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IMPACT OF AGE AND GENDER ON LEFT VENTRICULAR THROMBUS FOLLOWING MYOCARDIAL INFARCTION IN ADULTS (40-70 AGE) AT TERTIARY CARE HOSPITAL LRH PESHAWAR

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Abstract

Background: *Myocardial infarction, a common manifestation of coronary artery disease, stands as a significant contributor to global mortality and morbidity. It categorizes into ST elevation myocardial infarction (STEMI) and non-ST elevation myocardial infarction (NSTEMI), determined by electrocardiogram (ECG) assessments. A prevalent and serious complication of myocardial infarction is the occurrence of a left ventricular thrombus, notably linked with anterior wall myocardial infarction.*

Objectives: *To investigate the association of left ventricular thrombus development with various age groups, genders, and types of myocardial infarction. The objective is to identify which age group, gender, and type of myocardial infarction are more susceptible to developing left ventricular thrombus.*

Methods: *During the period from June to November 2023, a cross-sectional study was undertaken within the Department of Cardiology at Lady Reading Hospital, Peshawar. Data acquisition employed a predefined, self-structured questionnaire, and statistical analysis was performed using SPSS version 23.*

Results: *The study comprised 174 patients: 111 (63.8%) males and 63 (36.2%) females. Among STEMI patients, 84 (48.3%) had anterior wall MI, 60 (34.5%) had inferior wall MI, 3 (1.7%) had posterior wall MI, 12 (6.9%) had high lateral wall MI, and 8 (4.6%) had post MI. Left ventricular thrombus was identified in 31 patients with anterior wall MI and 7 patients with inferior wall MI. The Chi-square test revealed a statistically significant association between left ventricular thrombus and male gender, as well as anterior wall MI.*

Conclusion: *The study concludes that male gender and anterior wall myocardial infarction are significantly associated with the development of left ventricular thrombus compared to female gender and other types of myocardial infarction.*

INTRODUCTION

Myocardial infarction occurs when blood flow to a particular area of the heart is reduced or entirely obstructed, leading to the death of the impacted heart muscle cells. It is the foremost cause of death in industrialized nations and an increasing health concern in developing countries, where it competes with infectious diseases as a major health issue (1).

Patients experiencing acute myocardial infarction (AMI) frequently describe severe, squeezing, crushing, or pressure-like chest discomfort. This pain may extend to the left arm, neck, jaw, back, or abdomen. Approximately 64% of myocardial infarction (MI) cases presenting without chest pain are classified as silent myocardial infarctions (2).

Symptoms suggestive of cardiovascular disease, including nausea, vomiting, and epigastric pain without chest discomfort, can sometimes be mistaken for gastrointestinal disorders. Acute myocardial infarction (AMI) may present with various clinical manifestations, one of which is cold, clammy skin coupled with profuse sweating—signs commonly associated with the body's stress response during the event (3).

Troponin T (Trop-T) and Troponin I (Trop-I) are crucial biomarkers for the diagnosis of myocardial injury, with increased levels of Trop-I serving as a definitive marker of cardiac muscle damage (4) . These cardiac troponins are frequently regarded as the gold standard in the diagnosis of myocardial infarction (MI) (1).

Transthoracic echocardiography serves as the primary diagnostic modality for evaluating a left ventricular thrombus (LVT) (5). This imaging modality provides comprehensive information regarding the presence, size, shape, and dimensions of the thrombus. It demonstrates a sensitivity of 95% and a specificity ranging from 85% to 90%. On echocardiography, a left ventricular thrombus (LVT) typically appears as an echogenic mass with distinct borders, easily differentiated from the endocardial surface. The thrombus remains visible throughout the cardiac cycle and is generally located in areas of the left ventricular wall exhibiting reduced or absent motion, indicative of hypokinesis or akinesia (11).

According to the American Heart Association (AHA), about 525,000 cases of myocardial infarction occur annually in the United States. Among men aged 75-84 years, there is a higher incidence of new cases reported among Black men compared to White men. Furthermore, the data suggests a notable decrease in the incidence rate of ST-segment myocardial infarction (from 121 to 77 per 1000 cases) compared to non-ST-segment myocardial infarction (from 132 to 126 per 1000 cases) (6).

According to a 2014 report, myocardial infarction (MI) prevalence in Europe is higher among men compared to women. However, a 2013 report indicated that in Europe, the prevalence of MI is three times higher in women than in men. Additionally, MI prevalence is significantly higher in individuals aged over 75 years, approximately 2.45%, compared to those under 45 years old, where it is around 0.46% (6).

A study conducted in India found that the prevalence of myocardial infarction (MI) was 7.54%, with a higher occurrence in males (7.88%) compared to females (6.63%). Interestingly, MI rates were also more common in rural areas than in urban settings (7).

Pakistan, a developing nation in South Asia with a population of over 220 million, faces a considerable burden of cardiovascular diseases, particularly in rural communities where access to healthcare services remains limited. Heart disease is a major public health concern, contributing significantly to morbidity and mortality. Previous studies indicates that a substantial proportion of myocardial infarction (MI) cases in the country occur among younger individuals, with over 30% of reported cases affecting those under the age of 45 (8).

Myocardial infarction (MI) remains one of the leading causes of morbidity and mortality among adults aged 40 to 70 years, with left ventricular thrombus (LVT) being a significant and potentially life-threatening complication. The risk of developing both MI and LVT increases with age due to structural and functional changes in the cardiovascular system, including reduced myocardial elasticity, endothelial dysfunction, and an increased propensity for thrombus formation. As the global burden of cardiovascular diseases continues to rise, there is a critical need to understand the factors influencing post-MI complications to improve clinical management and patient outcomes.

Gender differences play a crucial role in cardiovascular disease presentation, progression, and prognosis. While men have a higher incidence of MI, women often experience more severe complications and poorer prognostic outcomes following a cardiac event. The physiological and hormonal variations between males and females may influence the formation of LVT after MI, yet existing research on this association remains limited. Investigating the impact of gender on LVT development can provide valuable insights into the underlying mechanisms contributing to thrombus formation and help tailor therapeutic interventions accordingly.

Furthermore, identifying the interplay between age and gender in the development of LVT following MI is essential for refining risk stratification models and optimizing treatment protocols. By elucidating these associations, this study aims to contribute to a more personalized approach to cardiovascular care, ultimately improving both short-term and long-term clinical outcomes for patients affected by MI-related complications.

Objective:

- To determine the association of left ventricular thrombus and myocardial infarction
- To identify the most common type of myocardial infarction that is linked with left ventricular thrombus
- To assess the association between gender and the likelihood of developing left ventricular thrombus following a myocardial infarction.

METHODOLODY:

This study employed a descriptive cross-sectional design and was conducted over four months at Lady Reading Hospital (LRH) in Peshawar. Established in 1927, LRH is strategically located 200 meters south of the Grand Trunk Road, in close proximity to significant historical landmarks, including Qila Balahisar and Masjid Muhabat Khan. The hospital operates under the jurisdiction of the Cantonment Board and serves as one of the largest and most well-equipped healthcare institutions in the region.

LRH houses a wide range of specialized departments, ensuring the provision of comprehensive medical services to the community. These departments include the Outpatient Department (OPD), Emergency Department, Intensive Care Unit (ICU), Pathology Department, Radiology Department, and Pharmacy Department. Additionally, the hospital offers advanced diagnostic and interventional services through its Cardiac and Neurology Investigations Unit, Pulmonology Investigations Unit, and Insulin Bank. It also features specialized facilities such as the Clubfoot Department and fully equipped Operation Theatres (OTs), catering to various surgical and therapeutic needs. With its state-of-the-art infrastructure and a multidisciplinary team of healthcare professionals, LRH plays a vital role in delivering high-quality medical care across multiple specialties.

A sample size of 174 was determined using open-epi, based on a 95% confidence level and a 5% significance level, with an anticipated frequency of 13% (9). Non-probability convenience sampling was used to facilitate data collection through a structured questionnaire.

The inclusion criteria comprised patients with a confirmed history of myocardial infarction (MI), encompassing both those with previous occurrences and those who had undergone interventional procedures such as percutaneous coronary intervention (PCI) or coronary artery bypass grafting (CABG). Conversely, patients were excluded if they had a pre-existing left ventricular thrombus prior to their diagnosis of MI. Additionally, patients receiving anticoagulant therapy for conditions such as liver disease or those presenting with abnormal coagulation profiles were not included in the study. Patients who developed left ventricular thrombus secondary to non-ischemic conditions, including dilated cardiomyopathy (DCM) or peripartum cardiomyopathy, were also excluded.

Operational definition:

Left ventricular thrombus: A left ventricular thrombus is a blood clot that develops inside the left ventricle of the heart, usually as a result of impaired heart function. It commonly occurs following a heart attack, heart failure, or conditions like dilated cardiomyopathy, where structural abnormalities in the heart affect normal blood flow and increase the risk of clot formation.

Myocardial infarction (MI): Myocardial infarction, commonly known as a heart attack, happens when a coronary artery, such as the left anterior descending (LAD), left circumflex (LCX), or right coronary artery (RCA), becomes completely blocked. This blockage cuts off the blood supply to a part of the heart muscle, causing damage. It is typically accompanied by intense chest pain, which may spread to the neck, jaw, or arms, and is often detected on an electrocardiogram (ECG) through characteristic ST-segment elevation in specific leads.

The collected data were analyzed using SPSS version 26, employing various statistical methods including descriptive statistics like frequency distributions, and percentages. Visual representations, such as bar charts and frequency tables, were created to illustrate the findings. Inferential statistics, particularly chi-square tests, were applied to examine the relationships between variables, specifically assessing associations between age, type of MI, gender, and the presence of left ventricular thrombus.

RESULTS:

This study conducted at Lady Reading Hospital (LRH), a tertiary care facility in Peshawar, aimed to ascertain the prevalence of left ventricular thrombus post-myocardial infarction among patients aged 40-70 years using echocardiography and cardiac enzyme profiles. A total of 174 patients participated, with a 100% response rate meeting the inclusion criteria. The results were as outlined: 44 patients (25%) belonged to the age group of 41-50 years, 71 (40.8%) fell into the 51-60 years category, and 59 (34%) were aged between 61 and 70 years. Regarding myocardial infarction patients, 111 (63.8%) were male and 63 (36.2%) were female, as illustrated in **Figure 1.1.**

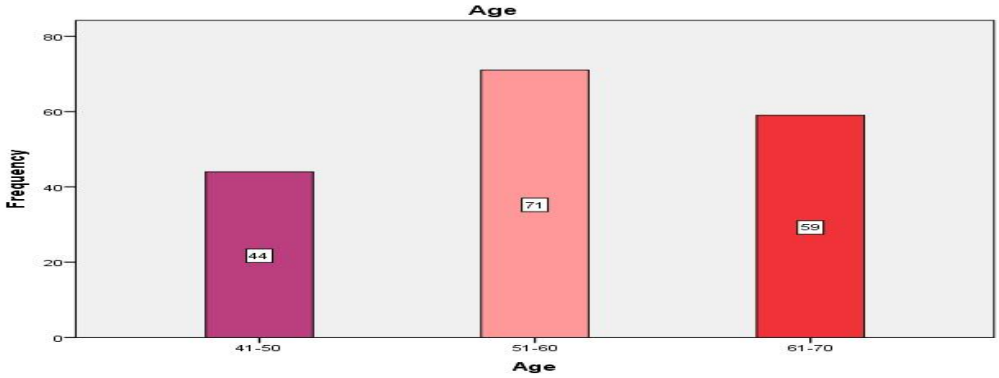

Figure: 1.1 shows the frequency of age

In present study, 73 participants (42%) hailed from urban areas, whereas 101 (58%) came from rural areas. Hypertension combined with diabetes emerged as the predominant risk factor associated with myocardial infarction, affecting 40 patients (23%) in our study. Hypertension alone remained the second utmost prevalent risk aspect, observed in 28 patients (16%). Various other risk factors were also identified.

S.NO	Variable	Category	Frequency (F)	Percentage (%)
1	Age	41-50 year	44	25.3%
		51-60 year	71	40.8%
		61-70 year	59	33.9%
2.	Gender	Male	111	63.8%
		Female	63	36.2%
3	Location	Urban	73	42%
		Rural	101	58%
4.	Diabetes		16	9.2%
5.	Smoking		13	7.5%
6.	Hypertension		28	16.1%
7.	Hyperlipidemia		11	6.3%

8.	Family history		7	4.0%
9.	Smoking plus Family History		2	1.1%
10.	Diabetes plus HTN plus Smoking		6	3.4%
11.	Diabetes plus HTN		40	23%
12.	Diabetes plus Family History		17	9.8%
13.	HTN plus Smoking		14	4%
14.	Diabetes plus HTN plus Family History		13	8%
15.	Types of MI	STEMI	167	96%
		NSTEMI	7	4%

Table 1.1 shows the sociodemographic data

In our study, the majority of patients (96%) presented with ST-segment myocardial infarction (STEMI). Among these STEMI cases, anterior wall MI was the most prevalent subtype, affecting 84 patients (48.3%), followed by inferior wall MI in 60 patients (34.5%), posterior wall MI in 3 patients (1.7%), high lateral wall MI in 12 patients (6.9%), and post MI in 8 patients (4.6%). Non-ST segment myocardial infarction (NSTEMI) was diagnosed in 16 out of 174 patients. Left ventricular thrombus (LV thrombus) was detected in 44 patients, accounting for 24.7% of the total cohort. The distribution of LV thrombus sizes post-MI revealed 11 cases (6.3%) classified as small, 10 cases (5.7%) as medium, and 22 cases (12.6%) as large.

S.NO	Variable	Category	Frequency (F)	Percentage (%)
1	STEMI	Anterior MI	84	48.3%
		Inferior MI	60	34.5%
		Posterior MI	3	1.7%
		High Lateral MI	12	6.9%
		Post MI	8	4.6%
2.	NSTEMI	Yes	16	9.2%
		No	158	90.8%
3.	LV Thrombus after MI	Yes	44	24.7%
		No	130	75.3%
4.	Size of LV Thrombus	Small	11	6.3%
		Medium	10	5.7%
		Large	22	12.6%

Table 1.2 shows the STEMI, NSTEMI, LV Thrombus and Size of LV Thrombus

We conducted chi-square tests to examine the association between left ventricular thrombus (LVT) and various categorical variables including age, gender, and type of ST-segment myocardial infarction (STEMI). The results revealed that age showed no significant association with LVT (χ^2=0.003, p=0.999). However, there was a significant association between LVT and gender (χ^2=8.284, p=0.004), with a higher incidence observed among males (36 cases) compared to females (8 cases). Similarly, a significant association was found between LVT and the type of MI (χ^2=11.583, p=0.021), particularly with anterior wall MI showing the highest likelihood of developing LVT (31 cases) compared to other types of MI. Specifically, LVT was observed in 11 patients age 41-50 years, 18 patients age 51-60 years, and 15 patients age 61-70 years. Regarding the type of STEMI, LVT occurred in 31 cases of anterior wall MI, 7 cases of inferior MI, 1 case of posterior MI, 3 cases of high lateral MI, and 2 cases of post MI. These findings underscore the independent association of LVT with gender and type of MI, highlighting higher risks among male patients and those with anterior wall MI in our study population. As shown in table 1.4.

S.NO	Variable	Category	LVT		X^2 value	P value
			YES	NO		
1.	Gender	Male	36	75	8.284	0.004
		Female	8	55		
2.	Age	41-50 year	11	33		
		51-60 year	18	53		
		61-70 year	15	44	0.003	0.999
3.	STEMI	Anterior MI	31	53		
		Inferior MI	7	53		
		Posterior MI	1	2		
		High Lateral MI	3	9	11.583	0.021
		Post MI	2	6		

Table 1.3 shows the chi square test and p value

DISCUSSION:

Coronary heart disease (CHD) is a leading cause of death worldwide, with myocardial infarction (MI) being its most significant manifestation. MI alone accounts for over 15% of global mortality. Among myocardial infarction (MI) types, ST-segment elevation myocardial infarction (STEMI) exhibits a higher prevalence and is linked to greater mortality rates in comparison to non-ST-segment elevation myocardial infarction (NSTEMI). Additionally, myocardial infarction is more frequently observed in men across all age brackets when compared to women (6).

The majority of Pakistan's population resides in rural areas, with a smaller proportion living in urban areas. A significant number of individuals in rural Pakistan are affected by heart diseases. According to a reported study, the prevalence of myocardial infarction (MI) exceeds 30% among patients under the age of 45 years in these rural areas (8).

The formation of a thrombus within the left ventricular (LV) cavity is a well-documented complication associated with various cardiovascular disorders. This condition is most commonly observed in patients with acute myocardial infarction (MI) and congestive heart failure, both of which are frequently accompanied by significant LV systolic dysfunction (10).

In this study, a total of 174 patients between the ages of 40 and 70 years, with a recent or prior history of myocardial infarction (MI), were assessed. The study population consisted of 111 males and 63 females, evaluated using echocardiography and cardiac enzyme profiling. A significant proportion of participants (58%) resided in rural areas, while 42% were from urban regions. Among individuals diagnosed with MI, the coexistence of hypertension and diabetes was identified as a prevalent risk factor, affecting 40 patients (23.1%). In comparison to European data, our findings indicate a greater prevalence of myocardial infarction (MI) in men than in women, with a notable rise among individuals aged over 75 years relative to younger age cohorts. Furthermore, contrary to trends observed in South Asian nations, MI prevalence appears to be higher among younger individuals under 45 years of age compared to older age groups (12).

The present study investigates the recurrence of left ventricular (LV) thrombus following myocardial infarction (MI) among adults aged 40-70 years, among whom 24.7% (n=43) developed LV thrombus. This prevalence aligns with findings reported by Sar Metal and DelewiR et al., who documented LV thrombus development rates of 19% and 8.8%, respectively (9).

In another study conducted by Jalal ud Din et al., it was reported that 34.1% of the 85 patients studied developed left ventricular thrombus (LVT) following myocardial infarction (MI). The study attributed this higher frequency to its focus solely on patients with acute anterior wall MI, a subtype historically associated with a heightened risk of thrombus formation post-MI, compared to other types of MI included in their analysis (6). In our study, which encompassed various types of myocardial infarction (MI), thrombus formation was observed in 44

patients, with anterior wall MI identified in 31 of these cases. This association was found to be statistically significant when compared to other MI subtypes. Therefore, our study concludes that patients with anterior wall myocardial infarction (MI) are at a markedly elevated risk of developing left ventricular thrombus (LVT) compared to those experiencing other types of MI.

This study concludes that residents of urban areas in Peshawar face higher risk factors for myocardial infarction compared to those in rural areas, primarily attributed to physical inactivity, hypertension, and diabetes. These risk factors were found to be inadequately managed within the population. However, this study did not specifically analyze the association between different myocardial infarction (MI) subtypes and the development of left ventricular thrombus. Additionally, the investigation did not include an evaluation of treatment modalities such as conventional thrombolytic therapy or percutaneous coronary intervention (PCI), including angioplasty.

Conclusion

This study underscores the significant burden of left ventricular thrombus (LVT) in Pakistan, mirroring patterns observed in other developing nations. Anterior ST-segment elevation myocardial infarction (STEMI) emerged as the leading precipitant of thrombus formation, with inferior STEMI also playing a substantial role. The findings indicate a greater propensity for LVT development in males following myocardial infarction (MI) compared to females. Moreover, elderly individuals residing in rural areas were particularly susceptible, largely due to constrained access to healthcare facilities and inadequate awareness regarding cardiovascular health. These findings highlight the urgent need for increased awareness campaigns focusing on the complications associated with MI and the necessity of routine post-MI screening to facilitate early detection and management.

Significance

This research addresses critical clinical concerns and carries broader implications for risk stratification and patient management within this population. By identifying key demographic and clinical risk factors associated with LVT, the study underscores the importance of targeted preventive and therapeutic strategies to mitigate thrombus formation following MI. Given the global burden of cardiovascular diseases, insights from this research contribute to a deeper understanding of post-MI complications, equipping healthcare professionals and policymakers with valuable data to refine treatment protocols and optimize patient outcomes.

Future Directions

The findings of this study serve as a foundation for future research aimed at improving post-MI care and minimizing complications associated with LVT. Further studies should explore the efficacy of individualized treatment approaches, integrating advancements in anticoagulation therapy and imaging modalities for early thrombus detection. Additionally, community-based initiatives focused on cardiovascular health education, particularly in underserved rural populations, may play a pivotal role in reducing LVT incidence. Strengthening healthcare infrastructure and implementing evidence-based guidelines can ultimately enhance patient survival and quality of life, contributing to more effective cardiovascular disease management on a national and global scale.

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Conflicts of Interest:

The authors declare no conflicts of interest.

REFERENCES

1.Awad Hegazy A. Myocardial Infarction: Risk Factors, Pathophysiology, Classification, Assessment and Management. Cardiology Research and Reports. 2022 May 31;4(5):01–11.

2.Lu L, Liu M, Sun RR, Zheng Y, Zhang P. Myocardial Infarction: Symptoms and Treatments. Cell Biochem Biophys. 2015 Jul 1;72(3):865–7.

3. S. S, P. M. Clinical presentation, risk factors, complications and outcome of acute myocardial infarction in elderly patients. Int J Res Med Sci. 2017 Oct 27;5(11):4765.

4.Haider KH, Alshoabi SA, Alharbi IA, Gameraddin M, Abdulaal OM, Gareeballah A, et al. Clinical presentation and angiographic findings of acute myocardial infarction in young adults in Jazan region. BMC Cardiovasc Disord. 2023 Dec 1;23(1).

5. Massussi M, Scotti A, Lip GYH, Proietti R. Left Ventricular Thrombosis: New Perspectives on an Old Problem. 2020; Available from: https://academic.oup.com/ehjcvp/advance-article-abstract/doi/10.1093/ehjcvp/pvaa066/5860834

6.Jiang J, Trundle P, Ren J. Medical image analysis with artificial neural networks. Computerized Medical Imaging and Graphics. 2010 Dec;34(8):617–31.

7.Raina K, Verma N, S Bhatia A, Khanum S, N Verma H. Prevalence of conventional risk factor in acute myocardial infarction among Jammu division population. International Journal of Clinical Biochemistry and Research. 2020 May 28;7(1):91–7.

8.Iqbal R, Jahan N, Hanif A. Epidemiology and Management Cost of Myocardial Infarction in North Punjab, Pakistan. Iran Red Crescent Med J. 2015 Jul 22;17(7).

9. Heart P, Ashraf A, Ahmad A, Hadi N, Shah J. FREQUENCY OF LEFT VENTRICULAR THROMBUS AMONG PATIENTS WITH ACUTE CORONARY SYNDROME. Vol. 51, th. 2018.

10.Talle MA, Buba F, Anjorin CO. Prevalence and Aetiology of Left Ventricular Thrombus in Patients Undergoing Transthoracic Echocardiography at the University of Maiduguri Teaching Hospital. Adv Med. 2014;2014:1–8.

11.Delewi R, Zijlstra F, Piek JJ. Left ventricular thrombus formation after acute myocardial infarction. Heart. 2012;98(23):1743–9.

12. Cheng YL, Lee CY, Huang YL, Buckner CA, Lafrenie RM, Dénommée JA, et al. We are IntechOpen , the world ' s leading publisher of Open Access books Built by scientists , for scientists TOP 1 %. Intech [Internet]. 2016;11(tourism):13. Available from: https://www.intechopen.com/books/advanced-biometric-technologies/liveness-detection-in-biometrics.