Frequency of Triple Vessel Coronary Artery Disease in Diabetic and Non-Diabetic Patients presenting with NSTEMI

Bilal Ahmed, Vengus Manzoor, Sabir Hussain, Wajid Hussain, Araj Jamil, Laraib Shaikh and Tahir Saghir

1Intervention Cardiology, National Institute of Cardiovascular Diseases, Karachi, Pakistan
2Critical care unit, National Institute of Cardiovascular Diseases, Karachi, Pakistan
3Cardiac Imaging, National Institute of Cardiovascular Diseases, Karachi, Pakistan
4Cardiac Emergency, National Institute of Cardiovascular Diseases, Karachi, Pakistan
5Step down, National Institute of Cardiovascular Diseases, Karachi, Pakistan

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*Corresponding Author:
Bilal Ahmed
Intervention Cardiology, National Institute of Cardiovascular Diseases, Karachi, Pakistan
bilalahmeddr01@gmail.com

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ABSTRACT

Multi-vessel coronary artery disease (MVD) has profound challenges to the revascularization system. Several investigations showed diverse forms of CAD associated with complete or incomplete revascularization in MVD in PCI. Diabetic patient had more multi-vessel CAD as compared to non-diabetics. Objectives: To determine the frequency of triple vessel coronary artery disease and afterwards compare the triple vessel coronary artery disease in diabetic versus non-diabetic patients presenting with NSTEMI. Methods: This Descriptive Cross-Sectional Study was conducted at Emergency Department of the National Institute of Cardiovascular Diseases (NICVD), Karachi for Six months from March 4, 2019, to September 3, 2019. Samples size n=250 was calculated through non-probability consecutive sampling technique. All the patients of either gender presenting NSTEMI and undergone coronary angiography, aged >40 and <75 years and agreed to participate after their volunteer affirmation were included in this study. Results: Out of 250 patients, 76.5% were male while 24.4% were female with a mean age of 56.80. Triple Vessel Disease was documented in 107(42.8%) patients. As for the study main objective variable diabetes, the comparative analysis of triple vessel disease between diabetic versus non-diabetic resulted in significant difference was noted i.e., p-value = 0.030. Conclusions: Diabetic Mellitus has a significant factor for 3VD among the patients of NSTEMI patients. As a risk factor and comorbid, DM screening is a necessary factor in all NSTEMI patients who diagnosed with 3VD.

INTRODUCTION

Cardiovascular diseases (CVD) account for 17.9 million deaths each year globally out of which 7.2M deaths were due to CAD [1]. It has been evaluated that presence of 3VD among ACS patients is the most lethal and severe form of coronary artery disease. Moreover, the highest susceptibility of CAD was observed in ethnicity of Indo-Asian origin and is therefore unexpectedly high mortality in the Indo-Pak subcontinent [2]. Multi-vessel coronary artery disease (MVD) has profound challenges to the revascularization system. Several investigations showed diverse forms of CAD associated with complete or incomplete revascularization in MVD in PCI. 3VCAD is said to be strongly associated form of atherosclerosis and is practically handled by CABG, due to its worst life long-term prognosis [3]. According to the report, 3VCAD presented in 8.7% of cases with NSTEMI. Mohr et al., carried out a cross-sectional study that revealed MVCD is the reason for NSTEMI [4]. In 2018 a cross-sectional study was done with a sample size of 123 patients presented with complaints of NSTEMI. Their results showed raised troponin I levels, more
than ten times which was the most extreme limit of the typical reach in NSTEMI patients, and it was firmly connected with more unpredictable and severe CAD [5]. In 2016, a cross-sectional study was conducted to find out the frequency of 3VD in patients with NSTEMI. They assumed that the patients with NSTEMI were probably going to have 3VD [6]. A retrospective study in the same year 2016 was carried out to find association between coronary risk factor profile and angiographic features between young STEMI and NSTEMI patients. Their results showed 3VD was significantly more common in the NSTEMI group [7]. Heitner et al., in 2019 had realized that the infarct-related artery (IRA) by coronary angiography can be demanding in patients with NSTEMI. Their analysis has shown that Delayed-Enhancement Cardiac Magnetic Resonance DE-CMR might prompt another IRA analysis or explain non-ischemic pathogenesis [8]. Among the risk factor of CAD, DM plays a major role in cardiovascular diseases and hence cardio-diabetology is the fast aroused subspecialty of CVDs around the world. According to WHO diabetes will be ranked 4th in Pakistan by the year 2025 which was further proved by a study that reported 3VD 32.78% v/s 27.15% in diabetes v/s non-diabetic NSTEMI patients. In addition to that diabetic patient had more multi-vessel CAD as compared to non-diabetics. The global and regional Mortality projections and disease burden, in the next 20 years CAD will remain the leading cause of death [9]. With this approach, this study aims to determine the frequency of triple vessel coronary artery disease and afterward compare the 3VD in diabetic v/s non-diabetics in patients presenting with NSTEMI.

METHODS

The descriptive cross-sectional study was conducted at the Emergency Department of the National Institute of Cardiovascular Diseases (NICVD), Karachi for Six months from March 4, 2019, to September 3, 2019. Samples size n=250 was calculated through non-probability consecutive sampling technique and by using W.H.O sample size calculator version 2.0, with a confidence interval at 95%, the margin of error (d) 3.5% and P =8.7% expected prevalence of TVCAD. All the patients of either gender presenting NSTEMI and undergone coronary angiography, aged > 40 and < 75 years and agreed to participate after their volunteer affiliation were included in this study. Patients diagnosed with chronic kidney diseases who are on dialysis (GFR<15ml/min/1.73m2), anemia (Hb< 7g/dl), ejection fraction less than 20% (low predictor of mortality rate), previous history of coronary artery bypass graft, prior history of any cardiac-related surgery, and History of circulatory collapse requiring cardiopulmonary resuscitation or any major complication during angioplasty like cardiogenic shock, renal failure or unconsciousness, (confirmed through patient history) and situs inversus were excluded from this study. The study was approved by the ethical committee of the College of Physicians & Surgeons, and the National Institute of Cardiovascular Diseases (NICVD), Pakistan (Ref. No: CPSP/REU/CRD-2016-195-1364). Written informed consent was taken from the patient who fulfilled the inclusion criteria were enrolled in this study. In Performa, baseline demographic data including name, age, gender, and admission date were recorded. All patients undergo coronary angiography procedure, having NSEMI with occluded arteries leads to AVR and 3VCAD, under the supervision of experienced consultant cardiologists practicing for > 5 years. All data regarding complete clinical investigations were recorded by the principal investigator on a preconceive Performa. Confounding and biased variables were strictly followed by controlling inclusion-exclusion criteria. Data analysis was done by using SPSS version 20. Mean ± SD was calculated for height, weight, BMI, and age. Categorically defined variables were calculated for gender, blood pressure, obesity smokers/ non-smokers, family history of cardiovascular diseases, and impact of these on TVCAD. where two-sided probability value < 0.05, considered as statistical criteria of significance for diabetic v/s non-diabetics group. A Chi-square test was used to observe the effect of 3VD on diabetic and non-diabetic patients. For the graphical presentation of data, tar graphs and pie charts were used. Probability value < 0.05 was used to check the significance criteria. Reference for the cutoff values used for the study as per WHO and Asian criteria is given in Table 1.

### Table 1: BMI Standard Chart for Adults (both Male and Female)[10]

| Weight          | "WHO Criteria" BMI Cut Off (Kg/m2) | "Asian Criteria" BMI Cut Off (Kg/m2) |
|-----------------|----------------------------------|-------------------------------------|
| Under Weight    | <18.5                            | <18.5                               |
| Normal          | 18.5-24.9                        | 18.5-22.9                           |
| Over Weight     | 25-29.9                          | 23-24.9                             |
| Pre-Obese       | -                                | 25-29.9                             |
| Obese           | ≥ 30                             | ≥ 30                                |
| Obese Type 1(Obes) | 30-40                           | 30-40                               |
| Obese Type 2 (Morbid Obese) | 40.1-50                  | 40.1-50                             |
| Obese Type 3 (Super Obese) | >50                      | >50                                 |

Results

Out of 250 patients, 75.6% were male while 24.4% were female with a mean age of 56.60 and standard deviation ±7.724 and BMI mean was 26.58 ± 3.857. The mean ± SD of height was 1.63±0.095 while weight was 70.20 ± 8.682. The prevalence rate of hypertension was found to be 60.8% while 47.2% of patients was Diabetes Mellitus. 105(42%) were smokers and 145(58%) were Non-Smokers. Obesity was noted in 50(20%) patients whereas a Family history of
heart disease was documented in 63(25.2%) patients and Triple Vessel Disease was documented in 107(42.8%) patients (Table 2). However, Triple vessel disease was found in 11.6% of patients with family history and 31.2% in patients with no family history which shows a non-significant association between family history and triple vessel disease (p=0.549%). In stratification of BMI and triple vessel disease, 17 – 27 and >27, BMI and triple vessel disease have no significant association i.e., (p= 0.662). Triple vessel disease was found 18.8% in smokers and 24.0% in non-smokers which shows a non-significant association between smoking and triple vessel disease i.e. (p = 0.594). As for the study main objective variable diabetes, the comparative analysis of triple vessel disease between diabetic versus non-diabetic resulted in significant difference was noted i.e., p-value =0.030 (Table 2).

| Triple Vessel Disease | p-Value |
|-----------------------|---------|
| 3VD                   | Non 3VD |
| Age Group in Years    |         |
| 45 – 5                | 0.001   |
| 8>58                  |         |
| Gender                | 0.530   |
| Male                  | 83 (33.2%) |
| Female                | 24 (9.6%)  |
| Family History        | 0.549   |
| Yes                   | 29 (11.6%) |
| No                    | 78 (31.2%) |
| Body Mass Index (In Kg/m2) | 0.662 |
| 17 – 27               | 68 (27.2%) |
| >27                   | 39 (15.6%) |
| Hypertension          | 0.004   |
| Present               | 76 (30.4%) |
| Absent                | 31 (12.4%) |
| Obesity               | 0.665   |
| Present               | 20 (8.0%)  |
| Absent                | 87 (34.8%) |
| Smoking Status        | 0.594   |
| Present               | 47 (18.8%) |
| Absent                | 80 (34.0%) |
| Diabetes Mellitus     | 0.030   |
| Present               | 59 (23.8%) |
| Absent                | 48 (19.2%) |

Table 2: Association of demographics characteristics, baseline characteristics, and risk factors with triple vessel coronary artery diseases. Chi-Square T-Test Applied

In the stratification of age group 45–58 and >58 years, triple vessel disease was found to be 20% and 22.8%, highly showed association between age and triple vessel disease with a p-value = 0.001. In the comparison of triple vessel disease between gender and triple vessel disease, males 33.2% and fhfg9.6% in females were evaluated beside no significant difference was noted in terms of p-value i.e., 0.530. Triple vessel disease was found at 30.4% in hypertensive and 12.4% in non-hypertensive patients. P-value showed a significantly higher association between hypertension and triple vessel disease i.e., P=0.004. In the stratification of obesity, triple vessel disease was found to be 8.0% and 34.8% respectively which shows a non-significant association between obesity and early triple vessel disease (P=0.665) (Figure 1).

**DISCUSSION**

It's becoming increasingly prevalent in our community to have an acute coronary syndrome because of the fast adoption of a sedentary lifestyle, just like in other Asian countries. In a cohort study of 1263 diabetic patients who went through the angiographic screening, 430n had been diagnosed with MVD. After long-term follow-up, it has been validated that PCI has a low mortality rate and require less revascularization as compared to CABG [11]. Clinical investigation results in CAD with DM-II were poor regardless of progress in medicines. Furthermore, this article’s findings suggested CABG was better than PCI in treating diabetic patients with MVD. CAD in comparison between diabetic and non-diabetic patients found to be CAD in diabetics had a significantly higher percentage of the extreme and unusual events. Diabetics have a higher danger factor profile and poor clinical results [12]. Retrospective data were retrieved of 2260 young females who went through PCI found out dyslipidemia was the main reason behind ACS in females [13]. A systematic review on the role of advanced glycation end products in the development of coronary artery disease among DM and non-DM, used any therapeutic agents in order to reduce the circulating AGE would be helpful to reduce the complication of DM for the treatment of CAD [14]. If a patient has NSTEMI with coronary artery disease in the left main or three arteries, they have a high mortality rate [15]. Because of this, the use of non-invasive diagnostic tools like the ECG is essential for the early and accurate detection of severe disease in the left main or three vessels CA. To sum up, the findings of these studies offer substantial evidence for increasing the ECG's ability to
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predict clinical outcomes in patients with NSTEMI by taking into account the amount or distribution of ST-segment depression (STD) [16, 17]. In the present study, Mean ± SD of age was 56.60 ±7.724 years among them 75.6% were male and 24.4% were female. Hypertension was found in 60.8% while 47.2% were noted as diabetic. In a comparison of triple vessel disease between diabetic versus non-diabetic significant difference was noted i.e. (p=0.030). Our results are comparable with all national and international studies. In the current study, triple vessel disease was documented in 42.8% of patients. Likewise, our study result, Shaikh et al., reported 30.2% of patients presented with triple vessel disease [18]. In the present study, Mean ± SD of age was 56.60±7.724 years among them 75.6% were male and 24.4% were female. Hypertension was found in 60.8% while 47.2% were noted as diabetic. In 74 comparisons of triple vessel disease between diabetic versus non-diabetic significant difference was noted i.e. (p=0.030). On the other hand, in Tanindi et al., study 42.9% of patients were diabetic. In a comparison of triple vessel disease between diabetic versus non-diabetic significant difference was noted i.e. (p=0.030). On the other hand, in Tanindi et al., study 42.9% of patients were diabetic [19-22]. Results are comparable with all national and international studies. Study design which was cross sectional was our main limitation of the study.

CONCLUSIONS

Diabetic Mellitus has a significant factor for 3VD among the patients of NSTEMI patients. As a risk factor and comorbids, DM screening is a necessary factor in all NSTEMI patients who diagnosed with 3VD.

Conflicts of Interest

The authors declare no conflict of interest

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REFERENCES

[1] Roth G, Johnson C, Ababajor A, Abd-Allah F, Abera S, Abyu G, et al. Global, Regional, and National Burden of Cardiovascular Diseases for 10 Causes, 1990 to 2015. Journal of the American College of Cardiology. 2017 Jul; 70(1):1-25. doi: 10.1016/j.jacc.2017.04.052

[2] Jafar T, Qadri Z, Chaturvedi N. Coronary artery disease epidemic in Pakistan: more electrocardiographic evidence of ischaemia in women than in men. Heart. 2008 Apr; 94(4):408-413. doi: 10.1136/hrt.2007.120774

[3] Butt M, Rehman M, Khan A, Abrar A. Frequency of Triple-Vessel Coronary Artery Disease in Adult Type 2 Diabetics Versus Non-Diabetics in Coronary Artery Disease Population of Islamabad, Pakistan. Gomal Journal of Medical Sciences. 2019 Jun; 17(2):37-41. doi:10.46893/gjms/17.02.2029

[4] Mohr F, Morice M, Kappetein A, Feldman T, Ståhle E, Colombo A, et al. Coronary artery bypass graft surgery versus percutaneous coronary intervention in patients with three-vessel disease and left main coronary disease: 5-year follow-up of the randomised, clinical syntax trial. The Lancet. 2013 Feb; 381(9867):629-638. doi: 10.1016/S0140-6736(13)60141-5

[5] Shaikh SA, Shaikh GA, Karim M. Severity of coronary artery disease in non-ST elevation myocardial infarction (nSTEMI) patients with high troponin-I level. Pakistan Heart Journal. 2018 Oct; 51(2):114-118. doi: 10.47144/phj.v51i2.1490

[6] Ahmed N, Kazmi S, Nawaz H, Javed M, Anwar SA, Alam MA. Frequency of diabetes mellitus in patients with acute coronary syndrome. Journal of Ayub Medical College Abbottabad. 2014 Mar; 26(1):57-60.

[7] Deora S, Kumar T, Ramalingam R, Nanjappa Manjunath C. Demographic and angiographic profile in premature cases of acute coronary syndrome: analysis of 820 young patients from South India. Cardiovascular Diagnosis and Therapy. 2016 Jun; 6(3):193-198. doi: 10.21037/cdt.2016.03.05

[8] Heitner J, Senthilkumar A, Harrison J, Klem I, Sketch M, Ivanov, A et al. Identifying the Infarct-Related Artery in Patients with Non-ST-Segment-Elevation Myocardial Infarction. Circulation: Cardiovascular Interventions. 2019 Apr; 12(5):e007305. doi: 10.1161/circinterventions.118.007305

[9] Mathers C. History of global burden of disease assessment at the World Health Organization. Archives of Public Health. 2020 Dec; 78(1):1-3. doi: 10.1186/s13690-020-00458-3

[10] Liido LO and Mirasol R. Comparison of body mass index based nutritional status using WHO criteria versus “Asian” criteria: report from the Philippines. The PHILSPEN Online Journal of Parenteral and Enteral Nutrition. 2011 Dec; (1):5-18.

[11] French J, Eftal M, Burgess S, Mussap C, Hee L, Juergens C, et al. P1388Late clinical outcomes of unselected patients with diabetic mellitus and multivessel coronary artery disease. European Heart Journal. 2017 Aug; 38(suppl_1). doi: 10.1093/heartj/ehx502.P1388

[12] Girdhar D. Coronary Angiographic (CAG) Findings between Diabetic and non-Diabetic Patients in Coronary artery disease: A Comparative Study. Journal of Medical Science and Clinical Research. 2018 Aug; 6(8):753-759. doi: 10.18535/jmscr/v6i8.126

[13] Nagamalesh U, Abhinay T, Naidu K, Ambujam N, Hegde A, Prakash V. Clinical profile of young Indian women presenting with acute coronary syndrome. Journal of Clinical and Preventive Cardiology. 2018
Ahmed B et al.,

Diabetes Research. 2021 Jan; 2021: 6683937. doi: 10.1155/2021/6683937

Jul; 7(3):106. doi: 10.4103/JCPC.JCPC_48_17

[14] Fishman S, Sonmez H, Basman C, Singh V, Poretsky L. The role of advanced glycation end-products in the development of coronary artery disease in patients with and without diabetes mellitus: a review. Molecular Medicine. 2018 Dec; 24(1):1-2. doi: 10.1186/s10020-018-0060-3

[15] Kueh SH, Devlin G, Lee M, Doughty RN, Kerr AJ. Management and long-term outcome of acute coronary syndrome patients presenting with heart failure in a contemporary New Zealand cohort (ANZACS-QI 4). Heart, Lung and Circulation. 2016 Aug; 25(8):837-46. doi: 10.1016/j.hlc.2015.10.007

[16] Usha P, Gopichandran L, Pathak P, Parakh N, Ramakrishnan S, Singh S. A study to evaluate the feasibility of a nurse-led follow-up clinic among postmyocardial infarction patients attending the Cardiology Outpatient Department at AIIMS, New Delhi. Journal of the Practice of Cardiovascular Sciences. 2018 Sep; 4(3):198. doi: 10.4103/jpcs.jpcs_52_18

[17] Ali L, Ashgar N, Hussain A, Shah M. ST segment elevation in lead aVR: Clinical significance in acute coronary syndrome. Annals of PIMS. 2016 Dec; 12(4):203-208.

[18] Shaikh Z, Daniel SS, Tripathi S, Shinde VS, Luthra A, Patil S, et al. A study of clinical profile of low-risk Acute Coronary syndrome in a teaching tertiary care hospital-A prospective observational study. 2020 Jan; 8(1):107-113. doi: 10.18535/jmscr/v8i1.13

[19] Tanindi A and Cemri M. Troponin elevation in conditions other than acute coronary syndromes. Vascular health and risk management. 2011 Sep; 7:597-603. doi: 10.2147/VHRM.S24509

[20] Shah R, Berzinge C, Mumtaz M, Jasper J, Goswami R, Morsy M, et al. Meta-Analysis Comparing Complete Revascularization Versus Infarct-Related Only Strategies for Patients With ST-Segment Elevation Myocardial Infarction and Multivessel Coronary Artery Disease. The American Journal of Cardiology. 2016 Nov; 118(10):1466-1472. doi: 10.1016/j.amjcard.2016.08.009

[21] Kim YH, Her AY, Jeong MH, Kim BK, Hong SJ, Kim S, et al. Two-year clinical outcomes between prediabetic and diabetic patients with STEMI and multivessel disease who underwent successful PCI using drug-eluting stents. Angiology. 2021 Jan; 72(1):50-61. doi: 10.1177/0003319720943111

[22] Liu F, Huang R, Li Y, Zhao S, Gong Y, Xu Z. In-Hospital Peak Glycemia in Predicting No-Reflow Phenomenon in Diabetic Patients with STEMI Treated with Primary Percutaneous Coronary Intervention. Journal of