

# Acute Myocardial Infarction in Very Young Filipino Adults

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## Abstract

**Introduction:** Acute myocardial infarction (AMI) is rare in “very young” patients and studies among Filipinos are scarce. The objective of this study is to determine the prevalence, clinical, echocardiographic and angiographic features, and outcome of this population.

**Methods:** A retrospective study of patients aged 19 to 30 years old who were diagnosed with AMI at the Philippine Heart Center from 2012 to 2016 was done.

**Results:** The prevalence of AMI in very young Filipino adults at our institution was 0.93% (11/1182). The mean age was 26.5±3.4 years with a male predominance (82%). Chest pain was the most common symptom (91%). More than half of the patients did not have hereditary diseases. Eight patients were smokers (72%). There was one case of illegal drug use (methamphetamine) (9%). There were only two cases of non-ST elevation myocardial infarction (NSTEMI) (18%). ST elevation myocardial infarction (STEMI) of the anterior wall was seen in four cases (36%), inferior wall in three cases (27%) and anterolateral wall in two cases (18%). Six patients (45%)

had left anterior descending artery (LAD) involvement. Two patients (18%) had right coronary artery (RCA) involvement. Two patients (18%) had both LAD and RCA involvement. The youngest patient, a 19-year-old female with Takayasu arteritis, had three-vessel involvement. Five patients (45%) underwent percutaneous coronary involvement (PCI) of the LAD while two had PCI of the RCA (18%). All patients were discharged improved.

**Discussion:** Acute myocardial infarction (AMI) in the young has not been extensively studied among Asians. Chest pain is the most common clinical presentation with STEMI being more frequent than NSTEMI in this age group. Male gender and smoking were the most common risk factors.

**Conclusion:** Early recognition and prompt management of AMI, particularly revascularization (if indicated), are of paramount importance to optimize outcomes.

**Keywords:** acute myocardial infarction, young, Filipinos, smokers

## Introduction

Acute myocardial infarction (AMI) is a major cause of death and disability worldwide.<sup>1</sup> The Framingham Heart Study reported the incidence of AMI to be 12.9 per 1000 among men who were 30 to 40 years old and 5.2 per 1000 among women who were 35 to 44 years old.<sup>2</sup> Wolfe and Vacek retrospectively studied 2,400 patients with AMI and reported an incidence of 1.5% among those who were <35 years old.<sup>3</sup> Furthermore, Gotsman et al. reported the incidence of AMI among those who were <30 years old to be 0.4% (15/3,758).<sup>4</sup> This highlights the uncommon occurrence of patients in this age group.

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To date, there has been no universally accepted age cut-off to define young in both local and international studies, but the age range has been observed to be between 30 to 45 years old.<sup>3-11</sup> In our cohort, we defined “very young” as those who had AMI when they were 30 years of age or younger similar to the study by Gotsman et al. and Puricel et al.<sup>4,5</sup> The scarcity of published literature on young Filipinos with AMI has prompted the authors of this study to provide new data and highlight the practical issues involved in their management. As of this writing, there are no published data in our institution in this age group. Our study primarily aims to provide updated and relevant data on the prevalence, clinical, echocardiographic and angiographic features, and outcome of AMI in the very young Filipinos in our institution.

## Methods

A retrospective review of the medical records of patients with AMI who were 19 to 30 years old from January 1, 2012–December 31, 2016 at the Philippine Heart Center

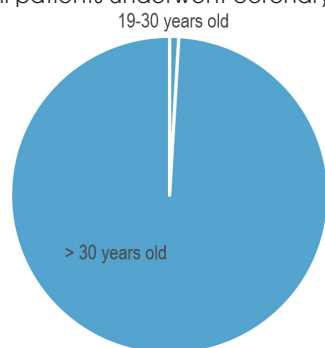
was conducted after approval was given by the Institutional Ethical Review Board. Patients who did not meet the criteria for AMI<sup>1</sup> and did not fall in the specified age group were excluded. Purposive sampling was employed. Medical records of admitted patients were reviewed at the medical records section. All data were encoded in password-protected Microsoft Excel spreadsheets. A code number was assigned for each patient. To maintain anonymity, a separate spreadsheet that linked the study code to the patient's name was made. Only the primary investigator had access to the file. Descriptive statistics was used to measure central tendency (e.g. mean, median) and spread (e.g. SD). Categorical data were expressed using frequency and percentage distribution. IBMSPSS version 21 was the statistical software used.

## Results

There were a total of 1,182 cases of AMI from 2012 to 2016 at the Philippine Heart Center. Among these patients, there were only 11 cases of AMI who were 19 to 30 years old, making the prevalence 0.93% as seen in Figure 1.

The mean age was  $26.5 \pm 3.4$  years with male predominance (82%). The most common symptom was chest pain (90%). Only one patient had a chief complaint of shortness of breath (9%). A majority did not have comorbid illnesses (90%). Only one patient had essential hypertension. More than half of these patients did not have any known hereditary diseases. Thirty percent had a family history of coronary artery disease ( $n=3$ ), while 20% had a family history of hypertension ( $n=2$ ). Alcoholic beverage drinking ( $>2$  standard drinks) were noted in nine patients (82%). Seventy-three percent were smokers ( $n=8$ ). Illegal drug use (methamphetamine) was only reported in one case (9%). The patients had a mean total cholesterol level of  $154.2 \pm 13.65$  mg/dL and a mean low density lipoprotein (LDL) level of  $99.5 \pm 14.39$  mg/dL. (Table I)

Nine patients had STEMI (82%) while two had NSTEMI (18%). STEMI of the anterior wall was seen in four cases (36%), inferior wall in three cases (27%) and anterolateral wall in two cases (18%). All patients underwent coronary angiography.



**Figure 1.** Prevalence of AMI among patients 19 to 30 years old at PHC from 2012 to 2016 ( $n = 11$ ,  $N = 1,182$ )

**Table I.** General characteristics of AMI cases 19 to 30 years old at PHC from 2012 to 2016 ( $N=11$ )

	f (%)
Male gender	9 (82%)
Chief complaint	
Chest pain	10 (91%)
Shortness of breath	1 (9%)
Comorbid illnesses	
Hypertension	1 (9%)
Takayasu arteritis	1 (9%)
Family history	
Coronary artery disease	3 (27%)
Hypertension	2 (18%)
Social history	
Cigarette smoker	8 (73%)
Illegal drug use	1 (9%)
Length of hospital stay	
1-3 days	1 (9%)
4-6 days	4 (36%)
$\geq 6$ days	6 (55%)
Outcome	
Discharged improved	11 (100%)
Expired	0
	<b>mean <math>\pm</math> SD</b>
Age (years)	$26.5 \pm 3.4$
Lipid profile	
Total cholesterol	$154.2 \pm 13.65$
Triglycerides	$150.5 \pm 112$
High density lipoprotein (HDL)	$34.5 \pm 5.8$
Low density lipoprotein (LDL)	$99.5 \pm 14.39$
Fasting blood glucose	$5.2 \pm 1$

**Table II.** Echocardiographic and angiographic findings of patients 19 to 30 years old with AMI at PHC from 2012 to 2016 ( $N=11$ )

	f (%)
Type of AMI	
STEMI	9 (82%)
Anterior	4 (36%)
Anterolateral	2 (18%)
Inferior wall	3 (27%)
NSTEMI	2 (18%)
Left ventricular ejection fraction	
Normal (52-72%)	6 (55%)
Mild (41-51%)	1 (9%)
Moderate (30-40%)	3 (27%)
Severe ( $<30\%$ )	0
No. of vessels involved	
1VD	8 (73%)
2VD	2 (18%)
3VD	1 (9%)
Specific vessel involvement	
LAD	5 (45%)
LAD with left main involvement	1 (9%)
RCA	2 (18%)
LAD and RCA	2 (18%)
LAD, LCX, RCA with LMI	1 (9%)

**Table III. Patients 19 to 30 years old with AMI who underwent revascularization, 2012-2016 (N=11)**

	f (%)
PCI	7 (64%)
LAD	5 (45%)
RCA	2 (18%)
CABG	0
Medical management only	4

Six patients (45%) had left anterior descending artery (LAD) involvement. Two patients (18%) had involvement of the LAD and right coronary artery (RCA). Two patients (18%) had RCA involvement. The youngest patient was a 19-year-old female with Takayasu arteritis who presented with chest pain and had STEMI of the anterior wall. Medical management and referral to Rheumatology were done. Corticosteroids were given to control the disease. (Table II)

On transthoracic echocardiography, 55% of the patients (n=6) had normal left ventricular (LV) function (Ejection fraction or EF of >52%). There was one case with mild LV dysfunction (EF 41-51%). There were three cases with moderate LV dysfunction (EF 30-40%) (27%). None had severe (EF <30%) LV dysfunction. Only seven patients (64%) underwent percutaneous coronary involvement (PCI). Five patients (45%) underwent PCI of the LAD while two had PCI of the RCA. The remaining four patients (36%) did not consent to any intervention and received only medical management. All patients were discharged improved. (Table III)

## Discussion

Acute myocardial infarction (AMI) in the young has not been extensively studied among Asians. Studies are limited and outdated. The lack of a standardized or uniform age cut-off has made direct comparisons difficult among the different nationalities. For instance, in our study, we reported a five-year prevalence rate of 0.93% among patients who had AMI at age 30 or younger. In the Gulf Registry of Acute Coronary Events, 7.6% (n=121) of the patients who had ACS were <40 years old<sup>6</sup> while the Thai ACS registry reported a prevalence of 5.8% (n=544) among patients who were <45 years old when they had ACS.<sup>7</sup>

While relatively rare, it is also possible that AMI in the young may be underreported. Jamil et al. noted that possible ignorance of coronary artery disease coupled with a false sense of security attributable to young age prevented the young from promptly seeking medical advice.<sup>8</sup> Most of the patients who had AMI in our study were male (82%) similar to the other studies.<sup>3-11</sup> The protective effects of estrogen may explain the low incidence of AMI among women who are pre-menopausal.<sup>12</sup> The mean age of our patients was 26.5±3.4 years which was similar to the study of Gotsman et al.<sup>4</sup> and Puricel et al.<sup>5</sup>

Typical symptoms of AMI have been consistently described in the young.<sup>4</sup> Similar to the other studies, chest pain was the most common presentation with STEMI being more common than NSTEMI in this age group.<sup>3-11</sup> Rather than stable or worsening angina as seen in older patients, the first onset of angina rapidly progresses to AMI in the very young which is likely due to lack of ischemic pre-conditioning, which is more evident in adults with history of brief episodes of chest pain.<sup>13</sup>

Etiologies of AMI in this age group can be grouped into those with angiographically normal or abnormal coronary arteries. The former can be brought about by coronary artery thrombosis due to hypercoagulable states (eg. nephrotic syndrome); coronary artery embolism which can be due to an infectious (eg. infective endocarditis) or non-infectious etiology (eg. non-bacterial thrombotic endocarditis) as seen in systemic lupus erythematosus; and coronary spasm (e.g. cocaine or amphetamine use), while the latter can be due to accelerated atherosclerosis, spontaneous rupture of the coronary arteries; aneurysms or anatomical abnormalities of the coronary arteries.<sup>9,10</sup>

Smoking was the most common risk factor identified in our patients (73%). Most of the reported patients who had AMI at a young age were former or current smokers, making cigarette smoking an important factor in developing an acute coronary event both in the young and across the lifespan.<sup>3</sup> The mechanism has been described to be multifactorial and include atherosclerosis and thrombosis brought about by endothelial dysfunction, vasospastic angina even in patients with insignificant coronary artery disease, disorder of oxygen transport with the use of nicotine which increases catecholamine release subsequently causing an increase in blood pressure and heart rate.<sup>10</sup> Primary prevention programs on smoking cessation may have a positive impact in further decreasing its incidence. In a pooled cohort study among the Danish population, smoking cessation reduced the risk of another AMI.<sup>14</sup> In a study among Korean men, cessation of smoking reduced the risk of not only AMI, but also subarachnoid hemorrhage and ischemic stroke.<sup>15</sup>

A family history of coronary artery disease was the second most common risk factor in our study similar to other studies.<sup>7</sup> Other risk factors reported in other studies include dyslipidemia<sup>5</sup>, obesity, oral contraceptive pill use and socioeconomic factors<sup>12</sup>, all of which may play a synergistic role in ACS development. Contrary to literature in older AMI patients, dyslipidemia was not prevalent in our cohort, suggesting a different mechanism that involves less of atherogenesis and more of inflammation and sympathetic surges.<sup>9,10</sup> However, our sample size is small to suggest such causality.

Among those who underwent coronary angiography, left anterior descending (LAD) artery involvement is commonly

seen.<sup>5,8,11</sup> Reperfusion therapy using percutaneous coronary intervention (PCI) was administered more frequently in the young which could be one of the plausible explanation of the good outcomes.<sup>5,7,8,11</sup> PCI is still the primary mode of revascularization recommended in PCI-capable hospitals for both genders, regardless of age, as recommended by the latest guidelines.<sup>16</sup> In addition, younger patients have been reported to have a lower in-hospital mortality rate, lower incidence of congestive heart failure and a shorter length of stay. Conversely, older age still remains an independent predictor of death.<sup>7</sup> With prompt recognition and aggressive management, good clinical outcome has consistently been reported.<sup>3-11</sup>

## Conclusion

Acute myocardial infarction (AMI) in the young is a very uncommon occurrence. Thus, without a high index of suspicion, the diagnosis may be missed which can possibly lead to increased morbidity and mortality. Early recognition and institution of aggressive measures such as revascularization are therefore of paramount importance.

## References

1. Thygesen K, Alpert J, Jaffe A, Simoons M, Chairman B and White H. Third universal definition of myocardial infarction. *European Heart Journal* (2012) 33: 2553-2556)
2. Kannel WB, Abbott RD. Incidence and prognosis of unrecognized myocardial infarction. An update on the Framingham study. *N Engl J Med* 1984; 311:1144.
3. Wolfe MW and Vacek JL. Myocardial infarction in the young. Angiographic features and risk factor analysis of patients with myocardial infarction at or before the age of 35 years. *Chest*. 1988. nov;94(5): 926-30.
4. Gotsman I, Lotan C and Mosseri M. Clinical manifestations and outcome of acute myocardial infarction in the very young. *Isr Med Assoc J*. 2003 Sep;5(9):633-6.
5. Puricel S, Lehner C, Oberhansli M, Rutz T, Togni M, Stadelmann M, Moschovitis A, et al. Acute coronary syndrome in patients younger than 30 years - aetiologies, baseline characteristics and long-term clinical outcome. *Swiss med Wkly*. 2013;143:w13816.
6. Panduranga P, Sulaiman K, Al-Zakwani I and Abdelrahman S. Acute Coronary Syndrome in Young Adults from Oman: Results from the Gulf Registry of Acute Coronary Events. *Heart Views*. 2010 Oct-Dec; 11(3): 93-98.
7. Tungsubutra W, Tresukosol D, Buddhari W, Boonsom W, Sanguanwang S and Srichaiveth B. Acute coronary syndrome in young adults: the Thai ACS Registry. *J Med Assoc Thai*. 2007 Oct;90 Suppl 1:81-90.
8. Jamil G, Jamil M, AlKharzaji H, Haque A, Chedid F, Balasubramanian M, Khairallah B, et al. Risk factor assessment of young patients with acute myocardial infarction. *Am J Cardiovasc Dis*. 2013; 3(3): 170-174.
9. Osula S, Bell GM, Hornung RS. Acute myocardial infarction in young adults: causes and management. *Postgrad Med J* 2002; 78:27-30.
10. Barbarousi M, Michalopoulou A and Vitos M. Acute Coronary Syndromes in the Young. *Hospital Chronicles* 2014; 9(1): 42-47.
11. Shah V and Jain U. Clinical profile of acute myocardial infarction in young adults. *International Journal of Medical Science and Public Health*. 2016;5(8): 1709-1712.
12. Idris N, Aznal SS, Chin S, Ahmad WAW, Rosman A, Jeyaindran S, et al. Acute coronary syndrome in women of reproductive age. *Int J Womens Health*. 2011; 3: 375-380.
13. Abete P, Testa G, Cacciatore F, Della-Morte D, Galizia G, Langellotto A, et al. Ischemic Preconditioning in the Younger and Aged Heart. *Aging Dis*. 2011 Apr; 2(2): 138-148.
14. Godtfredsen NS, Osler M, Vestbo J, et al. Smoking reduction, smoking cessation, and incidence of fatal and non-fatal myocardial infarction in Denmark 1976-1998: a pooled cohort study *Journal of Epidemiology & Community Health* 2003;57:412-416.
15. Song YM and Cho HJ. Risk of stroke and myocardial infarction after reduction or cessation of cigarette smoking: a cohort study in Korean men. *Stroke*. 2008 Sep;39(9):2432-8.
16. Ibanez B, James S, Agewall S, Antunes MJ, Bucciarelli-Ducci C, Bueno H, et al. 2017 ESC Guidelines for the management of acute myocardial infarction in patients presenting with ST-segment elevation: The Task Force for the management of acute myocardial infarction in patients presenting with ST-segment elevation of the European Society of Cardiology (ESC). *European Heart Journal*, Volume 39, Issue 2, 7 January 2018, Pages 119-177, <https://doi.org/10.1093/eurheartj/ehx393>

## Appendices

**Appendix A. Age and gender distribution of AMI cases <30 years old at PHC (2012-2016)**

Age (yrs)	Male	Female	Total
18-20	0	1	1
21-23	1	0	1
24-26	2	1	3
27-30	6	0	6
Total	9	2	11

