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Prevalence of Acute Myocardial Infarction in Young Adults and Conventional Risk Factors

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Abstract **Original Research Article**

Introduction: Smoking, diabetes mellitus, hypertension, dyslipidemia, sedentary life style, and positive family history are known as conventional risk factors of coronary artery disease (CAD) and the prevalence of it varies across populations. There is paucity of data in our country about the prevalence of risk factors for acute myocardial infarction (AMI) in young adults≤35 year. ***Aim of the Study:***This study aims to assess Prevalence of Acute Myocardial Infarction (AMI) in Young Adults with Conventional Risk Factors**.** ***Material & Methods:*** It is an observational cross-sectional single center study conducted in Jashore Medical College Hospital. A total of 1167 consecutive patients admitted with the diagnosis of Acute Myocardial Infarction (ST Elevation Myocardial Infarction: STEMI, and Non ST Elevation Myocardial Infarction: NSTEMI) were enrolled for the study from July 2019 to June 2020. Of these total patients 37 were in the age group of ≤35 year. A proforma was designed to collect patient information which included age, gender, diabetes mellitus, dyslipidemia, hypertension, smoking, family history of coronary artery disease (CAD), level of physical activity, and Body Mass Index(BMI). ***Results:*** Of the total study population (1167) a significant number (37) i.e, 3.17% fall in younger adult's ≤35 year. The conventional risk factors for AMI smoking, dyslipidemia and family history are major in both age groups but these risk factors are more prevalent in young adults (≤35 year) in which smoking in male 25(67.57%) vs female 0, dyslipidemia in male 34(91.89%) vs female 2(5.41%) and family history of MI in male 33(89.19%) vs female 2(5.41%). ***Conclusion:*** Present study showed high prevalence of Acute Myocardial Infarction in younger age group ≤ 35year. Conventional risk factors were present in both the age groups, but smoking, dyslipidemia and family history of CAD were significantly higher in younger age group.

Key words: Acute Myocardial Infarction, Diabetes, Dyslipidemia, Hypertension, Smoking.

INTRODUCTION

Coronary artery disease (CAD) is a leading cause of morbidity and mortality in both developing and developed countries [1]. Epidemiological studies have established cigarette smoking [2], diabetes mellitus (DM) [3], hypertension (HTN) [4], dyslipidemia, family history, obesity, and sedentary life style [5] as independent risk factors for CAD and have been labeled as conventional risk factors [6]. Acute Myocardial Infarction includes Non-ST elevation myocardialinfarction (NSTEMI) and ST elevation myocardial infarction (STEMI) which needs urgent or emergency care to reduce mortality or morbidity. Reduction of these risk factors has been convincingly shown to reduce the risk of future events [2, 7]. Prevalence of these risk factors may vary across populations [8]. Our study aims to assess the prevalence of conventional risk factors in patients who were admitted with diagnosis of AMI particularly in younger age group in Jashore Medical College Hospital.

OBJECTIVES

a) General objective

- To assess prevalence of acute myocardial infarction in young adults

b) Specific objectives

- Identify the clinical profile of myocardial infarction and common risk factors.

METHODOLOGY AND MATERIALS

It is an observational cross-sectional single center study conducted in Jashore Medical College Hospital. A total of 1167 patients admitted with the diagnosis of Acute Myocardial Infarction (NSTEMI, and STEMI) were enrolled for the study from July 2019 to June 2020. A proforma was designed to collect patient information which included age, gender, diabetes mellitus, dyslipidemia, hypertension, smoking, family history of Coronary artery disease, BMI, and levelof physical activity.

Definition of Acute Myocardial Infarction was adapted from the third universal definition of myocardial infarction (Eur Heart J 2012; 33:2551-2267) as a rise and or fall of cardiac troponin with at least one value above the 99th percentile of upper refference limit with at least one of the following:

- Ischemic symptoms
- Significant new or presumed new ST=T change
- New onset LBBB
- Appearance of new pathological Q wave
- Echocardiographic evidence of new regional wall motion abnormality or viable myocardial loss.

Diabetes mellitus was defined as previously diagnosed cases or fasting plasma glucose of ≥6.1mmol/l or ≥11.1 mmol/l 2 hour after 75g oral glucose after overnight fasting.

Hypertension was defined as the previously diagnosed cases or blood pressure of >140/90 mmHg on at least two occasions or in single sitting with evidence of end organ damage.

Dyslipidemia was defined as Total cholesterol (TC) >200mg/dl or Low density lipoprotein (LDL-C)>130mg/dl or Triglyceride (TG) >150mg/dl or High density lipoprotein (HDL=C) <40mg/dl in male and <45mg/dl in female.

Obesity was defined as BMI ≥30kg/m2and overweight as (25-29.9)kg/m2. Positive family history was taken as diagnosis of CAD in first degree relatives in age less than 50 year in male and less than 55 year in female.

Statistical analysis: Continuous variables were expressed as mean with range and categorical variables as count with percentage. Groups were compared using Chi Square test (cross tabulation method) for categorical variables. P value less than 0.05 was considered statistically significant with 95% confidence interval. Data were analyzed using the Statistical Package for the Social Sciences (SPSS) version 22.0.

RESULTS

During the study period we identified 1167 patients with Acute Myocardial Infarction of which 37 patients were finally selected in young age group of ≤35year by excluding the patients where proper data of conventional risk factors were not available. Of the total study population (1167) a significant number (37) i.e, 3.17% fall in young adults ≤35 year shown in Fig-1.Table-1 shows of the total study population male were 1039(89.03%) and female were 128(10.97%) in gender distribution. In age >35year were 1130(96.83%) and≤ 35year were 37(3.17%).Weight of participants below 60 kg were 669(57.33%) and more than 60 kg were 498(42.67%). Regarding residency rural were 939(80.46%) and urban were 228(19.54%). Education of the participants were with No education 128(10.97%), Primary 527(45.16%), Secondary 270(23.14%) and Graduation & above 242(20.74%). Of the total study population 1010(86.55%) had a family history of MI where 157(13.45%) had no family history of MI. The participants were further divided into two groups on the basis of their age as ≤35 year and >35 year among which 96.83 % were in >35year and 3.17% were in ≤35year group. Mean value for total cholesterol (TC) was 201.03 mg/dl, which ranged from 117 mg/dl to 319 mg/dl. Mean value for low-density lipoprotein cholesterol (LDL-C) was 122.87 mg/dl, which ranged from 71 mg/dl to 188 mg/dl. Mean value for Triglyceride (TG) was167.29 mg/dl, which ranged from 79 mg/dl to 462 mg/dl. Mean value for High-density lipoprotein-cholesterol (HDL-C) was 39.14 mg/dl, which ranged from 19 mg/dl to 62 mg/dl. The prevalence of CAD risk factors among the study population is summarized in Table-2. Hypertension was present in 540(46.27%) in the total study population where 479(41.05%) in male and 61(5.23%) in female and this was the most frequently observed risk factors in Acute Myocardial Infarction with P=0.888, whereas prevalence of smoking was seen in 455(38.99%) where 396(33.93%) in male vs59(5.06%) in female (P<0.05). Diabetes was present in 124(10.63%) in male vs33 (2.83%) in female among 1167 study populations with P value of 0.077. The prevalence of CAD risk factors among the study population by age is summarized in Table 3. Smoking is by far the most common observed risk factor in age≤35 year which was seen in male 17(1.46%) and 0 in female where in age>35year group this was seen in male 422(36.16%) and in female 16(1.37%). Among 1167 study population hypertension was seen in male 12(1.03%) and in female 1(0.09%) in age ≤35 year group and in age >35 year group this was seen in male 441(37.79%) and female in 86(7.37%). Diabetes was seen in male 5(0.43%) and female in 1(0.09%) in age ≤ 35 year group and in age >35 year group this was seen in male 127(10.88%) and female in 24(2.06%).The blood lipid analysis showed that the

mean level of total cholesterol was 201.03 mg/dl (IQR 117-319mg/dl), LDL-C was 122.87 mg/dl (IQR, 71-188 mg/dl), HDL-C was 39.14 mg/dl (IQR, 19-62) and Triglyceride was 167.29 mg/dl (IQR, 79-462 mg/dl). From Table-4 TC, LDL-C and TG all three levels were lower in men than women and HDL-C was seen higher in men compared to women though the difference were non-significant (p≥0.05).As shown in Fig.-2 The conventional risk factors for ACS smoking, dyslipidemia and family history are major in both age groups but these risk factors are more prevalent in younger (≤35 year) in which smoking in male 25(67.57%) vs female 0, dyslipidemia in male 34(91.89%) vs female 2(5.41%) and family history of MI in male 33(89.19%) vs female 2(5.41%).

Table-1: Demographic and study characteristics (N=1167)

Characteristic	N	%
Gender		
Male	1039	89.03
Female	128	10.97
Age		
≤35 year	37	3.17
>35 year	1130	96.83
Weight		
Below 60 kg	669	57.33
More than 60 kg	498	42.67
Residency		
Urban	228	19.54
Rural	939	80.46
Education		
No education	128	10.97
Primary	527	45.16
Secondary	270	23.14
Graduation/Above	242	20.74
Family History of MI		
Yes	1010	86.55
No	157	13.45

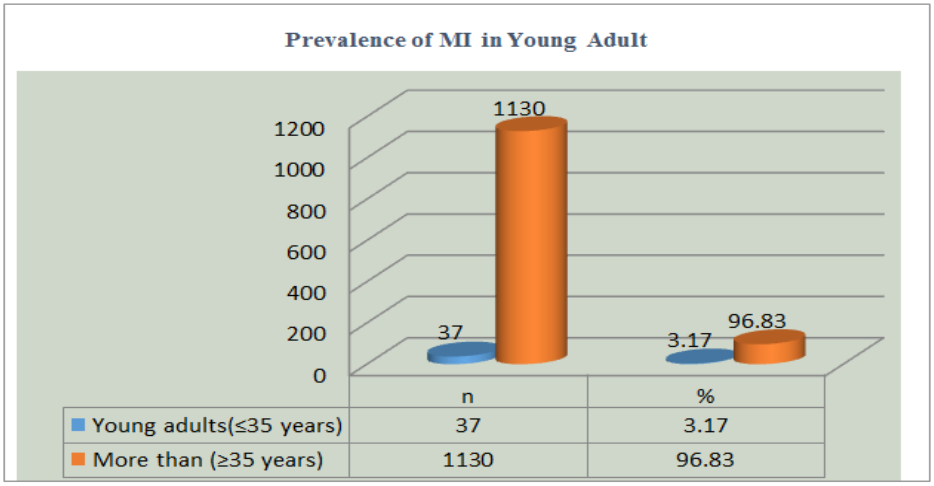

Fig-1: Prevalence of MI in Young Adult (N=1167)

Table-2: Prevalence of risk factors according to sex (N=1167)

Risk factors	patients (N=1167)		Male(N=1039)		Female(N=128)		P value
	N	%	N	%	N	%	
Smoking	455	38.99	396	33.93	59	5.06	<0.05
Hypertension	540	46.27	479	41.05	61	5.23	0.888
Diabetes	157	13.45	124	10.63	33	2.83	0.077
Alcoholic	15	1.29	15	1.29	0	0.00	0.077
Total	**1167**	**100.00**	**1014**	**86.89**	**153**	**13.11**	

Table-3: Prevalence of risk factors by age (N=1167)

Risk factors	Patients (N=1167)		≤35 year(N=37)				>35 year(N=1130)				P value
	N	%	Male		Female		Male		Female		
			N	%	N	%	N	%	N	%	
Smoking	455	38.99	17	1.46	0		422	36.16	16	1.37	<0.05
Hypertension	540	46.27	12	1.03	1	0.09	441	37.79	86	7.37	0.888
Diabetes	157	13.45	5	0.43	1	0.09	127	10.88	24	2.06	0.077
Alcoholic	15	1.29	1	0.09	0		14	1.2	0	0	
Total	**1167**	**100.00**	**35**	**3.01**	**2**	**0.18**	**1004**	**86.03**	**126**	**10.8**	

Table-4: Pattern of Lipid profiles in study populations by sex (N=1167)

Lipid Profiles	Patients (N=1167)		Male(N=1039)		Female(N=128)		P value
	N	%	N	%	N	%	
TC (IQR)(mg/dl)	**201.03(117-319)**		**199.90(117-319)**		**203.29 (118-302)**		
TC>200 mg/dl(%)	498	42.67	421	36.08	77	6.60	0.77
TC≤200 mg/dl(%)	669	57.33	618	52.96	51	4.37	
LDL-C (IQR)(mg/dl)	**122.87(71-188)**		**120.74(44-188)**		**127.15(47-259)**		
LDL-C>130 mg/dl(%)	470	40.27	415	35.56	55	4.71	0.77
LDL-C≤130 mg/dl(%)	697	59.73	624	53.47	73	6.26	
HDL-C (IQR)(mg/dl)	**39.14 (19-62)**		**39.97(19-53)**		**37.47(20-62)**		
HDL-C ≥40 mg/dl(%)	526	45.07	458	39.24593	68	5.83	0.67
HDL-C <40 mg/dl(%)	641	54.93	581	49.78578	60	5.14	
TG (IQR)(mg/dl)	**167.29(79-462)**		**166.19(79-340)**		**169.50(84-462)**		
TG >150 mg/dl(%)	725	62.13	646	55.36	79	6.77	0.48
TG≤150 mg/dl(%)	442	37.87	393	33.68	49	4.20	

Table-5: Distribution of dyslipidemia by sex (N=1167)

Subject	patients (N=1167)		Male(N=1039)		Female(N=128)		P value
	N	%	N	%	N	%	
No dyslipidemia	256	21.94	227	21.85	29	2.49	0.63
Dyslipidemia	911	78.06	812	67.18	99	8.48	
Total	1167	100	1039	89.03	9	10.97	

Table-6: Distribution of dyslipidemia by Age (N=1167)

Subject	Patients (N=1167)		≤35 year(N=37)				>35 year(N=1130)				P value
	N	%	Male		Female		Male		Female		
			N	%	N	%	N	%	N	%	
No dyslipidemia	256	21.94	1	0.09	0	0	160	13.71	95	8.14	0.63
Dyslipidemia	911	78.06	34	2.91	2	0.17	590	50.56	287	24.42	
Total	**1167**	**100**	**35**	**3**	**2**	**0.17**	**750**	**64.27**	**380**	**32.56**	

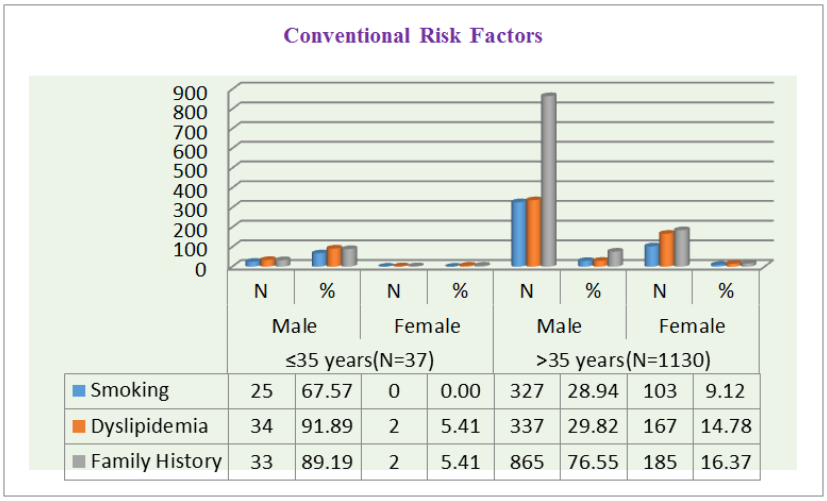

Fig-2: Distribution of Conventional Risk Factors (N=1137)

DISCUSSION

In the current study the total population was divided into two groups: ≤35year and >35year. Younger patients (age ≤35 year) with AMI event were 3.17%. Kalimuddinet al. [9] in a study showed 3% of AMI in the age group of ≤20year. Fournier JA et al.[10]. Showed AMI in 4.1% in patient's age ≤40year. It is a matter of concern that younger patients' percentage is increasing for acute coronary syndrome(ACS).The study done by Adhikariet al. [11] revealed clear preponderance of smoking, hypertension and dyslipidemia as common risk actors in acute ST-Elevation myocardial inarction as in our current study. The incidence of acute coronary syndrome (ACS) is lower in women than men in all age groups [12], which is consistent with our study. The finding that ACS event is more common in male patients in our study is consistent with report from many studies around the globe Observational Global Registry of Acute Coronary Events (GRACE) [13]. We found high prevalence of Dyslipidemia (78.06%), Hypertension (46.27%), Smoking (38.99%), and Diabetes (13.45%) in our study population. The study conducted by Adhikariet al. [11] have lower prevalence of dyslipidemia, 45.5% compared to our 78.06 which is much higher, it is probably due to our inclusion of raised TG in the definition of dyslipidemia[14]. Cigarette smoking plays a critical role in the development of CAD. Smoking is considered one of the most important modifiable risk factors for increasing cardiovascular disease. In our study, the prevalence of current smoking was 33.93% in male and 5.06% in female. Smoking was significantly higher in male population in overall, but more common in younger age group in our study. These results are similar to other recent studies. It was the second most frequently encountered conventional risk factor with acute STEMI living in Turkish study population [15]. Diabetes mellitus (DM) is a major health challenge in many Asian populations. However its prevalence is somewhat lower than that observed in developed countries [16], it is significant among South Asians, having 2% prevalence in rural South Asia but approaching 20% prevalence in urban South Asia and amongst immigrant South Asians [17-19]. In our study it is 3rd common among the conventional risk factors only after Hypertension and Smoking. Prevalence of DM in INTERHEART study was 26% in women, 16% in men [8]. The diabetes is a powerful risk factor in women. The higher prevalence of diabetes in women than in men is not consistent with our study (Male10.63% vsFemale2.83%). This could due to higher prevalence of AMI in young male and deprivation of hospitalization of the female counterpart. Hypertension is one of the main factors leading to atherogenesis and the development of vulnerable plaques whose instability or rupture is responsible for the development of acute coronary syndrome (ACS). In general population, the prevalence of hypertension rises progressively with age in both male and female. In GUSTO -1 trial which enrolled 41021 STEMI patients prevalence of a history of previous hypertension was 38.1% (15544 of 41021) [20]. Similarly, In GISSI-2 with 20491STEMI patients, history of HTN was present in about 35% of the whole population [21]. In epidemiological studies performed in N-STEMI patients, chronic HTN is the most prevalent risk factors [22]. Similar to these studies prevalence of HTN in-patient presented with ACS at our center was 46.27%. From all the registries and the data available up to now [20, 21, 23-25], ACS patients with hypertension are more likely to be male and older age similar to that of our study with HTN in male being 41.05 % and 5.23% in female. An observational study has shown untreated dyslipidemia as a strong predictor of in-hospital mortality [26]. Clinically significant changes in lipid occur after an ACS event [27]. From the time of admission to next morning TC and LDL-C level can undergo a change of 7% and 10% respectively, in patients with MI and 5% and 6% in those with unstable angina [31]. Our study showed 73.5% had at least one alteration in lipid levels. On other hand this may hint underestimation of the true prevalence of dyslipidemia as risk factors for Nepalese population. In previous observational study [28], every 1 mg/dl increment in HDL-C was reported to be associated with 2%-3% decrease risk of CVD in adult. In our study 54.93% of population has HDL-C < 40 mg/dl, which co-relates that HDL-C level is one of the conventional important risk factors for ACS. Elevated levels of TG are an independent risk factor for CHD [29]. Our study demonstrated TG level >150mg/dl as 62.13%. A reduction of 1% in TC level has been shown to reduce the risk for coronary artery disease [30] assuming that the reverse is true, our study does not correlate with previous studies as in our study 57.33% of population have TC level < 200 mg/dl, and suffered acute coronary syndrome event. LDL-C >130 mg/dl is seen in smaller percentage of 40.27% compared to 59.73% of LDL-C ≤130 mg/dl. This may point out that even lower level of LDL-C can be a risk factor for ACS even [31, 32] and future study needs to validate more accurate event. Our study clearly shows that conventional risk factors occur in most of the ACS patients in cluster. Adhikari CM et al. [11] showed that70% population had more than 2 risk factors which is same in our study too. All the above data from studies show that most of the ACS patients have cluster of conventional risk factors and primary prevention against all of the four conventional cardiovascular risk factors should be addressed by education, diet, exercise and pharmacologically.

LIMITATIONS OF THE STUDY

This study has some limitations, such as its observational design and small sample size. Doses of statin taken by patient vary and many are not documented and Lipid profile was taken at variable time within 24 hours. Nonconventional risk factors were not evaluated in this study.

Conclusion and Recommendations

Present study showed high prevalence of Acute Myocardial Infarction in younger age group with conventional risk factors especially smoking, dyslipidemia and positive family history for coronary artery disease suggesting the need for aggressive risk factor reduction in this age group as well as in general population.

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