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ORIGINAL ARTICLE

Comparison of Clinical and Angiographic Profiles of Patients with or without Left Main Coronary Artery Disease in Patients Undergoing Angiography for Acute Coronary Syndrome

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ABSTRACT

Background: High death rates are seen in cases with heart disease affecting the left major coronary artery. The left main coronary artery has different flow dynamics and pathophysiology than other coronary arteries. It is important to identify the best management options for patients with left main coronary artery disease based on their anatomic pattern.

Objective: To compare the clinical and angiographic profiles of patients with or without left main coronary artery disease in patients undergoing angiography for ACS.

Methods: An observational cross-sectional study was conducted. Invasive coronary angiography was performed on 985 adult patients diagnosed with coronary artery disease throughout a 6-month study period. The research participants were split into two groups: left main (Group 1) and non-left main (Group 2) following coronary angiography. It was determined whether there were any statistically significant variances between the two groups by comparing their demographics, risk factors, and angiograms.

Results: In group 1, the mean age and SD are 54.3±8.4 and in group 2, they are 54.4±11.9. There were 748 men (75.9% of the total) and 236 females (23.9%). Out of the male participants, 630 were assigned to Group 2 (non-LMCA) and 118 were placed in Group 1 (LMCA). All of the females were present in group 2. Left main illness tends to be greater in males, as indicated by the results of the comparison research between the two groups (p=0.046). BMI comparisons across the groups indicated no statistically significant difference (p>0.05).

The most common presentation was non-ST elevated ACS, which was significantly related to the LM group (p<0.05). The coronary angiogram of 867 patients showed no left main artery involvement in 88.0% of patients, while the left main in 118 cases was 12.0%. For this research, 985 participants had coronary angiography performed by cardiac catheterization. From the total of 985 patients, 89 (9.0%) were classified as having "normal" or "non-critical" coronary arteries, 227 (23.1%) as having "single vessel disease," 296 (30.0%) as having "double vessel disease," and 374 (38.0%) as having "triple vessel disease." There are 867 individuals (88.0%) with no involvement of the left main artery, and 118 patients (12.0%) having left main disease among the population investigated.

Conclusion: Patients with NSTE-ACS, diabetes and LMCA disease were considerably more likely to be men. They were also more likely to have a favorable family history (ACS). Triple vessel disease and distal left main disease were more prevalent among patients.

Keywords: Left main coronary artery, Coronary angiography, Coronary artery disease, acute coronary syndrome.

INTRODUCTION

Left main coronary artery disease (LMCA) places the big myocardial region at a risk that can range from 75% to 100%, dependent on the degree to which the left coronary artery predominates in the patient's cardiovascular system.[1] Clinical results are worse for patients with significant LMCA disease associated to those with the non-LMCA disease, even though LMCA disease is the most common form of obstructive CAD.[2] From asymptomatic to sudden death, LMCA presents with a wide range of symptoms.[3] In patients undergoing coronary angiography, significant LMCA disease is often the source of apprehension and uncertainty in the diagnosis and treatment.[1] It is extremely important to consider the anatomic complexity and extent of the CAD when deciding on the best management strategy for LMCA patients.[4] Several improvements have been made in the treatment strategies and risk profiles of patients with LMCA disease over the last two decades. This is still a very important open subject even though the evolution of the traits, care, and clinical outcomes of LMCA patients has not been adequately assessed.[2] In the absence of early intervention, it may result in increased mortality and morbidity and pose numerous diagnostic, evaluation, and management challenges. As a result, this patient population with CAD needs to receive more attention. Left main coronary artery disease might have some variations based on geography, even though several studies have been conducted around the world, and there are no data approximately these patients in Pakistan. In this observational analysis, we sought to identify people at risk by comparing the clinical and angiographic characteristics of patients with LMCA with those without left main arteries. thus justifying the escalation of their treatment according to their clinical and angiographical profiles. Patients can be managed better if we understand this particular issue better.

MATERIAL AND METHODS

We conducted this observational cross-sectional study at NICVD Karachi. Ranking among the top hospitals in Pakistan, the center consistently performs well. From 1st January 2019 to 30th June 2019, the entire period was six months. The study included 985 people with coronary artery disease who were aged≥18 years. Patients with cardiomyopathies, coronary artery disease, significant renal impairment, history of percutaneous coronary intervention or coronary artery bypass grafting, and severe renal impairment were excluded from the study. The local Institutional Review Board and ethics committee gave their approval to the project (IRB). The patients were carefully informed before their written consent was obtained.

According to the inclusion and exclusion criteria, adult patients with CAD who received invasive coronary angiography during their index hospitalization stay were eligible for this research. An electrocardiogram and echocardiogram were

performed after taking a detailed history, performing a physical examination as well as performing relevant laboratory tests. Using standard protocols, Patients who had coronary angiography were accessed by either the trans femoral or trans-radial technique, depending on the preference of the interventional cardiologist. We obtained angiographical data. Based on whether the LMCA had significant stenosis (Group 1) or not (Group 2), patients who underwent coronary angiography were separated into 2 groups. Afterward, we compared the two groups to see if there were statistically significant differences. Lesions defined as angiographically significant included those with stenosis of ≥50% or higher in the left main coronary artery (LMCA) and stenosis of ≥70% or greater in the other coronary arteries when comparing them with their adjacent segments with no lesions.[5]

The data collection sheet used for analysis was based on a preset, easily reasonable topic-oriented data sheet. To finalize the results, all the collected information was checked, verified, and edited. As a continuous variable, mean ± standard deviation or median are used to represent it. Frequency tables and charts were presenting categorical variables as complete numbers and percentages. Chi-square was employed for categorical data, while the student's t-test was utilized for continuous data. The significance of a difference was determined by a P value less than 0.05. The analysis was achieved with SPSS version 25.0 for Windows.

RESULTS

Patients' ages varied widely, from 34-80 years, with a mean and standard deviation of 54.2±8.9 years, respectively. Group 1 (LMCA) had a mean age of 54.38.4 while Group 2 (Non-LMCA) had a mean age of 54.4±11.9. (65.2%) of patients fell into the 40 to 60-year-old bracket. There was no statistically significant change among the age groups (p>0.05).

There were 748 men (75.9% of the total) and 236 females (23.9%). Among the men, 118 were assigned to Group 1 (LMCA), while the remaining 630 were present in Group 2. (no LMCA.) All of the females belong to Group 2. Left main illness tends to be greater in males, as indicated by the results of the comparison research among the two groups (p=0.046). There was no statistically significant change among the groups when comparing body mass index (p>0.05).

Clinical presentations: The majority of patients presented with non-ST-elevation acute coronary syndrome (45%). (NSTE-ACS). Out of the total, 89 (75.4%) were assigned to Group 1, while 355 (40.9%) were assigned to Group 2. Group 1 presents with LMCA, whereas Group 2 does not (p=0.039). When comparing clinical presentations, the LM group's NSTE-ACS score is considerably greater than that of the Left Main group. Other clinical manifestations, such as ST-elevation myocardial infarction (STEMI) and chronic coronary syndrome(CCS), did not show statistically significant changes between the two groups (p>0.05).

Risk factors: In group 1, there were 98 (83%) diabetes patients and 20 (16.9%) non-diabetic patients, whereas in group 2, there were 384 (44.2%) diabetic patients and 483 (55.7%) non-diabetics. The comparative study discovered a statistically significant difference (p=0.018) between the two groups. Analysis of the data showed that there was statistically significant variance between the two groups concerning the presence of a positive family history of CAD (p=0.005). For the other risk factors, no significant changes were found among the two groups (p>0.05).

Biochemical tests & Echocardiography: HbA1c levels tended to be higher in group 1, and this difference was statistically significant (p=0.029), In contrast, lipid profiles showed no significant difference (p>0.05). The majority of participants (53%), whose left ventricular ejection fraction was between 45 to 60%, were in the normal range. A statistically insignificant difference (p>0.05) in LVEF mean standard deviation or existence of a regional wall motion abnormality (RWMA) was found between the two groups.

Coronary angiography: For this research, 985 participants had coronary angiography performed by cardiac catheterization. From the total of 985 patients, 89 (9.0%) were classified as having "normal" or "non-critical" coronary arteries, 227 (23.1%) as having "single vessel disease," 296 (30.0%) as having "double vessel disease," and 374 (38.0%) as having "triple vessel disease." There are 867 individuals (88.0%) with no contribution of the left main artery, and 118 patients (12.0%) having left main disease among the population investigated.

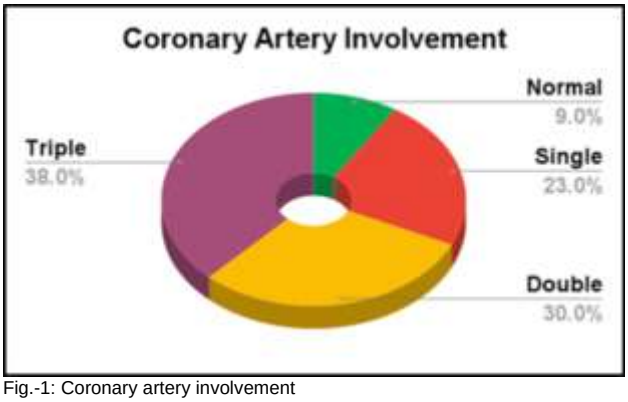

Fig.-1: Coronary artery involvement

The patients in Group 1 did not have isolated left main stenosis; instead, they had a single vascular disease (20 patients, or 16.9% of the total), a double vessel disease (30 patients, or 25.4%), or a triple vessel disease (69 patients, or 58.4%). In contrast, in group 2 (No LMCA), 89 patients (10.2%) had normal coronary arteries, 207 (23.8%) had a single vessel impacted, 266 (30.6%) had a double artery affected, and 305 (35.1%) had all three vessels affected. When contrasting the two groups, no statistically significant changes (p>0.05) were discovered. More frequently than single or double vessel illness, however, was triple vessel disease. 42 individuals with ostio-proximal lesions and 76 with distal lesions out of the 118 patients with left main artery stenosis had these conditions, respectively. Nobody was discovered to have a lesion just in the mid-shaft region of the left main artery. In cases of left main stenosis, the distal lesion was observed more often than in any other form. Research population 1 consisted of 118 individuals with severe LMCA stenosis (LMCA disease). There were no isolated LMCA lesions in any of the patients, 69 had lesions in 3 coronary arteries, 30 had lesions in 2 vessels (1 LCX and RCA and 2 LAD and LCX), and 20 had a single artery lesion (LAD). The second group consisted of the remaining patients (No LMCA disease).

There were 108 lesions in the LAD, 98 lesions in the LCX, and 79 lesions in the RCA among the patients with the single-vessel disease (23.0%).

The RCA and LAD were affected by 88 patients (30.0%), the LAD and LCX were affected by 108 patients, and the RCA and LCX were affected by 79 patients. Triple vessel disease affected 37% of patients. Both groups had LAD involvement, but there was no statistically significant change among those two coronary arteries (p>0.05).

Table-1: Relationship of the different numerous parameters with the incidence of significant LMCA Disease (n=985)

Variables	LMCA disease	No LMCA disease	P-value
	Group 1 (n=118)	Group 2 (n=867)	
Age (mean ± SD)	54.3±8.4	54.4±11.9	0.948ns
Sex			
Male (%)	118 (100%)	630 (63.9%)	0.046s
Female (%)	0 (0%)	236 (23.9%)	
BMI (mean ± SD)	33.48±2.98	33.86±4.36	0.504ns
Clinical presentation			
STEMI (%)	10 (8.4%)	197 (22.7%)	0.039s
NSTE-ACS (%)	89 (75.4%)	355 (40.9%)	

Unstable angina	20 (16.9%)	314 (36.2%)	
Risk factors			
Hypertension	98 (83.0%)	551 (63.5%)	0.236ns
Diabetes mellitus	98 (83.0%)	384 (44.2%)	0.018s
Dyslipidemia	49 (41.5%)	384 (44.2%)	0.915ns
Smoking	39 (33.0%)	394 (45.4%)	0.588ns
Family history of CAD	98 (83.0%)	325 (37.4%)	0.005s
Heart failure	79 (66.9%)	305 (35.1%)	0.067ns
Biochemical tests			
HbA1c (%, mean ± SD)	9.8±1.0	8.1±1.4	0.038s
Lipid profiles			
Total cholesterol	199.8±85.7	250.6±77.8	0.708ns
Triglyceride	320.0±72.0	287.5±73.2	0.560ns
HDL-C	45.7±13.4	53.8±8.9	0.570ns
LDL-C	131.4±37.9	236.8±42.7	0.586ns
Echocardiography LVEF (mean ±SD)	63.7±8.1	61.8±8.9	0.640ns
RWMA (%)	11 (9.3%)	788 (90.8%)	0.550ns

Table-2: Comparison of angiographic characteristics of patients with or without Left main coronary artery disease (n=985)

Characteristics	LMCA disease	No LMCA disease	P-Value
	Group 1 (n=118)	Group 2 (n=867)	
Pattern of CAD			
Normal/Non-critical	0 (0%)	89 (10.2%)	0.382ns
Single vessel disease	20 (16.9%)	207 (23.8%)	0.718ns
Double vessel disease	30 (25.4%)	266 (30.6%)	0.823ns
Triple vessel disease	69 (58.4%)	305 (35.1%)	0.410ns
Pattern of specific coronary artery involvement			
LAD	108 (91.5%)	611 (70.4%)	0.476ns
LCX	98 (83.0%)	542 (62.5%)	0.455ns
RCA	79 (66.9%)	502 (57.9%)	0.802ns

DISCUSSION

According to this study, 985 patients with coronary artery disease had significant left main coronary artery stenosis, identical to a previously published[6] study of 103 individuals at high risk for NSTE-ACS. Among 102 high-risk patients with NSTE-ACS, Claver et al. (2006) found 13.7% of significant LMCA stenosis,[7] while Palaparthi et al. (2017) found 17%, both of which are comparable to our findings.[8] According to Gehani et al., (2012), 3% of patients in Iran who underwent coronary angiography for any reason had significant LMCA stenosis.[9] In western countries, there is a reported frequency of LMCA disease of 0.7% to 12.6%.[3] Comparatively to western and middle eastern countries, LMCA disease occurred less frequently in this study. Different studies showed that patients with LMCA stenosis typically had a mean age of 55-69 years,[10,11] which was similar to the age of patients in this study. According to Chitman et al., (1981).[5] In the CASS investigation, old age was found to increase the risk of LMCA illness. As stated by Claver et al., there is a correlation between advancing age and LMCA illness (2006).[7] However, some studies found equivocal results in this regard. LMCA disease affects 89% of patients younger than 65 years of age, according to Palaparthi et al., (2017).[8] This study also indicated that individuals under the age of 65 had a higher prevalence of LMCA disease (73%), but that this difference was not statistically significant. LMCA symptoms were more prevalent for men with more than 70% prevalence in the male gender. However, some studies reported higher rates of male patients.[12] Gehani et al. (2012) and Claver, et al. (2005), on the other hand, observed no changes that were significant between the two groups. One study revealed that there were 48% fewer male patients than female patients (compared to 69%).[13] According to this study, the majority of those who have left the main disease are male, while 75.9% are male in the non- Left main coronary artery group with a statistically significant change ($p<0.05$).

32% of the study participants were overweight, compared to a normal weight of about 64%. A statistically significant difference did not exist between the two groups ($p >0.05$). Most studies found no difference between the two groups as well.[14,15]

The majority of patients with LMCA (73.3%) presented with NSTEACS, which is consistent with the findings of the research by Muhammad Yousuf Shaikh et al., (2012), which found that 71.9% of LMCA patients presented with NSTE-ACS.[16] According to Malladi Rao et al., (2015), similar findings were also found.[17] In terms of NSTE-ACS clinical manifestations, there was a statistically significant change between the two groups ($p<0.05$), with the LMCA group often having a greater prevalence.

According to our analysis of the risk factors, there is controversy regarding their association with LMCA stenosis, with inconsistent findings. Several studies have observed associations with certain risk factors, while others have detected associations with others. In a comparative study, diabetes mellitus ($p=0.018$) and a family history of coronary artery disease ($p=0.005$) were associated with Left main coronary artery disease. Some studies indicate, however, no significant changes among the two groups in terms of diabetes, hypertension, dyslipidemia, or smoking.[10,13,18] Several studies have shown that the LMCA group had a higher frequency of diabetes, dyslipidemia, and smoking.[7,15,19] In one study, patients with LMCA disease were less likely to suffer from hypertension, dyslipidemia, and smoking.[9] According to this study, hypertension and left main disease are not significantly correlated ($p=0.236$), which is similar to the finding found by Alshari et al., (2011).[20] According to Van't Hof et al., (2008), hypertension and LMCA were significantly correlated.[21]

The study found no statistically significant association between LMCA disease and other risk factors such as dyslipidemia and smoking. Patients in the LM group were shown to have a higher prevalence of dyslipidemia and tobacco use by Askari et al. (2019).[22] According to different studies, 12-47% of people have a family history of CAD. According to this study, 43% of patients had left main coronary artery disease and the association was significant. Even though it was not evaluated in several studies, Taimur et al. (2011) and Mahajan et al. (2006) found no difference between the two groups in the family history of CAD.

According to earlier publications on echocardiography results by Askari et al., 2019, the majority of patients with substantial LMCA illness had an ejection fraction of 45–60%. The mean left ventricular ejection fraction did not change statistically significantly ($p>0.05$) between the two groups in this research. Additionally, Gehani et al. (2012) discovered the same result ($p=0.93$). While most of the participants in the research had NSTEACS, Claver et al. (2006) did find a significant difference in left ventricular ejection fractions between LMCA and non-LMCA patients ($p=0.0447$).[7] It was found that regional wall motion abnormality (RWMA) was not significantly associated with LMCA stenosis in this study. In contrast, Alshari et al., (2011) found statistically significant differences among the two studied groups in their comparative analysis ($P<0.05$).[20]

It was found in this study that there was a significant change in HbA1c level among the two groups, with its level increasing in LMCA ($p=0.029$) compared to the other group. The lipid profile of the two groups did not differ significantly ($p>0.05$) however.

Results from coronary angiograms showed that only 12.0% of patients had left main disease and that 88.0% of patients did not have left main involvement. No left main stenosis was found in group 1 (LMCA). Single vessel disease affected 9.5% of patients, double vessel disease affected 10.7%, and triple vessel disease affected 17.6%. These percentages were reported by Malladi Rao et al., (2015) as 7.6%, 10.1%, and 7.8%, respectively. Regarding single, double, or triple vascular disease, no statistically significant differences between the two groups were discovered in this study ($p>0.05$). Triple vessel disease did not differ between the two groups, according to Askari et al. (2019) ($p=0.13$). The study discovered that triple vessel disease was more common than single and double vessel disease.

According to research by Malladi Rao et al., 2015, only 17% of instances with LMCA stenosis showed ostio-proximal

involvement, 11% involved mid-shaft disease, and 70.3% involved distal disease. Their study found that bifurcation-type lesions were most common among distal lesions. According to our research, 64 % of patients with left main coronary artery stenosis had distal lesions, the most prevalent of which were bifurcation-type lesions, compared to 36 % who had ostioproximal lesions (58 %). Shah Ibrahim et al., (2012) also reported similar findings. As a result, distal left main stenosis is more frequent than other types in most studies, including this study that has been confirmed by Gehani et al. (2012) revealing two-thirds of cases had distal LM stenoses. According to this study, in both groups, LAD was the most commonly involved coronary artery (73.6%) followed by LCX and RCA. Mathew et al., (2017) also demonstrated a similar finding showing LAD as the most common vessel involved.[23] We observed no statistically significant change among the two groups in our study of specific coronary arteries (p>0.05).

Accordingly, this study discovered that major risk variables for LMCA were male sex, diabetes mellitus, a positive family history of coronary artery disease, and clinical presentation of NSTEACS.

CONCLUSION

Patients who suffer from left main coronary artery disease account for a significant and undeniable portion of the CAD patient population. In contrast to the western left main illness cohort, this study's participants were younger on average and skewed male. A significant association was observed between diabetes mellitus and a family history of CAD with NSTE-ACS among those who presented with multiple risk factors. The triple-vessel disease was more prevalent in individuals with left main coronary artery disease and distal lesions were the most common anatomical locations of contribution, despite this, no statistically significant differences were seen among the angiographical results of individuals with and without left main coronary artery disease. A purposive sampling method was used in the study, so selection bias could have occurred. Our research revealed that the incidence of LMCA disease in the general population remained unknown because coronary angiography was only carried out on patients. In light of this study is performed at one center, it is recommended that a multi-center study with adequate study populations is conducted to understand the precise characteristics of patients with left main coronary artery disease in Pakistan.

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