ORIGINAL ARTICLE

A Study of Risk Factors in Acute Myocardial Infarction of Adults Ages 18 To 45 in A Tertiary Referral Centre for Cardiology Services in Malaysia's East Coast.

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ABSTRACT

INTRODUCTION: Acute myocardial infarction (AMI) is the major cause of death worldwide. There is limited data on the characteristics of afflicted young adults. A recent increase in recreational drugs has been associated. No local studies have ever reliably attributed this to young adults. This study aims to study the characteristic of AMI cases among young adults and these associations. **MATERIALS AND METHODS:** This cross-sectional study was conducted at a tertiary referral centre for Cardiology services, Hospital Tengku Ampuan Afzan (HTAA), Kuantan, Pahang. It involved screening 818 patients presenting with AMI at the Emergency Department of HTAA over a one-year duration. Malaysian citizens aged 18 to 45 years newly diagnosed with AMI were included. Urinary samples were collected for recreational drug screening. **RESULTS**: The incidence of AMI cases among young adults in HTAA Kuantan, Pahang were 10.3 per 100 persons of total AMI cases in one year (95% Confidence Interval, 8.4%-12.6%). Fifty -eight patients who met the inclusion criteria were recruited, 1.7 % tested positive for amphetamines. Males made up 96.6% of the patients and the most common risk factor identified for young adults with AMI was smoking (N=45, 77.6%) followed by obesity (N=33, 56.9%). More than half (58.6%) of the patients had 3 cardiovascular disease risk factors or more. **CONCLUSION**: Recreational drug use at AMI presentation was negligible. Males made up the majority and smoking was the most prevalent risk factor. To date, this is the first study in Malaysia looking at the incidence of young adults with AMI and their preponderant characteristics.

Keywords
acute myocardial infarction incidence, young adults, hypertension, smoking

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INTRODUCTION

Acute myocardial infarction (AMI) is a lethal manifestation of cardiovascular diseases.[1] Until now, there is a lack of data on the occurrence of AMI and the characteristics of afflicted young adults, especially in Pahang. Recent years have also seen a rise in the association between recreational drugs with AMI.[2] However, local population-based studies have never delineated the possibility of drug abuse as a causal factor for AMI in young adults. The high prevalence of young adults with hypertension and prehypertension were also identified as important risk factors in the development of AMI at an early age worldwide.[3,4] Nonetheless, there is no sufficient local data to describe the association between these risk factors and myocardial infarction in young adults. This study aims to study the characteristic of AMI cases among young adults and these associations.

Understanding the characteristics of the disease among young adults is hoped to shed light on the weight of the problem due to the limited data of AMI cases among young adults, and to justify to the stakeholders in the health ministry regarding the urgency of developing appropriate preventive measures guidelines to enable the primary care doctors to achieve better patient management and prognosis for this group of patients.

MATERIALS AND METHODS

This was a cross-sectional study of AMI cases presented at the emergency department of a tertiary referral centre for Cardiology services, Hospital Tengku Ampuan Afzan (HTAA), Kuantan, Pahang, from 31st July 2017 to 30th of July 2018. Inclusion criteria included Malaysian citizens aged 18 to 45 years diagnosed with AMI for the first time. After informed consent was obtained, recruited subjects' urinary samples (10mls) were collected for recreational drug screening using the Integrated E-Z Split Key Cup II (San Diego, USA, 2017) drug test kit. Ten ml of venous blood was drawn from patients with negative results. Upon admission into the ward, further information was attained.

AMI diagnosis was made based on elevated cardiac enzymes (serum creatine kinase or troponin) levels and/ or, the characteristic chest pain and/or, electrocardiogram (ECG) changes.[5,6] Body mass index (BMI) was calculated as weight in kilograms divided by the square of height. Waist circumference (WC) was taken at the midpoint between the rib lowest margin and the iliac crest superior border (Normal WC is less than 90 cm and 80 cm for men and women, respectively).[7]

Risk factors such as hypertension, hyperlipidaemia, and diabetes were attained from the patients' clinical notes and a structured interview with the patients during admission in the ward. Systolic blood pressure and diastolic blood pressure equal to or more than 140 mmHg and 90 mmHg, respectively were defined as high; hyperlipidaemia was defined by the elevation of fasting total cholesterol level (5.2 mmol/L or more); diabetes mellitus was when fasting blood sugar is equal to or more than 7.0 mmol/L or random blood sugar of 11.1 mmol/L or more[8].

Another behavioural risk factor such as current tobacco use was considered if the individual smoked any tobacco product. Former smokers were those who ceased smoking for a minimum of six-month duration.[9] Current alcohol use was when the consumption of alcohol was confirmed for the past 12 months.[8] Positive family history of cardiovascular disease was established when involved the first degree relatives (before the age of 55 years in men and 65 years in women).[10]

The study protocol was reviewed and approved by the Ministry of Health Malaysia Research Ethics Committee (NMRR-16-2572-32869).

STATISTICS

Data were analysed using IBM SPSS Statistics 22.0 (IBM Corp, Armonk, New York). All numerical data were described using mean (standard deviation). The incidence proportion of AMI cases among young adults in HTAA is calculated by dividing the number of new AMI cases among young adults (numerator) with the population at risk represented by the total AMI cases during the specified time interval (denominator).[11]

RESULTS

There was a total of 818 AMI cases presented to HTAA during the period of the study. 84 young adults were newly diagnosed with AMI, thus, the incidence proportion was 10.3 per 100 persons of total AMI cases over a year (95% Confidence Interval, 8.4%-12.6%). Fifty-eight patients who met the inclusion criteria were recruited for further analysis. Out of those recruited,1.7% tested positive for amphetamines.

The most common age at presentation was between 41-45 years (Table I). Males made up the majority and there was a preponderance of young Malays among the AMI patients.

Table II describes the risk factor profile of the patients. The majority of the patients were smokers for more than 15 years and there were also heavy smokers. About half of the patients were obese and had increased waist circumferences. More than half (58.6%) of the patients had 3 cardiovascular disease risk factors or more (Table III). The others had 1 or 2 cardiovascular risk factors. One patient had no apparent risk factor during the interview session.

Table I: Sociodemographic characteristics of patients

Variables, N=58	(Median age,	No. (%)
Age	40 (24-45)	
20-25		1 (1.7)
26-30		8 (13.8)
31-35		7 (12.1)
36-40		17 (29.3)
41-45		25 (43.1)
Gender		
Male		56 (96.6)
Female		2 (3.4)
Ethnicity		
Malay		46 (79.3)
Indian		6 (10.3)
Chinese		6 (10.3)
Marital status		
Married		49 (84.5)
Unmarried		8 (13.8)
Divorced		1 (1.7)
Education		
Primary		1 (1.7)
Secondary		33 (56.9)
Tertiary		24 (41.4)
Occupation		
Government		12 (32.4)
Private sector		37 (63.8)
Self-employed		9 (15.5)
Income (RM)		
0-1000		3 (5.2)
1001-2500		27 (46.6)
2501-4000		15 (25.9)
4001-6000		8 (13.8)
>6001		5 (8.6)

*IQR: interquartile range

Table II: AMI risk factors

Risk factors, N=58	Mean (SD)	No. (%)
Smoking		
Current smoker		45 (77.6)
No. of cigarettes per day	21 (16)	
Duration of smoking (years)	19 (8)	
No. of pack years	22 (22)	
Non-smoker		4 (10.3)
Ex-smoker		7 (12.1)
Second-hand smoker		41 (71)
Hypertension		20 (34.5)
Obesity (kg/m2)	28.0 (7.4)*	33 (56.9)
Overweight		20 (34.5)
Increased waist circumference (cm)	91 (18)*	32 (55.2)
Hyperlipidaemia		29 (50.0)
Diabetes mellitus		18 (31.0)
Family history of IHD		20 (34.5)
Alcohol consumption		7 (12.1)

*Median (interquartile range)

DISCUSSION

This is the first study in Malaysia looking at the incidence of young adults with AMI and their preponderant characteristics. Previous studies lacked data on the occurrence of new cases of AMI among young adults in a population, in order to provide a direct estimation of young adults at risk of contracting AMI. This study showed that the incidence proportion of young adults with AMI was 10.3 per 100 persons of total AMI cases over a year. The significant risk of young adults in this population to develop AMI is comparable to other western and developed countries.[12] This finding stresses the importance of earlier and more holistic preventive health measures to be initiated among the younger age group in an effort to reduce cardiovascular disease burden.

Recreational drug use at AMI presentation was negligible in this study. A multi-centre study, with a bigger sample size, should be performed further to see the possibility of drug abuse as a causal factor for AMI in young adults.

The findings revealed that males were predominantly predisposed to AMI compared to women in the young adult age group. As reported by INTERHEART study, women generally develop the first experience of AMI 9 years later than men.[13]

Table III: Number of risk factor in the patients

Number of risk factors, N=58	No. (%)
0	0 (0.0)
1	10 (17.2)
2	7 (12.1)
3	15 (25.9)
>3	26 (44.8)

The predominance of Malay AMI patients at presentation, followed by Chinese and Indians, reflected the racial ratio in Malaysia generally, and Pahang specifically. In Pahang, Malays made up 80.2%, Chinese 15.1%, and Indians 4.2%.[14] Nonetheless, the higher proportion of Indian AMI patients in this study could be due to the high prevalence of diabetes mellitus, one of AMI known risk factors, among Malaysian Indians.[15,16]

This study also found that more than half of the young adult AMI patients belong to the below 40% income group (household incomes of below RM 2500). The lower the income, the greater the likelihood of contracting disease and death.[17] Thus, having lower income could predispose them to diseases like ischaemic heart disease and its comorbid risk factors such as hypertension, hyperlipidaemia, and diabetes mellitus.

One of the key findings of this study is that smoking was found to be the dominant risk factor among young adult AMI patients (78%). The prevalence was at 78%, compared with 22.8% in the general population.[8] An earlier study of AMI among Malaysian young adults who underwent percutaneous coronary intervention between 2007-2009, reported that hypertension and diabetes mellitus were the two most common risk factors.[15] The findings are comparable to the study by Gail K. Larsen et al., (2013), which also found the highest smoking rates (78%) among patients with STEMI aged 18 to 34 years.[18] This is not surprising as it has been reported that 13% of Malaysian youths aged 15 to 19 years have already started smoking, and the number was higher, 25% and 47%, in the 20 to 24 years age group.[19]

Smoking and AMI in young adults were reported to have a close association and in general, smoking independently causes the disease with an OR 3-fold higher compared to the general population, and the highest OR was seen in patients aged below 35 years (OR 11.4 [95%CI, 10.0-12.8]).[18] Mild smoking leads to a higher risk of CVD, regardless of the number of cigarettes.[20] In the same study, researchers also found that for moderate and heavy smokers, the risk for AMI will not reduce concomitantly upon cessation, but within 20 years of stopping smoking.

Our findings also showed a high number of second-hand smokers (SHS) or environmental tobacco smokers among our young patients. Both smokers and non-smokers are exposed to environmental smoke, thus possibly confounding the adverse effects. Our study findings were supported by various previous studies which concluded that SHS is as harmful as first-hand smoking.[21]

Obesity (56.9%) and large waist circumferences (55.2%) were the second most prevalent CV risk factor in our study. Obesity is already an established risk factor for AMI. Based on data from NHMS, it was documented that obesity affects 27.2% in 2011 and 30.6% in 2015.

Obesity in younger patients is closely related to lifestyle. In addition to that, several previous studies have also shown that smokers are prone to be involved in unhealthy lifestyle practices thus leading to weight gain and obesity. Smokers who smoked 6 or more sticks per day have a greater tendency to become overweight or obese compared to those who smoked less.[19]

Our study showed that among the young AMI patients, hyperlipidaemia was the next most common risk factor, before hypertension, positive family history of ischaemic heart disease, and diabetes mellitus. Hypertension, diabetes mellitus, and hyperlipidemia, based on the Malaysian Annual Report of the Percutaneous Coronary Intervention (PCI) Registry 2014 – 2015, were predominantly associated with ACS at 64.6%, 46.3%, and 38.7% respectively. These findings were not reflected in the young-patient group, as we have found and which corroborates other studies.[15,22,23,24]

AMI patients commonly present with at least one of these risk factors; smoking, obesity, hypertension, hyperlipidaemia, and diabetes mellitus[8]. The concomitant presence of these risk factors were previously associated with a more advanced age group. However, our research showed that even young adult AMI patients also present with multiple risk factors. This is illustrated in Table III, in which 71% had 3 risk factors or more. The increase in multiple risk factors for cardiovascular disease in the younger age group indicated that being young is not

protective and necessitates screening for cardiovascular risk factors at a much younger age.

The prevalence of diabetes mellitus among the Malaysian population aged 18 years and above has increased from 2011 (15.2) to 2015 (17.5%). Similarly, an increasing trend was also seen for hyperlipidaemia, which was an increase from 32.6% in 2011 to 47.7% in 2015. For hypertension, the number was also marginally higher, documented as 32.7% in 2011 compared to 30.3% in 2015.[8] In addition, Omar et al (2016) assessed the prevalence of young hypertension in Malaysia, aged between 18 and 39 years of age and found that 17.3% of them were hypertensive.[25]

CLINICAL IMPLICATIONS

The presentation of multiple cardiovascular risk factors among young adults with AMI in this research shows that our younger population is just as vulnerable to the risk of cardiovascular disease. Undiagnosed cardiovascular risk factors which may be prevalent amongst the young will lead to late diagnosis and subsequently more complicated and costly secondary preventive measures. Smoking prevention and cessation programmes following the National Strategic Plan on Tobacco Control 2015-2020 are important steps in the primary prevention of cardiovascular disease.

It is vital to aggressively promote a healthy lifestyle amongst the younger generations, adopt screening programmes in high-risk individuals and introduce holistic preventive measures at a younger age, as early as 14 years old. Smoking is worth to be considered as one of the indications for an early cardiovascular disease screening among the younger age group. Furthermore, multiple cardiovascular risk factors among young adults highlight the need for improved delivery of the healthcare system to reach the targeted population for the prevention and control of cardiovascular diseases.

LIMITATIONS OF STUDY AND FUTURE RECOMMENDATION

The study was conducted at a single tertiary centre-HTAA, the main public cardiac referral centre for the state of Pahang. Thus, we could include the majority of AMI cases in Kuantan, Pahang to study the prevalence. However, the present results could not be generalized to patients of non -tertiary referral hospitals, for which low-risk ACS presentations may predominate.

CONCLUSION

In this study, we observed that the incidence proportion of young adults with AMI in Kuantan, Pahang was 10.3 per 100 persons of total AMI cases in a one-year period. AMI in young adults almost exclusively occurs in males. The majority of the young adults with AMI presented with multiple cardiovascular risk factors, while smoking was the most prevalent risk factor. Recreational drug use at AMI presentation was negligible. The increasingly high incidence of AMI in the younger age group indicates that an early and aggressive health intervention program is needed, targeting a younger age group in the population.

CONFLICT OF INTEREST

The authors declare no conflict of interest.

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REFERENCES

1. Wan Ahmad WA. Annual Report of the NCVD-ACS Registry, 2014 - 2015 - Patient characteristics. Kuala Lumpur, Malaysia: National Heart Association of Malaysia (NHAM) and the Ministry of Health Malaysia; 2017.
2. Villota JN, Rubio LF, Forés JS, et al. Cocaine-induced coronary thrombosis and acute myocardial infarction [3]. Int J Cardiol. 2004;96(3):481–2.
3. Wan Ahmad WA. National Cardiovascular Disease. Annual Report of the Acute Coronary Syndrome (ACS) Registry 2011-2013. Kuala Lumpur, Malaysia: National Heart Association of Malaysia (NHAM) and the Ministry of Health Malaysia; 2015.
4. Naing C, Yeoh PN, Wai VN, et al. Hypertension in

Malaysia: An analysis of trends from the national surveys 1996 to 2011. Med (United States). 2016;95 (2):1–13.
5. Malaysian Ministry of Health. Clinical Practice Guidelines Management of Acute ST-Segment Elevation Myocardial Infarction (STEMI). 3rd Editio. Vol. 14. Putrajaya, Malaysia; 2014.
6. Ministry of Health Malaysia. MOH/P/PAK/219.11 (GU). Clinical Practice Guideline Managament of Unstable Angina/Non-ST Elev Myocardial Infarct. 2011;
7. Ministry of Health Malaysia. Clinical Practice Guidelines. Management of Diabetes Mellitus. 2015.
8. Institute for Public Health. National Health & Morbidity Survey (NHMS) 2015. Vol. II: Non-Communicable Diseases, Risk Factors & Other Health Problems. Kuala Lumpur: Ministry of Health, Malaysia; 2015.
9. Malarcher A., Shah N., Tynan M. et al. State-specific secondhand smoke exposure and current cigarette smoking among adults - United States, 2008. Morbidity Mortality Weekly Report. 2009;58(24):1232 –5.
10. Ministry of Health Malaysia. Management of Dyslipidemia 2011. MOH Malaysia. (4th edition). Putrajaya: MOH Malaysia; 2011.
11. J. Rothman K. Epidemiology: An Introduction. Madison Avenue, New York: Oxford University Press Inc.; 2002.
12. Shah N. Myocardial Infarction in Young versus Older Adults: An Analysis of Differences in Proportion, Risk Factors, Clinical Demographics, Angiographic Findings and in-Hospital Outcomes. Int J Clin Cardiol. 2016;3(1):1–7.
13. Sonia SA, Islam S, Rosengren A, et al. Risk factors for myocardial infarction in women and men: Insights from the INTERHEART study. Eur Heart J. 2008;29:932–40.
14. Department of Statistics Malaysia. Penduduk mengikut umur, jantina dan kumpulan etnik, Pahang [Internet]. 2017 [cited 2018 Oct 18]. Available from: http://pqi.stats.gov.my/result.php
15. Zuhdi AS, Mariapun J, Mohd Hairi NN, et al. Young coronary artery disease in patients undergoing percutaneous coronary intervention. Ann Saudi Med. 2013;33(6):572–8.
16. Chew BH, Mastura I, Lee PY, Wahyu TS, Cheong AT, Zaiton A. Ethnic Differences in Glycaemic Control and Complications : The Adult Diabetes Control and Management (ADCM). Med J Malaysia. 2011;66(3):244–8.
17. Woolf SH, Aron L, Dubay L, et al. Wealth Linked to Health and Longevity ? [Internet]. 2015. Available from: webarchive.urban.org.
18. Larsen GK, Seth M, Gurm HS. The Ongoing Importance of Smoking as a Powerful Risk Factor for ST-Segment Elevation Myocardial Infarction in Young Patients Efficacy vs Effectiveness. JAMA Intern Med. 2013;173(13):1261–2.
19. Raihan K, Azmawati MN. Cigarette Smoking and Cardiovascular Risk Factor Among Male Youth Population. Malaysian J Public Heal Med. 2013;13 (1):28–36.
20. Teo KK, Ounpuu S, Hawken S, et al. Tobacco use and risk of myocardial infarction in 52 countries in the INTERHEART study : a case-control study. Lancet. 2006;368:647–58.
21. Centers for Disease Control and Prevention. Health Effects of Secondhand Smoke [Internet]. 2019 [cited 2019 Mar 20]. p. 2–5. Available from: https:// www.cdc.gov/tobacco/ data_statistics/fact_sheets / secondhand _smoke/ health _effects/index.htm
22. Chen TS, Incani A, Butler TC, et al. The Demographic Profile of Young Patients (< 45 years-old) with Acute Coronary Syndromes in Queensland. Heart Lung Circ. 2014;23:49–55.
23. Doughty M, Mehta R, Bruckman D, et al. Acute Ischemic Heart Disease Acute myocardial infarction in the young — The University of Michigan experience. Am Heart J. 2002;143(1):56–62.
24. Hoo FK, Foo YL, Sazlly Lim SM, et al. Acute coronary syndrome in young adults from a Malaysian tertiary care centre. Pak J Med Sci. 2016;32(4):841–5.
25. Omar MA, Irfan NI, Yi KY, et al. Prevalence of Young Adults Hypertension in Malaysia and its Associated Factors: Findings from National Health and Morbidity Survey 2011. Malaysian J Public Heal