had LCX disease, whereas, RCA disease had almost similar in both the groups. In both groups LAD is more commonly involved vessel [Table 3].

Table 4: Distribution of DVD among diabetic and non-diabetic patient.

DVD	diabetic	non diabetic	total
LAD AND LCX	5	3	8
LAD AND RCA	5	1	6
RCA AND LCX	2	3	5
total	12(63.15%)	7(36.84%)	19(100%)
p value	0.093		

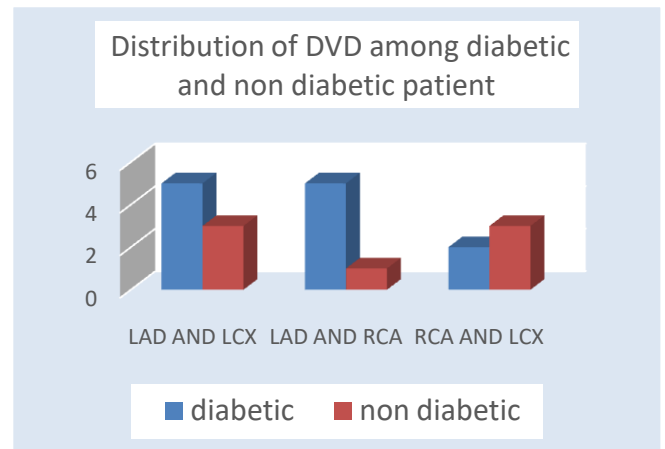


Figure 6: Distribution of DVD among diabetic and non-diabetic patient

In our study, CAG revealed that the incidence of DVD in diabetics was much higher (63.15%) compared to non-diabetics (36.84%). [Table 4].

Table 5: Duration of diabetes with number of vessels involved.

EXTENT OF CAD	UPTO 5 YEARS	5 TO 10 YEARS	> 10 YEARS	TOTAL
SVD	7(53.84%)	2(25%)	2(22.22%)	11
DVD	6(46.15%)	3(37.5%)	3(33.33%)	12
TVD	0(00%)	3(37.5%)	4(44.44%)	7
TOTAL	13(100%)	8(100%)	9(100%)	30

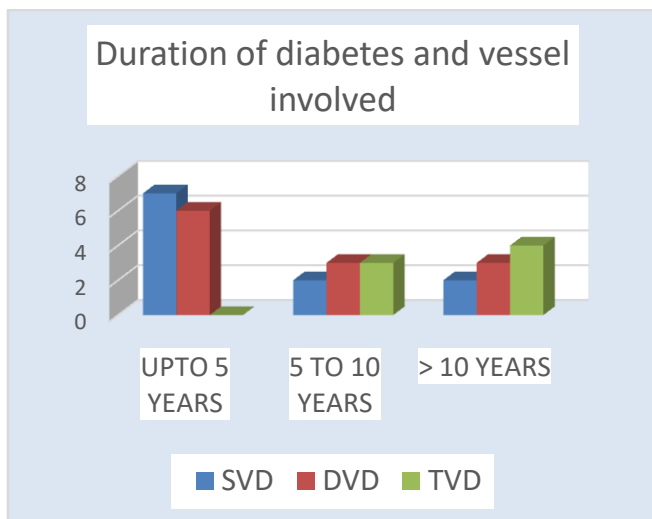


Figure 7: Duration of diabetes and vessel involved

The incidence of SVD and DVD was much higher in diabetic patients whose duration of disease as up to 5 years. Incidence of DVD and TVD is higher with duration of diabetes from 5-10 years. Incidence of triple / multi vessel disease was significantly higher with the duration of diabetes >10 years (44.44%) [Table 5].

### Discussion

DM is one of the modifiable risk factor for CAD. Insulin resistance leads to hyperinsulinemia, which in turn causes elevated triglyceride levels, low levels of high-density lipoprotein cholesterol, enhanced secretion of very low-density lipoprotein, disorders of coagulation, increased vascular resistance and hypertension [6]. Normal coronaries were more in non-diabetics than diabetic patients, [7, 8]. The risk of developing CAD in females was more in diabetics compared to non-diabetics as shown by Garcia MJ et al [9], we also had almost similar results. In the GUSTO-1 trial, diabetic patients were older compared to non-diabetic. But such results were not seen in our study. GUSTO-1 trial concluded that females were commonly involved in diabetic group, which was consistent with our results ( $P < 0.001$ ) [10]. This increased risk is greater in women, since they lose their protection against CAD associated with the menstrual

hormonal cycle. In our study LAD was the most commonly involved vessel in both the groups. These results are inconsistent with so many other studies where LAD and LCX were the most commonly involved artery in Non-DM and DM patient respectively [11, 12, 13, 14, 15]. In our study TVD was more common in diabetic group, a finding correlates with the study by Singh RB et al [16]. Diabetic patients more frequently had a pattern of diffuse disease in our study, this finding is consistent with so many other studies [17,18].

### Conclusion

People with diabetes have an increased prevalence of atherosclerosis and coronary artery disease (CAD) and experience higher mortality and morbidity after acute coronary syndrome and myocardial infarction (MI). According to our study, diabetics may have more extent of coronary artery disease at presentation, so care must be taken in diagnosis and management of these patients. The incidence of triple vessel or multivessel disease was significantly higher with the duration of diabetes more than 10 years. Patients with poor glycaemic control had diffuse pattern of atherosclerotic disease, Hence, adoption of lifestyle changes and medications that decrease cardiovascular complications and morbidity from diabetes mellitus.

### References

1. Perreault L, Færch K. Approaching pre-diabetes. Journal of Diabetes and its Complications. 2014;28(2):226-33.
2. Munjal YP. API Textbook of Medicine (Volume I & II): JP Medical Ltd; 2015.
3. Woodfield SL, Lundergan CF, Reiner JS, Greenhouse SW, Thompson MA, Rohrbeck SC, et al. Angiographic findings and outcome in diabetic

- patients treated with thrombolytic therapy for acute myocardial infarction: the GUSTO-I experience. *Journal of the American College of Cardiology*. 1996;28(7):1661-9.
4. Galderisi M, Esposito R, Trimarco B. Cardiac involvement in diabetes: the dark side of the moon. *Journal of the American College of Cardiology*; 2017.
  5. Gabir MM, Hanson RL, Dabelea D, Imperatore G, Roumain J, Bennett PH, et al. The 1997 American Diabetes Association and 1999 World Health Organization criteria for hyperglycemia in the diagnosis and prediction of diabetes. *Diabetes care*. 2000;23(8):1108-12
  6. Saltiel AR. Series introduction: the molecular and physiological basis of insulin resistance: emerging implications for metabolic and cardiovascular diseases. *The Journal of clinical investigation*. 2000 Jan 15;106(2):163-4.
  7. Thomas CS, Varghese K, Habib F, Abraham MT, Hayat NJ, Cherian G. Extent and Severity of Atherosclerotic Vascular Disease in Patients Undergoing Coronary Angiography The Kuwait Vascular Study. *Angiology*. 2003 Jan;54(1):85- 92.
  8. Miwa K, Nakagawa K. Risk factors that discriminate 'high-risk' from 'low-risk' Japanese patients with coronary artery disease. *Japanese circulation journal*. 2000;64(11):825-30.
  9. Garcia MJ, McNamara PM, Gordon T, Kannell WB. Morbidity and mortality in diabetics in the Framingham population: sixteen year follow-up study. *Diabetes*. 1974 Feb 1;23(2):105-11.
  10. Mak KH, Moliterno DJ, Granger CB, Miller DP, White HD, Wilcox RG, Califf RM, Topol EJ, GUSTO-I Investigators. Influence of diabetes mellitus on clinical outcome in the thrombolytic era of acute myocardial infarction. *Journal of the American College of Cardiology*. 1997 Jul 1;30(1):171-9.
  11. Sousa JM, Herrman JL, Teodoro M, Diogo S, Terceiro BB, Paola AA, Carvalho AC. Comparison of coronary angiography findings in diabetic and non-diabetic women with non-ST-segmentelevation acute coronary syndrome. *Arquivos Brasileiros de cardiologia*. 2006 Feb;86(2):150-5.
  12. Zornitzki T, Ayzenberg O, Gandelman G, Vered S, Yaskil E, Faraggi D, Caspi A, Goland S, Shvez O, Schattner A, Knobler H. Diabetes, but not the metabolic syndrome, predicts the severity and extent of coronary artery disease in women. *QJM: An International Journal of Medicine*. 2007 Sep 1;100(9):575-81.
  13. Natali A, Vichi S, Landi P, Severi S, L'abbate A, Ferrannini E. Coronary atherosclerosis in Type II diabetes: angiographic findings and clinical outcome. *Diabetologia*. 2000 May 1;43(5):632- 41.
  14. Lindvall B, Brorsson B, Herlitz J, Albertsson P, Werkö L. Comparison of diabetic and nondiabetic patients referred for coronary angiography. *International journal of cardiology*. 1999 Jul 1;70(1):33-42
  15. Wu TG, Wang L. Angiographic characteristics of the coronary artery in patients with type 2 diabetes. *Experimental & Clinical Cardiology*. 2002;7(4):199.
  16. Singh RB, Niaz MA. Coronary risk factors in Indians. *The Lancet*. 1995;346:778-79 [23]. Chowdhary I, Sambyal V. Study of Extent of Involvement of Various Coronary Arteries in Diabetic and Non-diabetic Patients Diagnosed with

- Acute Myocardial Infarction. JK Science. 2016 Jul 1;18(3):132.
17. John FB, Rachel D, Rosanna T. Epidemiology of Coronary Artery Disease. In: Dr. David G, Ed. Coronary Artery Disease-Current Concepts in Epidemiology, Pathophysiology, Diagnostics and Treatment. ISBN: 978-953-51-0262-5,
18. Krishnaswami S, Joseph G, Punnoose E, Chandy ST. Coronary angiographic findings in patients with diabetes: an exercise in cardiovascular epidemiology. The Journal of the Association of Physicians of India. 1996 Mar;44(3):169-71.