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Cardiology

RISK FACTORS PROFILE OF ADULT MYOCARDIAL INFARCTION PATIENTS IN A TERTIARY CARE HOSPITAL: A DESCRIPTIVE STUDY

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ABSTRACT **Aim:** Present study was done to assess the conventional and newer risk factors for myocardial infarction in young patients (≤45 years). **Methods:** Total 60 patients (≤45 yrs) were enrolled using total enumeration sampling technique. Cardiovascular risk factors related information was retrieved using the following tools. Interview schedule (personal cum clinical profile sheet, risk factor profile sheet, the self-developed questionnaire for dietary adherence, alcohol consumption record sheet), the Fagerström Test for Nicotine Dependence, perceived stress scale and Duke Activity Status Index calculator. **Results:** In present study out of 60 patients 90% of the participants were male, 50% of subjects were in the age group between 25 to 39 years. Traditional risk factors commonly assessed were age, gender, smoking, alcohol consumption, physical inactivity, obesity, stress, unhealthy food intake, and abnormal blood cholesterol. Novel risk factors observed at young age were high lipoprotein(a), homocysteine, C-reactive protein and low vitamin D levels. **Conclusion:** This study investigated the risk factors for MI in young patients (<45 years) admitted to territory care hospital in North India. This study reinforces the importance of traditional risk factors for cardiovascular disease while highlighting novel risk factors hence proposing the importance of sensitising young populations to focus more on prevention of novel the risk factors along with the traditional risk factors.

KEYWORDS : MI - Myocardial infarction, RF - Risk factors.

INTRODUCTION:

Acute myocardial infarction is an important cause of death worldwide.[1] Global prevalence of cardiovascular disease (CVD) has doubled (523 million in 2019) from (271 million in 1990), mortality increased from 12.1 million (1990) to 18.6 million (2019) and disability adjusted life years and years of life lost also increased and reached up to 34.4 million (2019) from 17.7 million (2019).[2] Approximately 3-4% of Indians in rural areas and 8-10% in urban areas are affected by CVD.[3]

Migration studies showed that Asian Indians have an increased risk of CHD than White Americans, 6 times higher than Chinese and 20 times higher than Japanese.[4,5] Indians are also prone to CAD at much younger age.[3] In recent years an increase in cases of MI among young generation (<45 years) has been reported.[1,6,7] Coronary artery disease in young (CADY) is a novel term used for increasing frequency of coronary artery disease among young individuals.[7] The most common reason for acute myocardial infarction (AMI) is clogged arteries due to atherosclerosis in young patients. However, it is also reported that younger population with artherosclerotic MI is associated with non-traditional CVD risk factors.[8]

Although the traditional/existing risk factors for MI have been fixed and awareness programmes are going on but still the young MI cases are on increase. It has been documented in the literature that along with traditional risk factors (smoking, alcohol, positive family history, obesity, hyperlipidaemia, hypertension, diabetes mellitus) young MI patients are reporting with some novel risk factors like type A personality, increased lipoprotein(a), hyperhomocysteinemia, high C-reactive protein, low vit D and structural aortic disease.[7,9]

Patient with myocardial infarction experience symptoms like chest discomfort or pain that radiate to the neck, jaw, shoulder, or arm and it may be intermittent or persistent. Some patients may have sweating, nausea, abdominal pain, dyspnoea, fatigue, epigastric discomfort, palpitations and syncope.[10,11,12,13] Myocardial ischemia is diagnosed with clinical features, ECG changes such as ST segment changes, development of left bundle branch block, appearance of Q wave, and elevated biochemical markers such as cardiac troponins.[10,12]

Although the role of conventional risk factors for coronary artery disease is proven for all age groups, younger patients show different risk factor profile, clinical presentation and prognosis. Management of young patients is a challenging task as they are the main part of working force and at the same time have significant contribution towards nation building. So early attention is needed for initiating primary and secondary preventive measures for reducing the CVD event in this age group.

Keeping this in view present study was conducted to identify the traditional and novel risk factors profile of MI cases having age ≤45 years.

METHODOLOGY:

Descriptive exploratory design was adopted to assess the risk profile of young myocardial infarction patients admitted in cardiology units of a tertiary care hospital in North India. Total 60 patients (≤45 years) were enrolled using total enumeration sampling technique. Cardiovascular risk factors related information was retrieved using the following tools. Interview schedule (Socio-demographic profile sheet, clinical profile sheet, risk factor profile sheet, the self-developed questionnaire for dietary adherence, alcohol consumption record sheet), the Fagerström Test for Nicotine Dependence, perceived stress scale and Duke Activity Status Index (DASI) calculator.

Personal cum clinical profile sheet contained items like age, family history, gender, diagnosis, BMI etc.

In risk profile sheet risk factors explored like, obesity current and past substance abuse, comorbidities, lab investigations etc.

The self-developed questionnaire for dietary adherence aims to gather information about participants' dietary habits, including their preferences and consumption patterns. It includes components like dietary preference (vegetarian, non-vegetarian) etc.

In alcohol consumption record sheet, the questions were asked regarding use of alcohol, frequency and amount.

The content validity of the self-developed questionnaire for completeness, content, and language clarity was ensured by seeking opinion of the experts from departments of cardiology public health and nursing. Valid suggestions and inputs were incorporated.

The Fagerström Test for Nicotine Dependence tool was used to assess the level of addiction to nicotine. Reliability of The Fagerström Test

for Nicotine Dependence is 0.91.[15]

Perceived stress scale had 10 questions used to explore feelings and thoughts related to stress felt during last month. Reliability of perceived stress scale is 0.79.[16]

The Duke Activity Status Index (DASI) calculator is a 12-item questionnaire that **assesses** person's ability to perform daily activities and exercise. The questionnaire evaluates physical function and mobility, the score ranges from 0 to 58.2. Higher the score, better the physical function. Reliability of DASI questionnaire is 0.99.[17]

Collected data was analysed using descriptive and inferential statistics with the help of SPSS (version 20.0). Ethical clearance was obtained from Institute Ethics Committee of the institute. Written informed consent was obtained before the participants inclusion in the study and confidentiality of data was maintained. Permission was taken from Head of department of Cardiology.

RESULTS:

Table 1: Personal Cum Clinical Profile Sheet Of The Participants N=60

Variables	f(%)
Age in (years)	
25-30	4(6.7)
30-35	5(8.3)
35-40	21(35.0)
40-45	30(50.0)
Gender	
Male	54(90.0)
Female	06(10.0)
Habitat	
Urban	29(48.3)
Rural	31(51.7)
Occupation	
Professional	12(20.0)
Skilled worker	22(36.7)
Unskilled worker	26(43.3)
Socio economic status (Rs./month) (As per modified B.G Prasad Scale 2021)	
Upper class (7770 and above)	6(10.0)
Upper middle class (3808-7769)	12(20.0)
Middle class (2253-3808)	17(28.3)
Lower middle class (1166-2253)	9(15.0)
Lower class (<1166)	16(26.7)
Comorbidities in family member:	41(68.3)
Type of comorbidities in family member (N=41):	
DM	7(17.0)
HTN	6(14.6)
CVD	11(26.8)
HTN and CVD	4(9.7)
DM and HTN	9(21.9)
DM, HTN, CVD	4(9.7)
Family members of participants with comorbidities	
Mother	13(31.7)
Father	20(48.8)
Brother	8(19.5)
BMI (kg/m^2):	
Normal (18.5-24)	31(51.7)
Overweight (25-29.9)	19(31.7)
Obese (>30)	10(16.7)
Diagnosis	
CAD ACS NSTEMI	10(16.7)
CAD ACS STEMI	04 (6.7)
CAD ACS AWMI	27(45.0)
CAS-ACS-IWMI	19(31.7)
Thrombolysis	14(23.3)
Duration of hospital stay (days)	
2-3	43(71.7)
4-5	10(16.7)
>6	7(11.7)
First medical facility visited	
Govt. hospital	37(61.6)
Pvt. hospital	23(38.3)
Co-morbidities	
Hypertension	13(46.4)
Diabetes Mellitus	7(25.0)
HTN & DM	8(28.6)
Heart rate (per minute)	
Normal (60-100	41(68.3)
Tachycardia (>100)	18(30.0)
Bradycardia(<60)	01(1.7)
Respiration (per minute)	
Normal (12-20)	30(50.0)
Tachypnea (>20)	30(50.0)
Blood pressure (mm of Hg) (JNC-8)	
Normal (<120 and <80)	30(50.0)
High-normal (<130 -139 or 85-89)	10(16.7)
Stage 1 HTN (140-159 or 90-99)	17(28.3)
Stage 2 HTN(160-179 or 100-109)	03(5.0)
SpO_2 (%)	
91-100	60(100.0)

Half of subjects were in the age group between 25 to 39 years. Majority of subjects (90%) were male. Almost equal number of the participants were from rural and urban areas i.e. 48.3%, 51.7% respectively. Only 30% of the participants were from upper/ upper middle class. Forty-one (68.3%) participants reported presence of comorbidities in the family in which CVD, DM, and HTN were the most prevalent. Participants also reported the relations affected by the reported medical histories, including mother, father, and brother. Almost half of the participants were in overweight and obese category. Most of the participants (76%) had CAD, ACS, AWMI/IWMI. 23.3% participants were thrombolysed. Hospital stay duration varied from 2-3 days in 71.7% of the participants. Most of the participants (61.6%) visited government health care facility for seeking treatment. Half of the participants (50%) were normotensive with antihypertensive medications. Hypertension (46.4%) was the most common comorbidity followed by Diabetes Mellitus (25%) and both HTN as well as DM (28.6%). Only 30% participants had tachycardia. Half of the participants (50%) were tachypneic. Nearly half of the participants (28.3%) had stage 1 hypertension and 5% participants had stage 2 hypertension. (Table 1)

Table 2: Diagnostic And Therapeutic Profile Of The Participants N=60

Treatment	f(%)
Troponin I (n=40)	
Positive	33(82.5)
Negative	7(17.5)
Troponin T (n=20)	
Positive	14(70)
Negative	6(30)
Ck MB (U/L) (n=19)	
Low (<11.1)	2(10.5)
Normal (11.1-42.9)	8(42.1)
High (>42.9)	9(47.3)
Current Intervention/surgery performed (n=58)	
PCI	57(98.2)
CABG	01(1.7)
Diagnostic studies	
Angiography	60(100.0)
Angiography site	
Radial	47(78.3)
Femoral	13(21.7)
LVEF(%)	
Low (<40)	16(26.7)
Normal (50-70)	44(73.3)
Medicines	
• Beta-blockers	28(46.7)
• Platelet aggregation inhibitors (PAI)	59(98.3)
• Anti-hypertensive	25(41.7)
• Anti hyperlipidemic	48(80.0)
• Anti-coagulants	50(83.3)
• Antianginals	42(70.0)
• OHA (Oral hypoglycaemic agent)	14(23.3)
• Insulin	02(3.33)
• OHA+Insulin	01(1.66)
• Other drugs (multivitamins, proton pump inhibitors)	56(93.3)

Majority of the participants (82.5%) had Trop I positive whereas 70% participants had Trop T positive. Majority of participants 98.3% underwent PCI. Only 1.7% of participants underwent coronary artery bypass surgery. **Angiography was** performed in all the participants (100%). Radial route was the most common route of angiography (78.3%). Most of the participants were on beta blockers, platelet aggregation inhibitors (PAI), antihypertensives, antihyperlipidemic, anticoagulants and antianginals 46.7%, 98.3%, 41.7%, 80%, 83.3%, 70% respectively. 23.3% of the participants were on oral hypoglycaemic agents, 3.33% of participants were on insulin and 1.66% of participants were on combination of OHA and insulin. Majority of participants (93.3%) were on other drugs like Multivitamins, proton pump inhibitors. (Table 2)

Table 3: CVD Risk Factor Profile Of The Participants N=60

Risk factors	f(%)
BMI (kg/m^2)	
Normal (18.5-24.9)	31(51.7)
Overweight (25-29.9)	19(31.7)
Obese (>30)	10(16.7)
Blood pressure (mm of Hg) (JNC-8)	
Normal (<120 and <80)	30(50.0)
High-normal (<130 -139 or 80-89)	10(16.7)
Stage 1 HTN (140-159 or 90-99)	**17(28.3)**
Stage 2 HTN (160-179 or 100-109)	**03(05.0)**
RBS (mg/dl) (American Diabetes Association)	
Normal (70-140)	44(73.3)
High (>140)	**16(26.7)**
Dietary habits	
Non-Vegetarian	**47(78.3)**
Vegetarian	13(21.7)
Fruit consumption <2 servings/day	**54(95.0)**
Vegetable consumption <3 servings/day	**43(71.6)**
Spicy/oily/salty/junk food	**44(73.3)**
Smoking	
Yes	**32(53.3)**
No	28(46.7)
Fagerstorm test for nicotine dependence	
1-2 (low dependence)	9(28.1)
3-4 (low to moderate dependence)	**9(28.1)**
5-7 (moderate dependence)	**14(43.8)**
Alcohol intake (>30ml/day)	
Yes	**37(61.7)**
No	33(38.3)
Stress (Perceived stress scale):	
Low stress (0-13)	3(05.0)
Moderate stress (14-26)	**25(41.7)**
Severe stress (27-40)	**32(53.3)**
Activity level	
(<34 score Risk of MI present)	**14(23.3)**
(>34score No risk of MI present)	46(76.7)
HDL value (mg/dl)	
Low (<35)	**12(20.0)**
Normal (35-55)	46(76.7)
High (>55)	2(3.3)
LDL value (mg/dl)	
Normal (0-110)	49(81.7)
High (>110)	**11(18.3)**
Total cholesterol level (mg/dl)	
Low (<150)	17(28.3)
Normal (150-200)	31(51.7)
High (>200)	**12(20.0)**
Triglyceride level (mg/dl)	
Low (<150)	16(26.7)
Normal (150-200)	30(50.0)
High (>200)	**14(23.3)**
Homocysteine level (umol/L)	
Normal (5.46-16.20)	33(55.0)
High (16.20)	**27(45.0)**
Vitamin D (ng/ml)	
Low (<11.1)	**7(11.7)**
Normal (11.1-42.9)	49(81.7)
High (>42.9)	4(6.7)
C-reactive protein (mg/dl)	
Normal (0-5)	20(33.3)
High (>5)	**40(66.7)**
Lipoprotein (a) (mg/dl)	
Normal (0-30mg/dl)	34(56.7)
High (>30mg/dl)	**26(43.3)**

Under risk factor profile of the participants most prevalent traditional risk factors were stress, fruit consumption <2 servings/day, vegetable consumption <3 servings/day, non-vegetarian, consumption of spicy/oily/ salty/ junk food whereas high lipoprotein(a), C-reactive protein, homocysteine were prevalent novel risk factors. Almost half of the participants (48.3%) were in overweight and obese category. 28.3% of the participants had stage 1 hypertension and 5 % had stage 2 hypertension. Most of the participants (78.3%) were non- vegetarian. Majority of the participants (95% for fruits and 71.6% for vegetables) consumed less than the recommended daily servings. 73.3% of the participants consumes spicy/oily/salty/junk food frequently. More than half of the participants (53.3%) were smokers. According to the Fagerstorm test for nicotine dependence 28.1% of the participants had low nicotine dependence and low to moderate dependence however 43.8% of the participants had moderate nicotine dependence. Most of the participants (61.7%) had alcohol intake more than 30ml/day. Severe stress was reported by half of the participants (53.3%) followed by moderate stress in 41.7% of the participants. 23.3% of the participants had (<34 score) functional activity. An elevated level of homocysteine was observed in nearly half (45.0%) of participants. Low levels of Vitamin D were present in 11.7% of the participants. High levels of C-reactive protein and lipoprotein (a) was seen in participants (66.7%) and (43.3%) respectively indicating high risk of developing CVD. (Table 3)

Table 4: Clustering Of Different Risk Factors Among Young Myocardial Infarction Cases

Number of risk factors	Type of risk factors	f(%)
4	Non - vegetarian, family history, obese, stress, <2 fruit servings/day, <3 vegetable servings/day, high homocysteine, c-reactive protein	2(3.33%)
5	Smoking, alcohol, Non- vegetarian, stress, <2 fruit servings/day, <3 vegetable servings/day, spicy/oily/junk food, high c-reactive protein, high lipoprotein(a)	2(3.33%)
6	Alcohol, non-vegetarian, family history, obese, stress, <2 fruit servings/day, <3 vegetable servings/day, spicy/oily/junk food, less physical activity, high homocysteine, high lipoprotein(a), high c-reactive protein	2(3.33%
07	Family history, non-vegetarian, HTN, smoking, obese, less activity, stress, alcohol, <2 fruit servings/day, <3 vegetable servings/day, spicy/oily/junk food, high c-reactive protein, high lipoprotein(a), high homocysteine, low Vit D	7(11.6%)
08	Family history, HTN, DM, non-vegetarian, smoking, alcohol, obese, lipid profile, less activity, stress, <2 fruit servings/day, <3 vegetable servings/day, spicy/oily/junk food, high c-reactive protein, high lipoprotein(a), high homocysteine, low Vit D	9(15%)
09	Family history, HTN, DM, non-vegetarian, smoking, alcohol, obese, lipid profile, less activity, stress, <2 fruit servings/day, <3 vegetable servings/day, spicy/oily/junk food, high c-reactive protein, high lipoprotein(a), high homocysteine.	13(21.6 %)
10	Family history, HTN, DM, non-vegetarian, smoking, alcohol, obese, lipid profile, less activity, stress, <2 fruit servings/day, <3 vegetable servings/day, spicy/oily/junk food, High c-reactive protein, High lipoprotein(a), homocysteine, low Vit D	13(21.6 %)
11	Family history, HTN, DM, non-vegetarian, smoking, alcohol, obese, lipid profile, less activity, stress, <3 fruit servings/day, <5 vegetable servings/day, spicy/oily/junk food, c-reactive protein, lipoprotein(a), homocysteine, Vit D	4(6.66%)

12	Family history, HTN, non-vegetarian, smoking, alcohol, obese, lipid profile, less activity, stress, <5 fruit servings/day, <5 vegetable servings/day, spicy/oily/junk food, c-reactive protein, lipoprotein(a), homocysteine.	3(5%)
13	Family history, HTN, DM, non-vegetarian, smoking, alcohol, obese, lipid profile, less activity, stress, <5 fruit servings/day, <5 vegetable servings/day, spicy/oily/junk food, c-reactive protein, lipoprotein(a), homocysteine, Vit D	4(6.66%)
14	Family history, non-vegetarian, smoking, alcohol, lipid profile, less activity, stress, <5 fruit servings/day, <5 vegetable servings/day, spicy/oily/junk food, c-reactive protein, lipoprotein(a), homocysteine, Vit D	1(1.66%)

Clustering of risk factors reflected that 4(6.66%) had ≤5 risk factors whereas in majority of the participants presence of risk factors varied from 6-10 (73.3%). More than 10 risk factors were present in 12(20%) participants. (Table 4)

DISCUSSION

The present study aimed to assess both novel and traditional risk factors among young MI patients. In India there has been an increase in the cases of myocardial infarction among young generation in recent years. According to clinical and pathological data 3-8% of the population got affected with myocardial infarction under the age of 45 years.[7]

In the present study half of the subjects were in the age group of 25 to 39 years. Gender distribution showed that majority of the subjects (90%) were males Similarly, the results of study that was conducted by Mulay et al. (2016)[7] showed that out of 45 patients, 88.8% were males and 35% of the participants were in the age group of 41-45 years. Krishnan et al. (2016) [18] also reported that maximum number of participants were males. This can be attributed to high use of cigarette/bidi and alcohol consumption in males than females in Indian population.

In the current investigation 70% of the participants had middle/ lower socioeconomic status. (as per modified B.G Prasad scale). The current findings are congruent with Jeemon et al. (2010)[19] where coronary heart disease was more prevalent among people of middle and lower middle class socioeconomic status. Low socioeconomic status can be one of the reasons of visiting Govt. health care facility where care cost in terms of stents and medications is quiet low as compared to private sector.

In current study most of the participants had CAD-ACS-AWMI and IWMI 45% and 31.7% respectively. The current findings are congruent with Mulay et al. (2016)[7] where 64.44% of the patients had anterior wall MI and 37.78% of the participants had inferior wall MI.

The current study showed that radial approach for PCI was used in more than half (78.3%) of the participants. Whereas femoral approach for PCI was used in only 21.7% of the participants. The current findings are congruent with Andrade et al. (2008-2014)[20] where radial assess was used in 56.2 % of the participants and femoral assess used in 43.79 % of the participants. Another study conducted by Mason et al. (2018)[21] showed that transradial artery access for percutaneous coronary intervention is associated with lower bleeding and vascular complications than transfemoral artery access.

In current study 68.3% of the participants had a family history of DM, HTN, CVD. Findings of current study are congruent with the study results Ranthe et al. (2015)[22] who reported that family history of myocardial infarction (MI) serves as a significant indicator of heightened risk for MI, particularly with first and second degree relatives.

In current study traditional risk factors such as family history, gender, smoking, alcohol consumption, high blood pressure, physical inactivity, obesity, stress, unhealthy diet, and abnormal blood cholesterol were present in the participants however high lipoprotein(a), homocysteine, C-reactive protein and low vitamin D were the reported novel risk factors. The findings of this study is supported by previous study conducted by Gupta et al. (2013)[9] that there are traditional risk factors as well as novel risk factors of CVD. Among the traditional risk factors include age, heredity, gender and ethnicity, smoking, alcohol consumption, the physical inactivity, obesity, stress, sedentary life style, Unhealthy diet, and abnormal blood cholesterol. Novel risk factors include lipoprotein(a), homocysteine, vitamin D and C-reactive protein.

In current research study more than half of the participants (53.3%) were smoking. These results are in agreement with Mulay et al. (2016)[7] where smoking was present in 55.56% of the patients. Another study conducted by Zasada et al. (2021)[14] showed that smoking was identified as common risk factor of myocardial infarction among young adults.

In current study it was observed that majority of the participants (61.7%) had more than prescribed amount of alcohol intake. Findings of current study are congruent with Mostofsky et al. (2015)[23] who reported that heavy (binge) drinking is associated with increased cardiovascular risk.

In present study it was found that just more than half of the participants (53%) had severe stress (53.3%). Satyjeet et al. (2019)[24] also investigated that the risk of cardiovascular events was higher in patients who had a history of social isolation, marital and work stress, childhood abuse and past trauma. Psychological stress is an important risk for cardiovascular disease.

In current study it was found that majority of participants were non-vegetarian (78.3%). These results are in agreement with Mulay et al. (2016)[7] where 77.78% of the participants were non -vegetarian. Dybvik et al. (2021)[25] also investigated that vegetarian diets are associated with reduced risk of CVD and IHD.

CONCLUSION

The study re-emphasizes, the role of traditional risk factor in developing CVD, along with this certain new indicator are pointing towards novel risk factors in case of MI at young age. To address this, targeted educational programs for young MI patients are crucial. Hence change in perspective of healthcare professionals in handling and treating MI at young age with a target to focus on novel risk factors along with existing traditional risk factors to decrease incidence of MI at young age.

REFERENCES

1. Alonso, J., Permanyer-Miralda, G., Cascant, P., Brotons, C., Prieto, L., & Soler-Soler, J. (1997). Measuring functional status of chronic coronary patients. Reliability, validity and responsiveness to clinical change of the reduced version of the Duke Activity Status Index (DASI). *European Heart Journal*, *18*(3), 414–419. https://doi.org/10.1093/oxfordjournals.eurheartj.a015260
2. Andrade, P. B. de, Nogueira, E. F., Rinaldi, F. S., Bienert, I. R. de C., Barbosa, R. A., Bergonso, M. H., Matos, M. P. B. de, Ferreira, C. F. B. de M., Kreimer, S., Esteves, V. C., Tebet, M. A., Mattos, L. A. P. e, & Labrunie, A. (2015). Comparison between femoral and radial approach in invasive coronary procedures after coronary artery bypass grafting. *Revista Brasileira de Cardiologia Invasiva (English Edition)*, *23*(1), 8–11. https://doi.org/10.1016/j.rbciev.2014.12.001
3. Chen, T. S.-C., Incani, A., Butler, T. C., Poon, K., Fu, J., Savage, M., Dahl, M., Callow, D. E., Colburn, D., Hammett, C., & Walters, D. L. (2014). The demographic profile of young patients (<45 years-old) with acute coronary syndromes in Queensland. *Heart, Lung & Circulation*, *23*(1), 49–55. https://doi.org/10.1016/j.hlc.2013.05.648
4. Dybvik, J. S., Svendsen, M., & Aune, D. (2023). Vegetarian and vegan diets and the risk of cardiovascular disease, ischemic heart disease and stroke: A systematic review and meta-analysis of prospective cohort studies. *European Journal of Nutrition*, *62*(1), 51–69. https://doi.org/10.1007/s00394-022-02942-8
5. Enas, E. A., Garg, A., Davidson, M. A., Nair, V. M., Huet, B. A., & Yusuf, S. (1996). Coronary heart disease and its risk factors in first-generation immigrant Asian Indians to the United States of America. *Indian Heart Journal*, *48*(4), 343–353.
6. Fernandez, R., Everett, B., Miranda, C., Rolley, J. X., Rajaratnam, R., & Davidson, P. M. (2015). MIGRATORY IMPLICATIONS FOR CORONARY HEART DISEASE RISK PREVENTION IN ASIAN INDIANS: EVIDENCE FROM THE LEADING HEALTH INDICATORS. *Journal of Cultural Diversity*, *22*(1), 30–38.
7. Gupta, S., Gudapati, R., Gaurav, K., & Bhise, M. (2013). Emerging risk factors for cardiovascular diseases: Indian context. *Indian Journal of Endocrinology and Metabolism*, *17*(5), 806–814. https://doi.org/10.4103/2230-8210.117212
8. Jeemon, P., & Reddy, K. S. (2010). Social determinants of cardiovascular disease outcomes in Indians. *The Indian Journal of Medical Research*, *132*(5), 617–622. https://doi.org/10.4103/0971-5916.73415
9. Krishnan, M. N., Zachariah, G., Venugopal, K., Mohanan, P. P., Harikrishnan, S., Sanjay, G., Jeyaseelan, L., & Thankappan, K. R. (2016). Prevalence of coronary artery disease and its risk factors in Kerala, South India: A community-based cross-sectional study. *BMC Cardiovascular Disorders*, *16*, 12. https://doi.org/10.1186/s12872-016-0189-3
10. Krittanawong, C., Khawaja, M., Tamis-Holland, J. E., Girotra, S., & Rao, S. V. (2023). Acute Myocardial Infarction: Etiologies and Mimickers in Young Patients. *Journal of the American Heart Association*, *12*(18), e029971. https://doi.org/10.1161/JAHA.123.029971
11. Krittanawong, C., Liu, Y., Mahtta, D., Narasimhan, B., Wang, Z., Jneid, H., Tamis-Holland, J. E., Mahboob, A., Baber, U., Mehran, R., Wilson Tang, W. H., Ballantyne, C. M., & Virani, S. S. (2020). Non-traditional risk factors and the risk of myocardial infarction in the young in the US population-based cohort. *International Journal of Cardiology. Heart & Vasculature*, *30*, 100634.

https://doi.org/10.1016/j.ijcha.2020.100634
12. Lu, L., Liu, M., Sun, R., Zheng, Y., & Zhang, P. (2015). Myocardial Infarction: Symptoms and Treatments. *Cell Biochemistry and Biophysics*, *72*(3), 865–867. https://doi.org/10.1007/s12013-015-0553-4
13. Mason, P. J., Shah, B., Tamis-Holland, J. E., Bittl, J. A., Cohen, M. G., Safirstein, J., Drachman, D. E., Valle, J. A., Rhodes, D., Gilchrist, I. C., & On behalf of the American Heart Association Interventional Cardiovascular Care Committee of the Council on Clinical Cardiology; Council on Cardiovascular and Stroke Nursing; Council on Peripheral Vascular Disease; and Council on Genomic and Precision Medicine. (2018). An Update on Radial Artery Access and Best Practices for Transradial Coronary Angiography and Intervention in Acute Coronary Syndrome: A Scientific Statement From the American Heart Association. *Circulation: Cardiovascular Interventions*, *11*(9), e000035. https://doi.org/10.1161/HCV.0000000000000035
14. Mechanic, O. J., Gavin, M., & Grossman, S. A. (2024). Acute Myocardial Infarction. In *StatPearls*. StatPearls Publishing. http://www.ncbi.nlm.nih.gov/books/NBK459269/
15. Meneses-Gaya, I. C. de, Zuardi, A. W., Loureiro, S. R., & Crippa, J. A. de S. (2009). Psychometric properties of the Fagerström Test for Nicotine Dependence. *Jornal Brasileiro De Pneumologia: Publicacao Oficial Da Sociedade Brasileira De Pneumologia E Tisilogia*, *35*(1), 73–82. https://doi.org/10.1590/s1806-37132009000100011
16. Mostofsky, E., van der Bom, J. G., Mukamal, K. J., Maclure, M., Tofler, G. H., Muller, J. E., & Mittleman, M. A. (2015). Risk of Myocardial Infarction Immediately After Alcohol Consumption. *Epidemiology (Cambridge, Mass.)*, *26*(2), 143–150. https://doi.org/10.1097/EDE.0000000000000227
17. Mozumder, M. K. (2022). Reliability and validity of the Perceived Stress Scale in Bangladesh. *PLOS ONE*, *17*(10), e0276837. https://doi.org/10.1371/journal.pone.0276837
18. Mulay Pramod Pz, M. S. P., & S, H. M. (2016). Acute Myocardial Infarction among Young Adults in India: Clinical Profile and Risk Factors. *International Journal of Innovative Research in Medical Science*, *1*(09), Article 09. https://doi.org/10.23958/ijirms/vol01-i09/07
19. Ojha, N., & Dhamoon, A. S. (2024). Myocardial Infarction. In *StatPearls*. StatPearls Publishing. http://www.ncbi.nlm.nih.gov/books/NBK537076/
20. Ranthe, M. F., Petersen, J. A., Bundgaard, H., Wohlfahrt, J., Melbye, M., & Boyd, H. A. (2015). A detailed family history of myocardial infarction and risk of myocardial infarction—A nationwide cohort study. *PloS One*, *10*(5), e0125896. https://doi.org/10.1371/journal.pone.0125896
21. Roth, G. A., Mensah, G. A., Johnson, C. O., Addolorato, G., Ammirati, E., Baddour, L. M., Barengo, N. C., Beaton, A. Z., Benjamin, E. J., Benziger, C. P., Bonny, A., Brauer, M., Brodmann, M., Cahill, T. J., Carapetis, J., Catapano, A. L., Chugh, S. S., Cooper, L. T., Coresh, J., … GBD-NHLBI-JACC Global Burden of Cardiovascular Diseases Writing Group. (2020). Global Burden of Cardiovascular Diseases and Risk Factors, 1990-2019: Update From the GBD 2019 Study. *Journal of the American College of Cardiology*, *76*(25), 2982–3021. https://doi.org/10.1016/j.jacc.2020.11.010
22. Satyjeet, F., Naz, S., Kumar, V., Aung, N. H., Bansari, K., Irfan, S., & Rizwan, A. (n.d.). Psychological Stress as a Risk Factor for Cardiovascular Disease: A Case-Control Study. *Cureus*, *12*(10), e10757. https://doi.org/10.7759/cureus.10757
23. Schulte, K. J., Mayrovitz, H. N., Schulte, K. J., & Mayrovitz, H. N. (2023). Myocardial Infarction Signs and Symptoms: Females vs. Males. *Cureus*, *15*. https://doi.org/10.7759/cureus.37522
24. *STEMI in India | European Heart Journal | Oxford Academic*. (n.d.). Retrieved July 19, 2024, from https://academic.oup.com/eurheartj/article/37/31/2449/2570404
25. Zasada, W., Bobrowska, B., Plens, K., Dziewierz, A., Siudak, Z., Surdacki, A., Dudek, D., & Bartuś, S. (2021). Acute myocardial infarction in young patients. *Kardiologia Polska*, *79*(10), 1093–1098. https://doi.org/10.33963/KP.a2021.0099