Biological and Clinical Sciences Research Journal
eISSN: 2708-2261; pISSN: 2958-4728
www.bcsrj.com
DOI: https://doi.org/10.54112/bcsrj.v6i6.1800
*Biol. Clin. Sci. Res. J., Volume 6(6), **2025**: 1800*
Original Research Article

Assessment of Incidence of Familial Hypercholesterolemia in Young Patients With Premature Acute Myocardial Infarction

Sajid Ali*, Muhammad Shuaib Abid

Department of Cardiology, Punjab Institute of Cardiology, Lahore, Pakistan
**Corresponding author`s email address:* drsajidali14@gmail.com

(Received, 14th May 2024, Accepted 22nd June 2025, Published 30th June 2025)

Abstract: *Familial hypercholesterolemia (FH) is an autosomal dominant lipid disorder associated with significantly increased risk of premature atherosclerotic cardiovascular disease. Despite its high global prevalence and clinical relevance, FH often remains underdiagnosed, particularly in South Asian populations where cardiovascular events occur earlier.* ***Objective:*** *To determine the incidence of familial hypercholesterolemia in patients with acute myocardial infarction.* ***Methodology:*** *A prospective study was conducted in the Cardiology Department of Punjab Institute of Cardiology Hospital, Lahore from April 2024 to April 2025. A total of 100 patients who had experienced a type I premature acute myocardial infarction were included in the study.The incidence of familial hypercholesterolemia by Dutch Lipid Clinic Network score by using the personal and family history of premature cardiovascular diseases and level of low-density lipoprotein cholesterol.A DLCN score of less of 3 indicated no FH, 3-5 indicated possible FH, a score of 6-8 indicated probable FH and a score >8 indicated definite FH.* ***Results:*** *A total of 48 (48%) patients did not have FH, 45 (45%) had possible FH and 7 (7%) had definite or probable FH. The cardiovascular risk factors of premature myocardial infarction. Familial hypercholesterolemia was the strongest predictor (aOR: 39.2 (18.8-80.3), p<0.0001). Male gender (aOR: 2.9 (2.8-4.0), p<0.0001), smoking (aOR: 7.1 (6.3-9.2), p <0.0001) and diabetes (aOR: 3.0 (2.2-4.4), p<0.0001) were also significant determinants of premature MI.* ***Conclusion:*** *There is a low incidence of familial hypercholesterolemia in patients with premature myocardial infarction. Regular screening is required to timely diagnose FH in general population and reduce risks.*

Keywords: Acute Coronary Syndrome, Familial hypercholesterolemia, Myocardial Infarction

[***How to Cite:*** Ali S, Abid MS. Assessment of incidence of familial hypercholesterolemia in young patients with premature acute myocardial infarction. *Biol. Clin. Sci. Res. J.*, **2025;** 6(6): 548-550. doi: https://doi.org/10.54112/bcsrj.v6i6.1800

Introduction

Familial hypercholesterolemia is a frequent genetic condition which causes abnormally high level of LDL cholesterol, increasing risk of cardiovascular events. It has a prevalence of 0.37%-1.23% with every 1 in 273 individuals affected by it in Pakistan.(1). It is passed through genetic mutations and increases morbidity, most commonly acute coronary syndrome and death. The prevalence of FH in patients with premature acute coronary syndrome is 5-50% (2).

Although FH shows signs since birth, the statistics of its diagnosis are poor. Its prevalence is significantly lower with increasing age but older females have a common incidence than males (3). A timely diagnosis ensures its management through medication and lifestyle changes to control cholesterol levels. It is important to screen patients that experience premature coronary artery disease as it is one of the major risk factors of FH.

The Dutch Lipid Clinic Network (DLCN) score is an accurate diagnostic tool that predicts the occurrence of FH based on physical assessment, level of LDL cholesterol, history of premature cardiovascular disease and genetic testing (4). Anti-hyperlipidemic agents including PCSK 9 inhibitor, statin therapy and ezetimibe are used to treat FH and cascade testing is required to identify probable individuals at risk (5).

This study was conducted to determine the incidence of familial hypercholesterolemia in patients with acute myocardial infarction.

Methodology

A prospective study was conducted in the Cardiology Department of Punjab Institute of Cardiology Hospital, Lahore from April 2024 to April 2025. A total of 100 patients who had experienced a type I premature acute myocardial infarction were included in the study.Men older than 55 years and women older than 60 years were excluded. All patients agreed to become a part of the study. The ethical review board approved the study.

All patients provided their personal and family history of cardiovascular diseases or was taken from medical records. On admission, clinical symptoms, lipid levels, medication details, radiological data and revascularization data was recorded for each patient. The incidence of familial hypercholesterolemia by Dutch Lipid Clinic Network score by using the personal and family history of premature cardiovascular diseases and level of low-density lipoprotein cholesterol. For patients who were already undergoing lipid lowering options, baseline lipid concentration without treatment were estimated depending on type and dose of medication. A DLCN score of less of 3 indicated no FH, 3-5 indicated possible FH, a score of 6-8 indicated probable FH and a score >8 indicated definite FH. There was a strong suspicion of development of FH in probable or definite cases.

All data was analyzed by SPSS version 22. Variables were expressed as percentage and mean ± SD. Chi-squared test and ANOVA test were used to compare three groups of FH. Multivariate logistic analysis was conducted to investigate correlation between FH and premature MI while adjusting for confounding factors including gender, diabetes, hypertension, smoking and family history of premature CVD. Statistical significance was determined at a p value of less than 0.05.

Results

The mean age of patients was 45.2 years among which 85 patients (85%) were males and 68 (68%) had STEMI. 48 (48%) patients did not have FH, 45 (45%) had possible FH and 7 (7%) had definite or probable FH. The baseline characteristics did not differ significantly between patients with or without FH, however, patients with definite FH had a significantly

higher administration of lipid lowering (p<0.001) and antiplatelet therapy (p=0.003) at admission and ezetimibe (p<0.001) at discharge (Table I).

A total of 3 (43%) patients with definite FH were diagnosed by molecular diagnostics and 4 (57.5%) had mutations of LDL-C receptor and apolipoprotein B. 3 (43%) of these patients had multivessel disease which is significantly higher than 11 (23%) patients in patients with no FH (p=0.02). Stent revascularization was highest in patients with possible FH (p=0.05).

Table II analyzed the cardiovascular risk factors of premature myocardial infarction. Familial hypercholesterolemia was the strongest predictor (aOR: 39.2 (18.8-80.3), p<0.0001). Male gender (aOR: 2.9 (2.8-4.0), p<0.0001), smoking (aOR: 7.1 (6.3-9.2), p <0.0001) and diabetes (aOR: 3.0 (2.2-4.4), p<0.0001) were also significant determinants of premature MI.

Table 1: Baseline demographic and clinical characteristics

	No familial hypercholesterolemia (n=48)	**Possible familial hypercholesterolemia (n=45)**	**Probable or definite familial hypercholesterolemia (n=7)**	**P**
Age	43.5 ± 6.1	44 ± 4.9	43 ± 6.2	0.5
Male gender	39 (81.4%)	40 (89%)	6 (85.6%)	0.1
Family history of CVD	-	25 (55.6%)	4 (57.5%)	<0.001
Smokers	34 (71%)	34 (75.7%)	4 (57.5%)	0.3
Hypertension	9 (18.8%)	9 (20%)	2 (28.5%)	1
Diabetes	3 (6.3%)	6 (13.4%)	1 (14.2%)	0.2
BMI	27.3 ± 3.8	27.2 ± 4.0	29.1 ± 4.9	0.5
History of stroke	-	1 (2.3%)	-	0.4
History of PAD	-	1 (2.3%)	-	0.4
Total cholesterol	189 ± 38	240 ± 75	440 ± 20	<0.001
LDL-C	115 ± 25	149 ± 40	274 ± 75	<0.001
HDL-C	44 ± 20	49 ± 50	48 ± 18	0.4
Triglycerides	151 ± 74			0.4
Medication at admission				
Anti-platelet therapy	2 (4.2%)	5 (11.2%)	2 (28.6%)	0.003
Lipid-lowering therapy	2 (4.2%)	6 (13.5%)	3 (43%)	<0.001
Anticoagulant therapy	1 (2.2%)	1 (2.3%)	-	0.4
Diagnosis				
OHCA	5 (10.5%)	3 (6.7%)	-	0.08
STEMI	31 (64.6%)	32 (71.2%)	5 (72%)	1
NSTEMI	15 (31.3%)	11 (24.5%)	3 (43%)	0.9
Medication at discharge				
Statins	46 (96%)	44 (98%)	6 (85.7%)	0.2
High-dose statins	31 (64.7%)	30 (66.7%)	5 (72%)	1
Ezetimibe	1 (2.2%)	1 (2.3%)	2 (28.6%)	<0.001
Dual antiplatelet therapy	43 (89.7%)	42 (93.4%)	7 (100%)	1
Antihypertensives	47 (98%)	44 (98%)	6 (85.7%)	1

Table 2: Multivariate analysis of risk factors of premature MI

Risk factors	**Adjusted OR (95% CI)**	**P**
Familial hypercholesterolemia	39.2 (18.8-80.3)	<0.0001
Male gender	2.9 (2.8-4.0)	<0.0001
Smoking	7.1 (6.3-9.2)	<0.0001
Diabetes	3.0 (2.2-4.4)	<0.0001
Family history of FH	1.4 (1.0-1.3)	0.42
Hypertension	0.92 (1.2-1.5)	0.19

Discussion

This study was conducted to assess the incidence of familial hypercholesterolemia in patients with premature MI. The results showed a 7% rate of FH which means every 1 in 14 people suffer from FH. This percentage is significantly higher than previous reported in Pakistan but similar to western studies (6, 7, 8) This difference can be accounted by the significant difference in sample size, study duration, inclusion criteria and most of these studies are conducted on a nationwide level while our study is single centered and included only MI patients (9).

Kramer et al reported a 4.7% pooled prevalence of FH in acute coronary syndrome with 13.7% incidence in younger patients (≤ 45 years). This is little lower than our study with every 1 in 7 people affected with FH (2). An Arabian Gulf study also reported a 3.7% incidence of definite or probable FH (10). An Australian study on 180 patients also showed a 6% rate of phenotypic FH (11).

A meta-analysis of prevalence of FH according to ethnicity also reported the lowest incidence in Asian population with 1:400 ratio and 0.25% overall pooled prevalence (12). A Sri Lankan study also reported an FH rate of 1: 217 (13). However, a 0.13% prevalence of FH was reported in Nepal, 0.5% in Malaysia, 0.47% in Thailand and 0.1% in India (14, 15, 16, 17). These statistics indicate the underdiagnosis and undertreatment of FH in Asian populations.

Among cardiovascular disorders of premature MI, male gender was a strong predictor after familial hypercholesterolemia. However, in previous studies females were at high risk of developing higher LDL-C

since childhood, which continued in adulthood (18, 19). Women were also less likely to receive lipid lowering treatment and the cholesterol burden is enhanced by breastfeeding and pregnancy.

Conclusion

There is a low incidence of familial hypercholesterolemia in patients with premature myocardial infarction. Regular screening is required to timely diagnose FH in general population and reduce risks.

Declarations

Data Availability statement
All data generated or analysed during the study are included in the manuscript.
Ethics approval and consent to participate
Approved by the department concerned. (IRBEC-24)
Consent for publication
Approved
Funding
Not applicable

Conflict of interest

The authors declared the absence of a conflict of interest.

Author Contribution

SA (MO)
Manuscript drafting, Study Design,
Review of Literature, Data entry, Data analysis, and drafting article.
MSA (SR)
Conception of Study, Development of Research Methodology Design, Study Design, manuscript review, critical input.

All authors reviewed the results and approved the final version of the manuscript. They are also accountable for the integrity of the study.

References

1. Khan M, Ain Q, Sikonja J, Batool H, Hayat MQ, Khan MI, et al. Prevalence of Familial Hypercholesterolemia in Pakistan: A Pooled Analysis of 1.5 Million Individuals and Comparison with Other Countries of the Region. Global Heart. 2025;20(1):23.
2. Kramer AI, Trinder M, Brunham LR. Estimating the prevalence of familial hypercholesterolemia in acute coronary syndrome: a systematic review and meta-analysis. Canadian Journal of Cardiology. 2019;35(10):1322-1331.
3. Chasioti G, Kotanidou A. Women and familial hypercholesterolemia. Health & Research Journal. 2024;10(2):123-134.
4. Krstić M, Singh-Lukač S, Petakov A, Mitrović M, Mišević V, Lalić K. Correlation of the Dutch Lipid Clinic Network score as a diagnostic tool and lipid parameters in patients with familial hypercholesterolemia. Medicinski pregled. 2023;76(5-6):151-155.
5. Zubielienė K, Valterytė G, Jonaitienė N, Žaliaduonytė D, Zabiela V. Familial hypercholesterolemia and its current diagnostics and treatment possibilities: a literature analysis. Medicina. 2022;58(11):1665.
6. Hauguel-Moreau M, Aïdan V, Hergault H, Beauchet A, Pépin M, Prati G, et al. Prevalence of familial hypercholesterolaemia in patients presenting with premature acute coronary syndrome. Archives of cardiovascular diseases. 2022;115(2):87-95.
7. Elbadawi A, Elgendy IY, Omer M, Abdelazeem M, Nambi V, Krittanawong C, et al. Outcomes of acute myocardial infarction in patients with familial hypercholesteremia. The American Journal of Medicine. 2021;134(8):992-1001. e1004.
8. Chen Y-J, Chen I-C, Chen Y-M, Hsiao T-H, Wei C-Y, Chuang H-N, et al. Prevalence of genetically defined familial hypercholesterolemia and the impact on acute myocardial infarction in Taiwanese population: A hospital-based study. Frontiers in Cardiovascular Medicine. 2022;9:994662.
9. Farhad A, Noorali AA, Tajuddin S, Khan SD, Ali M, Chunara R, et al. Prevalence of familial hypercholesterolemia in a country-wide laboratory network in Pakistan: 10-year data from 988, 306 patients. Progress in Cardiovascular Diseases. 2023;79:19-27.
10. Al-Rasadi K, Al-Zakwani I, Alsheikh-Ali AA, Almahmeed W, Rashed W, Ridha M, et al. Prevalence, management, and outcomes of familial hypercholesterolemia in patients with acute coronary syndromes in the Arabian Gulf. Journal of clinical lipidology. 2018;12(3):685-692. e682.
11. Samuel R, Birdsey G, Amerena J. Prevalence of familial hypercholesterolaemia in acute coronary syndrome patients in a large regional coronary care unit. Heart, Lung and Circulation. 2021;30(5):730-733.
12. Toft-Nielsen F, Emanuelsson F, Benn M. Familial hypercholesterolemia prevalence among ethnicities—systematic review and meta-analysis. Frontiers in Genetics. 2022;13:840797.
13. Matthias AT, Samaranayake T, Hewa PS. Screening for familial hypercholesterolemia in Sri Lanka: A laboratory-based multicenter study. International Journal of Noncommunicable Diseases. 2024;9(2):58-64.
14. Sharma S, Adhikari S, Shah N, Aebischer Perone S, Lab B, Heller O, et al. Familial hypercholesterolemia in community-based KHDC Nepal program-baseline data. European Journal of Preventive Cardiology. 2022;29(Supplement_1):zwac056. 184.
15. Barde AK, Sethi S, Bhargav M, Waghdhare S. Indian prevalence of familial hypercholesterolemia demystified by applying Dutch lipid clinic network criteria. Int J Adv Med. 2022;9:1177-1182.
16. Chua Y-A, Razman AZ, Ramli AS, Kasim NAM, Nawawi H. Familial hypercholesterolaemia in the Malaysian community: prevalence, under-detection and under-treatment. Journal of Atherosclerosis and Thrombosis. 2021;28(10):1095-1107.
17. Jeenduang N, Nuinoon M, Ratanawan C. Prevalence of familial hypercholesterolemia among the southern Thai population: A preliminary study. 2022.
18. Klevmoen M, Mulder JW, Roeters van Lennep JE, Holven KB. Sex differences in familial hypercholesterolemia. Current Atherosclerosis Reports. 2023;25(11):861-868.
19. Schreuder M, Hamkour S, Siegers K, Holven KB, Johansen AK, Van De Ree M, et al. LDL cholesterol targets rarely achieved in familial hypercholesterolemia patients: A sex and gender-specific analysis. Atherosclerosis. 2023;384:117117.