

## Risk Factor Profile of Young Adult Myocardial Infarction (MI) Cases : A Cross-Sectional Study at Tertiary Care Centre of Gujarat, India

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### Abstract :

**Introduction:** Myocardial Infarction (MI) is a life threatening clinical condition. It is a multifactorial non-communicable disease involving interplay of many modifiable and non-modifiable risk factors.

**Objective:** The study was conducted with objective to study socio-demographic profiles and distribution of risk factors among young adults having MI.

**Method:** A study was conducted at tertiary care centre of Rajkot, Gujarat. One year time frame was decided for this cross-sectional study. All the patients having age <45 years admitted in Intensive Care Unit (ICU) of Medicine department with first attack of MI were interviewed and examined for various clinic-epidemiological determinants of MI.

**Results:** Total 106 young MI cases were enrolled in the study. Relative frequency showed male preponderance (88.7%). Risk factors like tobacco uses, sedentary life-style and obesity were identified as risk factors relatively more frequently associated with young MI cases. In contrast to old MI cases, proven risk factors like hypertension and diabetes mellitus were found less frequently associated. About one third of the cases were lacking adequate amount of protective foods (green leafy vegetables and fruits) in their daily diet. Four patients without any risk factor except male gender were noted. 50% cases were having three or less number of risk factors.

**Conclusion:** The findings suggest male preponderance, tobacco consumption, sedentary life-style and obesity as quite common risk factors of premature Coronary Artery Disease (CAD).

**Key Words :** Coronary Artery Disease, Myocardial Infarction, Risk Factors, Young Age

### Introduction :

India has observed rapid transition from burden of communicable diseases to non-communicable diseases over the past couple of decades and Ischemic heart disease (IHD) is established as modern era's epidemic. Global and national data pointed out that as per situation in 2014, IHD ranked 1st causing deaths and disabilities, both globally and nationally.<sup>[1,2]</sup> More than half of the worldwide cardiovascular disease risk burden is estimated to be borne by Indian subcontinent by 2020.<sup>[3]</sup> Moreover migration studies showed that Indians are 3-4 times higher at risk of Coronary artery disease (CAD) than White Americans, 6 times higher than Chinese and 20 times higher than Japanese.<sup>[4,5]</sup> Not only that but Indians are also prone to CAD at much younger age.<sup>[6]</sup> Studies carried out in India, and other places suggest that Asian in general and Indians in particular are at an increased risk of MI at younger age (<40 years).<sup>[7]</sup> The

proportion of CAD in young Indians is about 12%-16%.<sup>[8,9]</sup>

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 income producer of the family. Myocardial infarction at an early age is an important problem for the consulting physician as well because it is having devastating effect on quality of life and survival of young adults. So, present study was conducted to identify the proportion of young MI cases and risk factor profile of MI cases having age <45 years.

### Method:

The cross-sectional study design was adopted for present study. It was conducted from 1st April 2016 to 31st March 2017 at PDU Govt. Medical College Hospital, Rajkot. The hospital is a tertiary care centre

catering entire Saurashtra region of Gujarat. There is disparity in literature for the cut-off age of young Myocardial Infarction (MI) case varying from <30 years to <55 years. Cut-off point of 45 years age was used to define young MI patient.<sup>[10]</sup> The study subject enrolled in the study were selected from the patient admitted in the Intensive Care Unit (ICU) of Medicine department having first attack of MI. Following an attack of MI, person's habits and risk factors profile might be altered because of post-MI life-style modifications. So, only the persons having first known MI incident were enrolled in study. Patients below 45 years of age who were conscious, co-operative, well oriented were enrolled after informed consent. Patients seriously ill, unconscious or non-willing to participate were excluded from the study.

For this study a person was considered as a case of MI, if any two of the following three criteria were satisfied: (1) ECG showing ST segment elevation, (2) rise in CK-MB levels > 25 IU/l or (3) symptoms of ischemia lasting for > 20 minutes (complain of left sided chest pain which was compressive in nature, ill localized, radiating to upper extremity, mandibular or epigastric region; may or may not be associated with nausea, vomiting, palpitation, excessive sweating or difficulty in breathing).<sup>[11,12]</sup> Patients were admitted and treated by the treating physician of Medicine department, PDU Hospital, Rajkot. All investigations were done on the basis of physician's description.

The study was approved by institutional ethical committee. Data collection was done by an interview technique using preformed, pretested and semi-structured questionnaire. Questionnaire included information regarding socio-demographic profile, risk factor profile, addiction history, diet profile and notes on examination measurements. Clustering of risk factors was analysed using ten risk factors named male sex, positive family history, hypertension, diabetes, tobacco consumption, alcohol consumption, history of Oral Contraceptive pills (OC pills) consumption, sedentary life style, stress due to acute life event, obesity and frequency of protective diet intake <5 days per week. Persons having continuous daily physical exercise of less than 30 minutes a day for 5 days a week were considered physically active. Persons not fitting in the definition

were considered as having sedentary life style. Modified Prasad's socioeconomic classification was used considering All India Consumer Price Index (AICPI) of April, 2017 of Rajkot.<sup>[13]</sup> Body Mass Index (BMI) was calculated and classified using World Health Organization (WHO) classification.<sup>[14]</sup> Cut-off points for high waist to hip ratio (W:H ratio) were adopted from the WHO guideline stating W:H ratio  $\geq$  0.90 for male and  $\geq$  0.85 for female is having substantially increased risk of metabolic complications.<sup>[15]</sup> Data entry was done in Microsoft Office Excel 2007 and analysis was done using the software package Epi Info (Version 7.2.2.6) from CDC, Atlanta, U.S.A.<sup>[16]</sup>

## Results:

Total 106 young MI patients having first attack of MI were admitted at PDU Hospital, Rajkot during one year period. It is 26.1% of total 406 cases admitted during this period. The youngest patient of MI in present study was of 24 years only. The study showed that 6.6% among young MI cases were below the age of 30 years. Steep rise observed at the age of 35 years. There was a male preponderance with 88.7% males and 11.3% females. (Table 1)

**Table 1: Age and sex distribution of young myocardial infarction cases**

Age (in years)	Male (%)	Female (%)	Total (%)
21 - 25	2 (1.9)	0 (0.0)	2 (1.9)
26 - 30	5 (4.7)	0 (0.0)	5 (4.7)
31 - 35	13 (12.3)	1 (0.9)	14 (13.2)
36 - 40	32 (30.2)	6 (5.7)	38 (35.8)
41 - 45	42 (39.6)	5 (4.7)	47 (44.3)
Total	94 (88.7)	12 (11.3)	106 (100.0)

Present study revealed that most of the cases were from urban area, joint family and literate. Manual labourer was the single group having more than half of cases. More than half of the cases were from upper middle and upper socio-economic class.

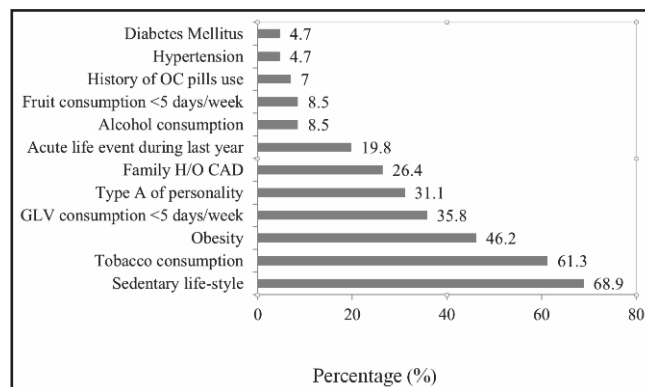
**Table 2: Socio - demographic profile of young myocardial infarction cases**

Variable	Frequency (%)
<b>Residence</b>	
Urban	79 (74.5)
Rural	27 (25.5)
<b>Marital status</b>	
Married	105 (99.1)
Unmarried	1 (0.9)
<b>Literacy status</b>	
Illiterate	15 (14.2)
Literate	91 (85.8)
<b>Occupation</b>	
Service	34 (32.1)
Manual labour	56 (52.8)
Household	12 (11.3)
Agriculture	4 (3.8)
<b>Socio - economic class<sup>#</sup></b>	
Class I & II	58 (54.7)
Class III	36 (34.0)
Class IV & V	12 (11.3)
<b>Type of family</b>	
Nuclear	42 (39.6)
Joint	64 (60.4)

<sup>#</sup>as per Modified Prasad classification

(Table 2)

In present study it was found that all the frequently related risk factors of MI were modifiable risk factors except male preponderance and positive family history of CAD among first order relatives. Sedentary life-style (68.9%), tobacco consumption (61.3%) and obesity (46.2%) ranked on first 3 positions while hypertension (4.7%) and diabetes

**Figure 1: Comparison of risk factors present in young myocardial infarction patients**

mellitus (4.7%) both stood as at the lowest rank as related risk factors among young MI cases. (Figure 1)

Family history of CAD was present in 26.4% cases while tobacco consumption was present in 61.3% cases. Consumption of leafy vegetables for <5 days/week (35.8%) were identified as other frequently related risk factors in young MI patients. (Table 3)

One fifth (20.8%) cases were found having clustering of one or two risk factors. Maximum numbers of patients (66%) were having clustering of three to five risk factors. (Table 4)

### Discussion:

Coronary Artery Diseases (CAD) in India is not only tolling country's economy by the mean of lifelong medications and incidental admissions plus interventions but also affecting physically and mentally productive age group having responsibly of family and at workplace. Risk factors involved in premature MI are different from that of old MI cases and so are the preventive measures.

Present study reported two youngest cases at the age of 24 years with mean age 40.08 years. Few other studies also reported MI cases at younger age of 22 years.<sup>[17,18]</sup> Other Gujarat based studies reported mean age of young MI cases as 35 years.<sup>[19,20]</sup> Lower mean age in these studies was because of lower cut-off age (<40 years) in defining young MI case. It is also found in present study that 19.8% cases were as young as below 35 years of age.

The study found male preponderance having 88.7% male cases. Male: Female ratio was found as

**Table 3: Risk factor profile of young MI cases**

Risk factor	Frequency (%)
Family history of myocardial infarction and present	28 (26.4)
Hypertension Present	5 (4.7)
Diabetes Mellitus Present	5 (4.7)
Tobacco consumption Present	65 (61.3)
Alcohol consumption Present	9 (8.5)
History of oral contraceptive pills use Present*	7 (58.3)
Sedentary life-style Present	73 (68.9)
Green leafy vegetable consumption <5 days/week	38 (35.8)
Fruit consumption <5 days/week	9 (8.5)
Acute life event during last year Present	21 (19.8)
Type of personality Type A	33 (31.1)
Body Mass Index (BMI) BMI $\geq$ 25 kg/m <sup>2</sup>	19 (17.9)
Waist : Hip(W:H) ratio $\geq$ 0.90 for male and $\geq$ 0.85 for female	49 (46.2)

\*only female cases considered in denominator (n=12)

**Table 4: Clustering of different risk factors among young myocardial infarction cases**

Number of risk factors	Frequency (%)	Cumulative frequency (%)
1	4 (3.8)	4 (3.8)
2	18 (17.0)	22 (20.8)
3	30 (28.3)	52 (49.1)
4	23 (21.7)	75 (70.8)
5	17 (16.0)	92 (86.8)
6	11 (10.4)	103 (97.2)
7	1 (0.9)	104 (98.1)
8	2 (1.9)	106 (100.0)

high as 7.8:1 in present study. In previous studies the gender distribution of young MI in men reported to be between 72-99%.<sup>[17-19,21,22]</sup>

Frequency distribution revealed that demographically more number of cases was noted from urban area (74.5%), literates (85.8%), upper socio-economic class (54.7%) and joint family (60.4%). North India based study at tertiary care centre reported 71% cases from rural area. It was because the hospital was rural area based tertiary care centre.<sup>[21]</sup> It also noticed that 105 (99.1%) cases were married persons and the finding is consistent with our study. Our study reported 52.8% manual labourer cases which were higher than 34% cases reported in North India based study. The probable reason is using different classification of occupational divisions by the study.<sup>[21]</sup>

Family history of CAD among first degree blood relatives was present in about one fourth (26.4%) patients. Other Gujarat based studies from Bhavnagar and Ahmedabad reported positive family history of CAD in 13% and 19% cases respectively.<sup>[19,20]</sup> Lower number of positive family history in Bhavnagar based study would be because of limited sample size of 30 cases.

Tobacco consumption is an important independent risk factor for CAD in young adults. Tobacco consumption was found to be as high as 61.3% among cases. Similar finding (58.7%) was noted by Mukherjee et al.<sup>[23]</sup> Narang et al. found 88.24% young MI cases having habit of tobacco consumption.<sup>[21]</sup> In same North India based study they found 70.58% cases taking alcohol while alcohol use as we found in our study was only in 8.5% cases. Status of Gujarat being dry state and alcohol consumption banned by law could be reason for same.

Among female cases out of total 12 more than half (58.3%) gave the history of OC pills usage. OC pills use is considered as one among the risk factors most of the studies done on MI of all ages. But two studies done on young MI cases showed none of the participant was using OC pills.<sup>[19,24]</sup> Socio-demographic and cultural background could be the possible reason behind it.

High blood pressure and high blood sugars are key determinants and proven risk factors of MI. In present study out of 106 cases only 5 (4.7%) reported hypertension and same number of patients were found to be diabetics. Similar findings were found in Pakistan based study having 6.6% hypertensive and 3.3% diabetic cases in young MI.<sup>[24]</sup> Gupta et al. reported higher number of young MI cases having hypertension (33%) and diabetes (37%).<sup>[19]</sup> Gujarat based study reported 16% hypertensive and 11% diabetic.<sup>[20]</sup> Narang et al. also reported 11.76% hypertensive and 23.53% diabetic in their study.<sup>[21]</sup> Kolkata based study also reported 24% diabetic and 18% hypertensive.<sup>[20]</sup>

Sedentary life style was found in 68.9% cases. Considering active and productive younger population group this figure is quite significant. Other

study also supported the finding having significant number of cases with sedentary life style.<sup>[19]</sup> With higher W:H ratio 46.2% cases found obese. Obesity among young MI using BMI criteria was as low as 17.9% only. This clearly indicates central obesity is more important risk factor than higher BMI.

Stressful life condition in term of occurrence of any acute life event in past one year was present in 19.8% cases. Narang et al. too in their study found insignificant number of cases (11.77%) having role of stress as risk factor.<sup>[21]</sup>

In UK based prospective analysis by Crowe et al. showed that risk of MI is 32% less among vegetarians.<sup>[25]</sup> In present study we found that inclusion of fruits and green leafy vegetables in regular diet as protective food were missing in 8.5% and 35.8% cases respectively. In Saurashtra region as a cultural practise vegetarian diet is predominant one. The families having predominant non-vegetarian diet are less in number. So other factors might be playing role as a risk factors.

In our study 4 (3.8%) young MI cases were having only one risk factor and that was the male gender. It indicates occurrence of MI at younger age even without any established known risk factors. Pakistan based study showed only 1 (0.01%) case had single risk factor.<sup>[24]</sup> we found 50% cases having clustering of more than 3 risk factors. Similar findings were suggested in study by Akhtar et al.<sup>[26]</sup>

### Conclusion:

Male gender, tobacco consumption, sedentary life-style and obesity are the major risk factors associated with CAD in younger age. Patients below the age of 30 years are also reported which indicates need of attention even before the age of 30 years. Very few persons were having hypertension and diabetes at younger age which indicates the likely chances of missing attention to other risk factors and life style modifications. Except male gender and family history of MI all the frequently associated risk factors like tobacco consumption, sedentary life style and obesity are well modifiable risk factors in this particular age group.

### Recommendations:



Screening at younger age not only for high blood pressure and high sugar level but also for early warning sign and symptoms should be done. Non-sedentary life style with obesity prevention and tobacco free youth should be given more importance at younger age and must be addressed as primordial and primary prevention agenda.

### Limitations:

The study included only one tertiary care unit which can pose a problem of selection bias. This study is a descriptive study with frequency analysis only, comparative studies can help more in determining level of significance for any particular risk factor.

### Declaration:

Funding: Nil

Conflict of Interest: Nil

### References:

- World Health Organization. Global health estimates: Deaths by Cause, Age, Sex and Country, 2000-2012. Geneva; 2014. Available at: [http://www.who.int/healthinfo/global\\_burden\\_disease/estimates/en/index1.html](http://www.who.int/healthinfo/global_burden_disease/estimates/en/index1.html). Accessed 31 January 2017.
- Institute of Health Metrics and Evaluation. Available at: <http://www.healthdata.org/India>. Accessed 18 January 2016.
- Yusuf S, Ounpuu S. Tackling the growing epidemic of cardiovascular disease in South Asia. *J Am Coll Cardiol*. 2001;38(3):688-89.
- Enas EA, Garg A, Davidson MA et al. Coronary heart disease and its risk factors in the first generation immigrant Asian Indians to the United States of America. *Indian Heart J* 1996;48:343-54.
- Ensa EA, Salim Yusuf. Third meeting of the international working group on coronary artery disease in South Asians. *Indian Heart J* 1995;51:99-103.
- Janus ED, Postiglione A, Singh RB et al. The modernization of Asia: Implications for coronary heart disease. *Circulation* 1996;94:2671-3.
- Yusuf S, Hawken S, Ounpuu S, Dans T, Avezum A, Lanas F, et al. Effect of potentially modifiable risk factors associated with myocardial infarction in 52 countries (the INTERHEART study): Case-control study. *Lancet* 2004;364:937-52.
- Negus BH, Willard JE, Glamann DB et al. Coronary anatomy and prognosis of young, asymptomatic survivors of myocardial infarction. *Am J Med* 1994;96:354-8.
- Mammi MV, Pavithran K, Abdu Rahiman P et al. Acute myocardial infarction in North Kerala – A 20 year hospital based study. *Indian Heart J* 1991;43:93-6.
- Oliveira A, Barros H, Azevedo A et al. Impact of risk factors for non-fatal acute myocardial infarction. *Eur J Epidemiol* 2009;24:425-32.
- Cabaniss CD. Clinical Methods: The History, Physical and Laboratory Examinations. 3rd ed. Butterworth Publishers; 2013. pp.161-3.
- Thygesen K, Alpert JS, Jaffe AS, Simoons ML, Chaitman BR, White HD, et al. Third universal definition of myocardial infarction. *Circulation* 2012; 126: 2020-35. Available from: doi: 10.1161/CIR.0b013e31826e1058. [Last accessed on 2018 June 06].
- Kumar P. Social classification - need for constant update. *Indian J Community Med* 1993; 18:2.
- World Health Organization (WHO). Global database on body mass index. WHO, 2006. Available from: [http://apps.who.int/bmi/index.jsp?introPage=intro\\_3.html](http://apps.who.int/bmi/index.jsp?introPage=intro_3.html). Accessed 01 July 2018.
- Waist Circumference and Waist-Hip Ratio Report of a WHO Expert Consultation Geneva, 8-11 December, 2008. Available from: [https://apps.who.int/iris/bitstream/handle/10665/44583/9789241501491\\_eng.pdf](https://apps.who.int/iris/bitstream/handle/10665/44583/9789241501491_eng.pdf). Accessed 29 April 2019.
- Center for Disease Control and Prevention. Epi Info version 7.2.2.6, 2018. Available from: <https://www.cdc.gov/epiinfo/index.html>. Accessed 29 April 2018.
- Rajeev Bhardwaj, Arvind Kandoria, Rajesh sharma. Myocardial infarction in young adult-risk factors and pattern of coronary artery involvement. *Niger Med J* 2014 Jan-Feb;55(1):44-47.
- Tammiraju Iragavarapu, T Radhakrishna, K Jagdish Babu, R Sanghamitra. *J Pract Cardiovas Sci* 2019;5(1):18-25.
- Saumya Gupta, Krishna K. Lakhani, Hirava Munshi. A study of risk factors in young patients of acute coronary syndrome. *International Journal of Contemporary Medical Research*. 2017;4(10):2144-2147.
- Jayesh Prajapati, Hasit Joshi, Sibasis Sahoo, Kapil Virpariya, Meena Parmar, Komal Shah. Age related differences of novel atherosclerotic risk factors and angiographic profile among Gujarati acute coronary syndrome patients. *J Clin Diagn Res*. 2015 Jun; 9(6):OC05-OC09.
- Monika Bhandari, Vikas Singh, Deepesh Venkatraman. *Nig J Cardiol* 2017;14(2):84-91.
- Udit Narang, Ankit Gupta, Sunita Gupta, Nitin Gupta, Sandeep Joshi, Sidharth Sharma. *International Journal of Contemporary Medical Research*. 2018;5(6):F14-F21.
- Mukherjee D, Hsu A, Moliterno DJ, Lincoff AM, Goormastic M, Topol EJ. Risk factors for premature coronary artery disease and determinants of adverse outcomes after revascularization in patients  $\leq$  40 years old. *Am J Cardiol* 2003;92:1465-7.
- Abdul Wajid Khan Faisal, Mohammad Ayub, Tariq Waseem, Rao Shahzad Abdul Tawwab Khan, Syed Sibit Hasanain. Risk factors in young patients of acute myocardial infarction. *J Ayub Med Coll Abbottabad* 2011;23:12-14.
- Francesca L Crowe, Ruth C Travis, Tomothy J Key. Risk of hospitalization or death from ischemic heart disease among British vegetarians and nonvegetarians: results from the EPIC-Oxford cohort study. *Am J Clin Nutr* 2013 Mar;97(3):597-603.
- Akhtar J, Islam N, Khan J. Risk factors and outcome of ischemic heart disease in young Pakistani adults. *Specialist* 1993;9:123-6.