ARYA Atherosclerosis J

Short Communication Open Access

Evaluate gender differences in patients with left main coronary artery disease

Mohammad Haji Aghajani[1], Mohammad Parsa Mahjoob[2], Abdolreza Babamahmoodi[3], Roxana Sadeghi[2], Naser Kachoueian[5], Reza Hamneshin Behbahani[2*]

1- Prevention of Cardiovascular Disease Research Center, Shahid Beheshti University of Medical Sciences, Tehran, Iran
2- Department of Cardiology, Imam Hossein Hospital, Shahid Beheshti University of Medical Sciences, Tehran, Iran
3- Antimicrobial Resistance Research Center, Communicable Diseases Institute, Mazandaran University of Medical Sciences, Sari, Iran
4- Department of Cardiac Surgery, Imam Hossein Educational Hospital, Shahid Beheshti University of Medical Sciences, Tehran, Iran

Correspondence:

Reza Hamneshin Behbahani; Department of Cardiology, Imam Hossein Hospital, Shahid Beheshti University of Medical Sciences, Tehran, Iran;
Email: rzbehbahani@gmail.com

Received: 21-07-2024
Accepted: 08-12-2024

How to cite this article:
Haji Aghajani M, Mahjoob MP, Babamahmoodi A, Sadeghi R, Kachoueian N, Hamneshin Behbahani R. **Evaluate gender differences in patients with left main coronary artery disease.** ARYA Atheroscler. 2025; 21(1): 1-6.

DOI:
https://doi.org/10.48305/arya.2024.42805.2979

Abstract

BACKGROUND: Left main coronary artery disease (LMCAD) is a potentially life-threatening situation. The medical treatment of LMCAD can lead to critical cardiovascular events. The association between LMCAD and gender has been studied in the medical field.

METHODS: This cross-sectional study was conducted at Imam Hossein Hospital in Tehran. At the beginning of the project, patient files were collected for 6,250 individuals who presented with heart complaints between 2016 and 2021 and underwent angiography examinations. These files were reviewed, and patients diagnosed with left main coronary artery disease during the angiography were identified.

RESULTS: After reviewing 6,250 angiography results from 2016 to 2021, it was found that 274 patients had significant stenosis in the left main coronary artery, resulting in a prevalence of LMCAD of 4.38%. The mean age of the 274 patients with LMCAD was 65.98 ± 10.29 years, and 22.63% of them had premature CAD. Males constituted 75.18% of the group, with 25.18% being smokers. Common comorbidities included hypertension (51.82%), diabetes (42.70%), and chronic kidney disease (13.50%). The gender-based analysis highlighted variations, with women being older on average ($P = 0.007$), more likely to have premature left main involvement ($P = 0.011$), and exhibiting lower rates of smoking ($P < 0.001$) and chronic kidney diseases ($P = 0.013$) but higher prevalence of hypertension ($P < 0.001$) and diabetes ($P = 0.011$) compared to men.

CONCLUSION: Our findings showed that these gender-specific differences are crucial for tailored management strategies in patients with left main coronary artery disease. Further research is needed to optimize outcomes for this high-risk population.

Keywords: Left Main Coronary Artery Disease; Gender; Comorbidity; Coronary Angiography; Iran

Introduction

Left main coronary artery disease (LMCAD) is a potentially life-threatening situation. The medical treatment of LMCAD can lead to critical cardiovascular events[1].

Studies have indicated a potential link between LMCAD and gender, with some suggesting that women may face a higher risk of developing this condition compared to men. Despite this observation, the underlying reasons for this gender disparity remain unclear, necessitating further research into this connection[2].

One plausible explanation for the elevated risk of LMCAD in women could be attributed to variations in the manifestation of heart disease between men and women. Women may exhibit different symptoms of heart disease, such as fatigue, shortness of breath, and nausea, which can complicate the diagnosis and treatment of LMCAD in women[1,3].

Moreover, hormonal factors, particularly estrogen levels, may contribute to the development of LMCAD in women. Estrogen has demonstrated a protective impact on the cardiovascular system, implying that fluctuations in estrogen levels during menopause or other hormonal shifts could potentially heighten the risk of LMCAD in women[3].

Healthcare providers should be mindful of the potential gender differences in LMCAD and consider these factors when diagnosing and treating patients. Further research is imperative to enhance comprehension of the relationship between gender and LMCAD and to formulate tailored prevention and treatment approaches for women susceptible to this condition.

Acute myocardial infarction remains a leading cause of mortality worldwide, with left main coronary disease presenting a significant risk factor for adverse cardiac events. Recurrent AMIs in patients with left main coronary disease pose a substantial challenge in clinical management and prognostication. Understanding the impact of recurrent AMIs on mortality rates is crucial for optimizing patient care and improving outcomes[4].

Recurrent episodes of AMI represent a severe medical condition linked to heightened morbidity and mortality rates. Research indicates that the likelihood of mortality escalates with each subsequent AMI occurrence, significantly impacting patient outcomes[5]. Early recurrent myocardial infarction is particularly concerning, with an approximate 50% mortality rate within 5 years[6]. Studies have also established that recurrent ST-elevation myocardial infarction (STEMI) leads to more adverse outcomes in terms of morbidity and mortality when compared to the initial AMI event[4]. Moreover, the risk of mortality post-AMI surges with each successive AMI, underscoring the critical need for enhanced monitoring and treatment strategies for this vulnerable patient demographic[5].

This study aims to fill the gap in knowledge by investigating the relationship between LMCAD and gender, as well as associated risk factors, in patients with left main coronary disease at a referral hospital in Tehran.

Materials and Methods

This cross-sectional study was conducted at Imam Hossein Hospital in Tehran. At the project's onset, patient files from 6,250 individuals presenting with heart complaints between 2016 and 2021, which resulted in an angiography examination, were retrieved. Within these files, angiography reports were reviewed, and patients diagnosed with left main coronary artery disease during the angiography examination were identified.

Gender, age at the time of angiography, smoking status, diabetes status, presence of hypertension, chronic kidney diseases, and history of Coronary Artery Bypass Graft (CABG) were extracted from the patient histories and their medical records.

In this study, CAD occurring (left main involvement with stenosis ≥ 50%) in men and women younger than 55 and 65 years, respectively, was considered premature CAD.

The review board approved the studies involving humans of the medical school, Shahid Beheshti University of Medical Sciences (SBMU), Tehran, Iran (IR.SBMU.MSP.REC.1402.054). The Ethics Committee/institutional review board

waived the requirement of written informed consent for participation from the participants or the participants' legal guardians/next of kin because of the medical record-based design of the study and lack of access to patients due to the study's design.

Statistical analysis

Quantitative data are described using mean and standard deviation, and qualitative data are described as frequency and percentage. A parametric student's t-test was used to compare the difference in the mean of quantitative variables between the two groups. The Chi-square test or Fisher's exact test was also used to assess the difference in the distribution of qualitative variables. All analyses were performed at a significance level of less than 0.05 using STATA software version 14.

Results

In general, after reviewing 6,250 angiography results from 2016 to 2021, it was found that 274 patients undergoing coronary angiography had significant stenosis in the left main coronary artery, resulting in a prevalence of left main coronary artery disease of 4.38% (95% confidence interval: 3.89% - 4.92%).

The average age of all such patients was 65.03 ± 10.45 years, and 24.82% were under 55 years. On the other hand, 22.63% of patients with left main involvement were premature (PCAD).

In total, 75.18% of patients were male and 24.82% female. 25.18% of patients were smokers. The most common underlying diseases in patients with left main involvement were hypertension (51.82%), diabetes (42.70%), and chronic kidney disease (13.50%). 57.6% of patients have mentioned a positive history of cardiovascular disease in their family.

After examining the results by gender, it was observed that the average age of patients with left main involvement was significantly higher in men than women (P = 0.007), so 71.98% of men

Table 1. Characteristics of patients with left main disease between genders

Variables	All patients (n = 274)	Female (n= 68, 24.82%)	Male (n= 206, 75.18%)	P_value
Age (years)	65.98 ± 10.29	68.86 ± 9.29	65.03 ± 10.45	**0.007***
Age				
≤ 55 years	68 (24.82)	3 (7.14)	65 (28.02)	**0.003***
> 55 years	206 (75.18)	39 (92.86)	167 (71.98)	
Smoker				
No	205 (74.82)	63 (92.65)	142 (68.93)	**<0.001***
Yes	69 (25.18)	5 (7.35)	64 (31.07)	
Medical history				
Diabetes				
No	157 (57.30)	30 (44.12)	127 (61.65)	**0.011***
Yes	117 (42.70)	38 (55.88)	79 (38.35)	
Hypertension				
No	132 (48.18)	12 (17.65)	120 (58.25)	**<0.001***
Yes	142 (51.82)	56 (82.35)	86 (41.75)	
Chronic kidney diseases				
No	237 (86.50)	65 (95.59)	172 (83.50)	**0.013***
Yes	37 (13.50)	3 (4.41)	34 (16.50)	
Coronary Artery Bypass Graft (CABG)				
No	199 (72.63)	47 (69.12)	152 (73.79)	0.454
Yes	75 (27.37)	21 (30.88)	54 (26.21)	
Family history of ischemic heart diseases				
No	256 (93.43)	65 (95.59)	191 (92.72)	0.575
Yes	18 (6.57)	3 (4.41)	15 (7.28)	
CAD Category				
Premature coronary artery disease (PCAD)	62 (22.63)	23 (33.82)	39 (18.93)	**0.011***
Mature coronary artery disease (MCAD)	212 (77.37)	45 (66.18)	167 (81.07)	

Data presented as mean ± standard deviation or frequency (%), statistical significant, P_value<0.05*

were over 55 years old, and 86.86% of women were over 55 years old (P = 0.003).

On the other hand, in women (33.82%), left main involvement was more premature than in men (18.93%) (P = 0.011).

Smoking was significantly more common in men (31.07%) than women with coronary artery disease (7.35%) (P < 0.001). Hypertension (82.35%) and diabetes (55.88%) were significantly higher in women with left main coronary artery disease than men (P < 0.05). In comparison, chronic kidney disease in men (16.50%) with left main coronary artery disease was significantly higher than in women (4.41%) (P = 0.013).

More information about patients is described in Table 1.

Discussion

This study explores the complex relationship between Left Main Coronary Artery Disease (LMCAD) and gender at a referral hospital in Tehran. LMCAD is a serious and potentially life-threatening condition caused by the obstruction of the left main coronary artery. If not addressed, it carries significant risks, potentially leading to ischemic heart disease and other critical cardiovascular events. Previous research has suggested a possible link between LMCAD and gender, indicating that women may have a higher risk of developing this condition compared to men[3].

The underlying factors contributing to the gender disparity in LMCAD remain unclear, highlighting the need for further investigation into this association. One possible explanation for the increased vulnerability of women to LMCAD may be the differences in how heart disease presents in men and women. Women often exhibit different symptoms of heart disease, such as fatigue, shortness of breath, and nausea, which can complicate the diagnosis and management of LMCAD in female patients. Additionally, hormonal influences, particularly estrogen levels, could play a significant role in the development of LMCAD in women.

Recognizing these potential gender disparities in LMCAD is crucial for healthcare providers to ensure accurate diagnosis and tailored treatment for their patients. A study conducted in Germany over the past decade examined sex-specific differences among patients with acute coronary syndrome (ACS) and revealed significant disparities. These findings highlight the need for further investigation into the treatment approaches and outcomes for ACS patients, particularly with consideration of gender differences[7].

Studies conducted by Nussbaum et al. indicate that women generally have a lower awareness of the risks, symptoms, and manifestations of heart attacks, and this lack of awareness tends to decrease with age. Diabetes, smoking, early menopause, as well as obstetric complications like preeclampsia, and gestational hypertension, are stronger risk factors for ischemic heart disease in women compared to men. Women aged 45 to 74 face a higher risk of mortality from a first heart attack compared to men[8].

Huckaby LV et al, found that male patients were more likely to have three-vessel disease and undergo complete revascularization compared to female patients. Female sex was associated with a higher risk of death and major adverse cardiac and cerebrovascular events (MACCE) but not repeat revascularization[9]. Ardissino et al. showed distinct differences in baseline risk factors and outcomes between men and women in the context of early-onset MI, with women exhibiting a lower burden of atherosclerotic disease and better long-term prognoses[10].

Risk factors that may lead to a myocardial infarction comprise genetic predisposition, hypertension, obesity, diabetes, poor dietary habits with excessive intake of saturated fats or sodium, sedentary lifestyle, smoking, heavy alcohol consumption, substance abuse, elevated blood pressure, high cholesterol levels, and smoking. These elements contribute to the onset of coronary artery disease, a major factor in the occurrence of heart attacks[11-13].

Pellegrini et al. found that smoking, recent

myocardial infarction, diabetes, and elevated cholesterol serve as robust predictors of disease recurrence, elevating the likelihood of subsequent surgical interventions on patients undergoing open-heart procedures[14]. It has been demonstrated that smoking is consistently associated with increased CAD severity[15].

Conclusion

These findings underscore the importance of considering gender-specific differences in the management and treatment of patients with left main artery disease, particularly concerning cardiovascular risk factors and comorbidities. Further research is essential to deepen our understanding of the interplay between gender and LMCAD, leading to the development of personalized prevention and treatment strategies.

Acknowledgment

The authors would like to thank the personnel of Imam Hossein Hospital, Shahid Beheshti University of Medical Sciences, who helped us complete this project.

Conflict of interests

The authors declare no conflict of interest.

Funding

There is no funding in this study.

Author's Contributions

Study Conception or Design: MHA
Data Acquisition: RHB
Data Analysis or Interpretation: RHB
Manuscript Drafting: AB, RHB
Critical Manuscript Revision: MPM, RS
All authors have approved the final manuscript and are responsible for all aspects of the work.

References

1. Ramadan R, Boden WE, Kinlay S. Management of Left Main Coronary Artery Disease. J Am Heart Assoc. 2018;7(7):e008151. https://doi.org/10.1161/JAHA.117.008151
2. Kałużna-Oleksy M, Skorupski WJ, Grygier M, Araszkiewicz A, Skorupski W, Grajek S, et al. A Personalized Approach to Percutaneous Coronary Interventions in the Left Main Coronary Artery-Is the Female Gender Associated with Worse Outcomes? J Pers Med. 2021 Jun 20;11(6):581. https://doi.org/10.3390/jpm11060581
3. Collet C, Capodanno D, Onuma Y, Banning A, Stone GW, Taggart DP, et al. Left main coronary artery disease: pathophysiology, diagnosis, and treatment. Nat Rev Cardiol. 2018 Jun;15(6):321-31. https://doi.org/10.1038/s41569-018-0001-4
4. Radovanovic D, Maurer L, Bertel O, Witassek F, Urban P, Stauffer JC, et al. Treatment and outcomes of patients with recurrent myocardial infarction: A prospective observational cohort study. J Cardiol. 2016 Dec;68(6):498-503. https://doi.org/10.1016/j.jjcc.2015.11.013
5. Plakht Y, Gilutz H, Shiyovich A. When More Means Less: The Prognosis of Recurrent Acute Myocardial Infarctions. J Clin Med. 2021 Dec 15;10(24):5889. https://doi.org/10.3390/jcm10245889
6. Nair R, Johnson M, Kravitz K, Huded C, Rajeswaran J, Anabila M, et al. Characteristics and Outcomes of Early Recurrent Myocardial Infarction After Acute Myocardial Infarction. J Am Heart Assoc. 2021 Aug 17;10(16):e019270. https://doi.org/10.1161/jaha.120.019270
7. Neumann JT, Goßling A, Sörensen NA, Blankenberg S, Magnussen C, Westermann D. Sex-Specific Outcomes in Patients with Acute Coronary Syndrome. J Clin Med. 2020 Jul 6;9(7):2124. https://doi.org/10.3390/jcm9072124
8. Ten Haaf ME, Bax M, Ten Berg JM, Brouwer J, Van't Hof AW, van der Schaaf RJ, et al. Sex differences in characteristics and outcome in acute coronary syndrome patients in the Netherlands. Neth Heart J. 2019 May;27(5):263-71. https://doi.org/10.1007/s12471-019-1271-0
9. Huckaby LV, Seese LM, Sultan I, Gleason TG, Wang Y, Thoma F, et al. The Impact of Sex on Outcomes After Revascularization for Multivessel Coronary Disease. Ann Thorac Surg. 2020 Oct;110(4):1243-50. https://doi.org/10.1016/j.athoracsur.2020.02.026
10. Ardissino M, Nelson AJ, Maglietta G, Malagoli Tagliazucchi G, Disisto C, Celli P, et al. Sex-Related Differences in Long-Term Outcomes After Early-Onset Myocardial Infarction. Front Cardiovasc Med. 2022 Jul 4;9:863811. https://doi.org/10.3389/fcvm.2022.863811
11. Anderson JL, Morrow DA. Acute Myocardial

Infarction. N Engl J Med. 2017 May 25;376(21): 2053-64. https://doi.org/10.1056/nejmra1606915

12. Picariello C, Lazzeri C, Attanà P, Chiostri M, Gensini GF, Valente S. The impact of hypertension on patients with acute coronary syndromes. Int J Hypertens. 2011;2011:563657. https://doi.org/10.4061/2011/563657
13. Cui J, Liu Y, Li Y, Xu F, Liu Y. Type 2 Diabetes and Myocardial Infarction: Recent Clinical Evidence and Perspective. Front Cardiovasc Med. 2021 Feb 24;8:644189. https://doi.org/10.3389/fcvm.2021.644189
14. Pellegrini RV, Di Marco RF, Werner AM, Marrangoni AG. Recurrent ischemic heart disease: the effect of advancing age. J Cardiovasc Surg (Torino). 1994 Oct;35(5):371-6.
15. Salehi N, Janjani P, Tadbiri H, Rozbahani M, Jalilian M. Effect of cigarette smoking on coronary arteries and pattern and severity of coronary artery disease: a review. J Int Med Res. 2021 Dec;49(12):3000605211059893. https://doi.org/10.1177/03000605211059893