## ORIGINAL ARTICLE
# INVOLVED CULPRIT ARTERIES AND PROPORTION OF SPONTANEOUS ARTERIAL RECANALIZATION IN ACUTE LATERAL WALL MYOCARDIAL INFARCTION ADULT PATIENTS IN PAKISTAN

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**Objectives:** To elucidate the involved culprit arteries and proportion of spontaneous arterial recanalization (SAR) in acute lateral wall myocardial infarction (ALWMI) patients in Pakistan.

**Methodology:** This cross-sectional study was conducted in the outpatient department (OPD) of a tertiary care cardiac center from February 2019 to July 2019. Patients meeting selection criteria of ALWMI were included. Key angiographic outcomes were recorded for each patient. Proportion of SAR in terms of involved culprit arteries was assessed.

**Results:** One hundred fifty two (152) patients were included, out of which 81% (124) were males. Mean age was $54.73 \pm 11.03$ years. Most (46.4%) of the study patients presented with single vessel disease. Overall, 89 (59%) patients showed SAR with settled ECG changes. Of them 73 (66%), 8 (33%) and 8 (47%) patients had diagonal artery involvement, 1st obtuse marginal artery involvement and ramus intermedius artery involvement respectively. Statistical significance (p=0.006) is observed for relationship of involved culprit arteries and SAR in ALWMI patients.

**Conclusion:** This cross-sectional study reports the proportion of arterial recanalization in terms of involved culprit arteries. Diagonal was the culprit artery (~ 73%) in most patients presented with ALWMI. SAR proportion is also highest in patients with diagonal artery involvement. This tendency of SAR was more in single vessel diseases patients compared to double vessel and triple vessel diseases patients.

**Keywords**: acute lateral wall myocardial infarction, arterial re-canalization, left anterior descending artery, left circumflex artery, left coronary artery

## INTRODUCTION

Left ventricular function and survival after acute myocardial infarction (AMI) is dependent upon timely recanalization of infarct arteries. Isolated lateral wall myocardial infarction (LMI), similar to other AMI, is caused by thrombus formation subsequent to the acute plaque rupture in the left circumflex (LCx) coronary artery or one of its branches.[1] Acute myocardial infarction (AMI) is caused through the blockage of coronary arteries and its branches. Anterior AMI is caused is usually caused by left anterior descending artery occlusion, while inferior AMI is caused by right coronary artery and/ or left circumference artery.[2] Two types of AMI are observed in clinical setting, ST-segment elevation myocardial infarction (STEMI) and non-ST-segment elevation myocardial infarction (NSTEMI) characterized by ST-segment elevation or non-elevation in ECG.[3,4] In AMI patients usually coronary vessel occlusions are observed that could range from single vessel disease to triple vessel disease or more.[5]

Patients can survive through myocardial infarction (MI) with non-obstructive coronary arteries (MINOCA), occasionally. Generally MINOCA is projected around 6% on the basis of meta-analysis which is done in 2015.[6]

Prevalence of age-specific MI ranges from 0.06% to 2.46% in adults of 45 to 75 years in developed countries. In contrast, among South Asian countries (India, Pakistan, Sri Lanka, Bangladesh, and Nepal) the prevalence of MI is observed higher in adults younger 45 years of age.[2] A recent cross-sectional study in Punjab province of Pakistan showed average 3.05% frequency of myocardial infarction among male & female subjects.[7]

The care of myocardial infarction can be possible through reperfusion. It can restore the flow, the quality of myocardium and extent of myocardial salvage during AMI. The gold standard for achieving reperfusion is angioplasty. Large number of patients fail to get complete coronary patency, while some

patients have spontaneous coronary recanalization on the pre-intervention angiogram. Spontaneous recanalization (SR) of infarct-related coronary artery is an important interpreter of myocardial salvage and improved outcome in patients with STEMI.[8,9]

Up to 30% of patients were observed with spontaneous recanalization, in the setting of ST-elevation acute coronary syndrome (STE-ACS) in the past few years.[10-14] Very few data define clinically Spontaneous Recanalization (SR) in STE-ACS patients.[4,15] In the recent European and American recommendations, clinically defined spontaneous recanalization is defined within the context of non-STE-ACS.[16] For patients with SR immediate angioplasty is the safe and effective treatment option.[3] This study is first of its kind in Pakistan, to understand the involved culprit arteries and proportion of spontaneous arterial recanalization in acute lateral wall myocardial infarction (ALWMI) patients.

## METHODOLOGY

A Cross-sectional study was conducted in the outpatient department of National Institute of Cardiovascular Diseases (NICVD), Karachi Pakistan from February 2019 to July 2019. Study was approved by ethics review committee of NICVD (Approval No: ERC-72/2020). The Study follows strengthening the reporting of observational studies in epidemiology (STROBE) guidelines to report the results of the study.

Male and female patients aged 18 years and above, diagnosed with ALWMI were enrolled after getting written informed consent regarding their participation in the study and publication of acquired data while maintaining anonymity. Patients refusing to give consent, with prior history of MI and/or treated with fibrinolytic therapy at the time of presentation were excluded from the study Confirmation of ALWMI was made if patients meet any of the following criteria: typical chest pain >20 minutes (retrosternal pain with radiation to left arm or shoulder, aggravates on exertion or emotional stress, relieved with rest or nitroglycerin) and new ST elevation > 1mm in leads (I, aVL, V5 and V6) and reciprocal ST depression in leads III and aVF.

Study process data was gathered using structured questionnaire covering demographic characteristics, predisposing risk factors, and angiographic profile along with comorbid disease conditions were for the patients admitted at NICVD, Karachi, Pakistan. Key angiographic outcomes were observed and recorded for each enrolled patient by experienced interventional cardiologist, including number of vessels involved, the culprit artery, total occlusion and/or spontaneous recanalization status.

Sample size was calculated based on SR in the setting of STEMI is reported in up to 30% of patients [5-9], taking prevalence guess of 30%, at 95% confidence level with the margin of error of 8%, sample size for the study was calculated to be n = 150 patients. Sample size was calculated using WHO sample size calculator version 2.0. Data was analyzed using SPSS version 21 (IMB Inc, Armonk, USA). For quantitative data, mean and standard deviation were reported and for qualitative data frequencies and percentages were presented. Chi-square test was used to determine the statistical significance. Statistical significance was kept at $\alpha = 0.05$ (2-tailed).

## RESULTS

One hundred fifty two (152) patients were included in the study. Of study patients, 81% (n=124) were males and 19% (n=28) were females. Mean age of study patients was 54.73 ± 11.03. Patients' comorbid conditions includes diabetes mellitus, hypertension and smoking. All included patients' angiographic outcomes were recorded, including involvement of culprit arteries and manifestation of no. of vessels in the disease. Majority (46.4%) of patients presented with single vessel disease. 41 (26.8%) and 39 (25.5%) patients presented with double vessel and triple vessel disease respectively. Baseline characteristics are depicted in Table 1.

**Table 1: Baseline characteristics**

| Variables (N=152) Demographics | | | Mean ± S.D / N (%) |
|---|---|---|---|
| Age (years) | | | 54.73 ± 11.09 |
| Gender | Male | | 124 (81) |
| | Female | | 28 (19) |
| Comorbid Conditions | Diabetes Mellitus | | 45 (29.6) |
| | Hypertension | | 48 (31.6) |
| | Smokers | | 33 (21.7) |
| Vascular Characteristics | | | |
| Culprit Arteries | LAD* | 1st Diagonal | 100 (66) |
| | | 2nd Diagonal | 10 (6.6) |
| | 1st Obtuse Marginal | | 24 (16) |
| | Ramus Intermedius | | 17 (11) |
| Vascular Disease | Single Vessel | | 71 (46.4) |
| | Double Vessel | | 41 (26.8) |
| | Triple Vessel | | 39 (25.5) |

*Left anterior descending artery*

The primary outcome of the study, proportion of arterial re-canalization in ALWMI patients in terms of involved culprit arteries is calculated and depicted in Figure 1. Overall, 89 (59%) patients showed

spontaneous recanalization with settled ECG changes. In all patients main LAD artery had non-obstructive coronary artery diseases (≤50%), 73 (66%), 8 (33%) and 8 (47%) patients with diagonal artery, 1st obtuse marginal artery, and ramus intermedius artery involvement had spontaneous recanalization respectively upon angiographic examination. The right coronary artery (RCA) was observed to be non-occlusive in all the patients and no patient required coronary intervention for the concerned artery. Pearson's chi-square value indicates the relationship of culprit arteries involvement and arterial recanalization with statistical significance (p-value = 0.006). Graphical presentation of involved culprit arteries and proportion of arterial re-canalization or total occlusion is elaborated in Figure 1.
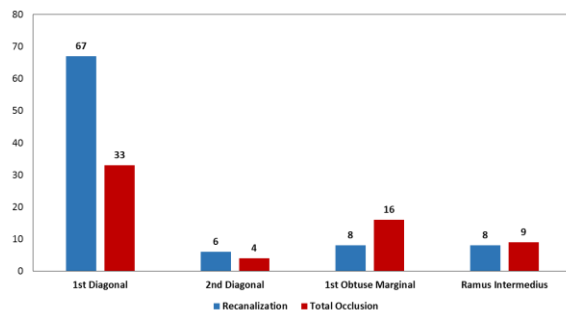


**Figure 1: Culprit Arteries and Proportion of Arterial Re-Canalization in AMI Patients**

## DISCUSSION

This cross-sectional study was conducted to acknowledge the involvement of culprit arteries in causing acute myocardial infarction (AMI) and also the proportion of patients who had spontaneous arterial recanalization. Our study depicted the specified outcomes in older adults with mean age of ~ 54 years, similar age group of patients' outcomes are reported in different ethnic population as well.[8,17] Male to female ratio of our study patients is approximately 3:1 i.e. evident from previously published studies as well.[8,17] Diabetes mellitus, hypertension and smoking were the major comorbid condition in our study patients i.e. the usual observation in coronary artery disease patients.[18,19]

Our study results depicted that majority (72%) of AMI patients had involvement of left anterior descending arteries, which is the established aspect of acknowledgment evident from literature as well.[20] 1st obtuse marginal artery and ramus intermedius artery were also among the culprit arteries involved in acute myocardial infarction. Our study also depicted that, majority of patients had single vessel disease and

endorsing the fact that lessen the vessel involvement leads to the better prognosis of the disease.

Our study indicates that patients which showed involvement of 1st diagonal culprit artery, had presented with highest proportion (66%) of spontaneous arterial recanalization and ultimately the better prognosis is predicted in such patients. Patients with 1st obtuse marginal culprit artery had higher proportion (75%) of total occlusion of vessels indicating poor prognosis of disease in such patients. Based on this, it can be interpreted that AMI patients with LAD culprit artery tends to have more spontaneous arterial recanalization and ultimately can have better disease prognosis. Study also confirms the statistically significant relationship of the two variables (Culprit Arteries in AMI patients and spontaneous arterial recanalization).

Although study directs some key outcomes but patients' single time exposure in study, observational nature of the study and not studying effect modifying factors are some of the limitations of the study. However, this study is first of its kind in Pakistani population to gauge the involvement of occluded coronary arteries and proportion of spontaneous arterial recanalization in such patients. Future, prospective cohort studies with better control can exactly gauge the correlation of the two specified variables and depict the risk estimation as well.

## CONCLUSION

Diagonal arteries (LAD) was found in majority of cases as the culprit artery in patients with isolated high lateral wall MI and it had more tendency towards spontaneous recanalization as compared to 1st obtuse marginal and ramus intermedius artery which indicated the better short and long term prognosis. This tendency of spontaneous recanalization was more in single vessel diseases patients compared to double vessel and triple vessel diseases patients. A statistically significant relationship is found between culprit arteries and spontaneous arterial recanalization.

### AUTHORS' CONTRIBUTION:

SA, SFM, and MNK: Concept and design, data acquisition, interpretation, drafting, final approval, and agree to be accountable for all aspects of the work. NAS, KN, SMA, UHB, SB, AM: Data acquisition, interpretation, drafting, final approval and agree to be accountable for all aspects of the work.

**Conflict of interest:** Authors declared no conflict of interest.

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