CHARACTERISTICS OF ACUTE MYOCARDIAL INFARCTION CASES AMONG YOUNG ADULTS IN HOSPITAL TENGKU AMPUAN AFZAN, KUANTAN PAHANG

BY

MOHD ZHAFRI BIN MOHD RAZIB

A dissertation submitted in fulfilment of the requirement for the degree of Master of Medicine (Family Medicine)

Kulliyyah of Medicine
International Islamic University Malaysia

NOVEMBER 2019

ABSTRACT

Introduction: Acute myocardial infarction (AMI) is a major cause of death around the world. There are limited studies regarding the characteristics of the disease among young adults. This study aimed to study the characteristic of AMI cases among young adults presented to Hospital Tengku Ampuan Afzan (HTAA), Kuantan, Pahang. **Method**: This prospective observational study was conducted in HTAA from 31st July 2017 to 30th July 2018 involving 818 patients who were diagnosed with AMI. Inclusion criteria included Malaysian citizen aged 18 to 45 years old diagnosed with AMI and abled to give written informed consent. **Results**: Patients with AMI and aged less than 45 years old were 88 (10.8%). The incidence proportion of AMI cases among young adults in HTAA Kuantan, Pahang were 10.3 per 100 persons of total AMI cases over a year period (95% Confidence Interval, 8.4%-12.6%). A total of 58 patients that met the study inclusion criteria were recruited for further descriptive analysis. The median age of the patients was 40 years old (range = 24 - 45). Fifty-six (96.6%) patients were males, while 46 (79.3%) of the patients were Malays. Married patients account for 49 (84.5%) patients, and 45 (77.7%) patients had incomes less than RM 2500 that made up the majority of the young adult AMI patients. The commonest risk factors for young adults with AMI was smoking (N=45, 77.6%) followed by obesity (N=33, 56.9%), increased waist circumference (N=32, 55.2%), hyperlipidaemia (N=29, 50.0%), hypertension (N=20, 34.5%), family history of cardiovascular disease (N=20, 34.5%), diabetes mellitus (N=18, 31.0%), and alcohol consumption (N=7, 12.1%). All patients had at least one cardiovascular risk factor, while 17 (37%) patients had a single one coronary vessel involvement and left anterior descending artery was the commonest vessel involved (n=36) in the angiogram findings. **Conclusion**: The incidence proportion of AMI cases among young adults in Pahang was 10.3 per 100 persons of total AMI cases over a year period. It occurs exclusively in males, with smoking and obesity being the two most prevalent risk factors, unlike earlier studies which showed hypertension as the main cardiovascular risk factor. The high incidence of AMI cases in the younger age group strongly suggests that an early aggressive health intervention program needs to be conducted targeting a younger age group in the population.

APPROVAL PAGE

I certify that I have supervised and read this study and that in my opinion it conforms to acceptable standards of scholarly presentation and is fully adequate, in scope and quality, as a dissertation for the degree of Master of Medicine (Family Medicine).

……
Samsul Bin Draman
Supervisor

……
Aszrin Binti Abdullah
Co-Supervisor

……
Azarisman Shah Bin Mohd Shah
Co-Supervisor

……
Jamalludin Ab. Rahman
Co-Supervisor

I certify that I have read this study and that in my opinion it conforms to acceptable standards of scholarly presentation and is fully adequate, in scope and quality, as a dissertation for the degree of Master of Medicine (Family Medicine).

……
Razman Bin Mohd. Rus
External Examiner

This dissertation was submitted to the Department of Family Medicine and is accepted as a fulfilment of the requirements for the degree of Master of Medicine (Family Medicine).

……..
Mohd Aznan Bin Md Aris
Head, Department of Family Medicine

This dissertation was submitted to the Kulliyyah of Medicine and is accepted as a fulfilment of the requirements for the degree of Master of Medicine (Family Medicine).

……
Azmi Bin Md Nor
Dean, Kulliyyah of Medicine

DECLARATION

I hereby declare that this dissertation is the result of my own investigation, except where otherwise stated. I also declare that it has not been previously or concurrently submitted as a whole for any other degrees at IIUM or other institutions.

Mohd Zhafri Bin Mohd Razib

Signature…….……..……. Date …….……

INTERNATIONAL ISLAMIC UNIVERSITY MALAYSIA

DECLARATION OF COPYRIGHT AND AFFIRMATION OF FAIR USE OF UNPUBLISHED RESEARCH

PREVALENCE AND CHARACTERISTIC OF NEW MYOCARDIAL INFARCTION AMONG YOUNG ADULTS IN HOSPITAL TENGKU AMPUAN AFZAN

I declare that the copyright holders of this dissertation are jointly owned by the student and IIUM.

Affirmed by Mohd Zhafri Bin Mohd Razib

……..……..…… ……..

Signature Date

DEDICATION

Al-Fatihah to my late mother Hjh Norrashidah bt Hj Salleh (1960-2008) and my cute nephew Furqan Ramadhan (July 2014- Nov 2014).

ACKNOWLEDGEMENTS

In the name of Allah, The Most Gracious and The Most Merciful.

Alhamdulillah praise is to Allah (SWT), the Most Gracious, the Most Merciful, and blessings be upon His Messenger, the Prophet Muhammad s.a.w.

I would like to convey my most heartfelt appreciation to the main supervisor, Associate Professor Dr Samsul Bin Draman, for his patience, guidance, and continuous supervision throughout this study. I am also heartily thankful to my co-supervisor Assistant Professor Dr Aszrin bte. Abdullah who patiently provided her valuable advice, constant help, encouragement, and for putting up with my inexperience in this field. I have not stopped learning from both of them up until this very moment.

I am also greatly indebted to Professor Dr Azarisman Shah bin Mohd Shah, Professor Jamalludin Bin Ab Rahman, Associate Professor Dr Norlelawati bte Abdul Talib, and Assistant Prof Dr Aida Nur Sharini bte Mohd Shah who were the sparks for the ideas on this work and consequently the contributors to many input to ensure that this research will yield good results. It was not possible for this work to come to light without guidance from them.

To my colleagues and research team, Dr Norbaiyah bte Bakrim, Dr Aminuddin bin Hasnol Aidi, Dr Wan Fatien Nabiela bte Wan Omar, Sr Siti Radziah Shaikh Alaudeen, and Sr Nuratiqah Abd Razak, thank you for the great teamwork, contributions, and thorough effort while we in progress of completing this work.

I would also like to express my gratitude to Hospital Tengku Ampuan Afzan for supporting this study, especially the Department of Accident and Emergency and the Department of Cardiology. Thank you to the heads of department, Dr Zainalabidin Bin Mohamed from Accident and Emergency Department, and Dr Siti Khairani Bte Zainal Abidin from Cardiology Department for their assistance and support from the very beginning until the final stage of my work that was completed successfully.

Last but not least, I wish to dedicate this thesis to my loving, ever considerate-wife, Nur Hanis bt Yahaya, and my two cheerful children; Abdullah Azzam and Nur Jannah, that always become my motivation to ensure that this work could be submitted in due time. Nur Hanis, with an affectionate companionship, had helped me in many ways from the very beginning of my master programme.

It is my utmost pleasure to also dedicate this work to my dear parents Mohd Razib bin Ali,Yahaya bin Ishak, Fauziah bte Mahfuz, Jamaliah Md Sidek, Asyraf, Nurraihana, Hanifi, Amirul, Fatihah, Fitri, Faiz, and Hasni and to all my family members, who granted me the gift of their unwavering belief in my ability to accomplish this goal. Thank you for your support and patience. I also wish to express my appreciation and gratitude to whoever provided their time, effort, and support for this project.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF ABBREVIATIONS

ACS	Acute coronary syndrome
AMI	Acute myocardial infarction
BMI	Body mass index
CCU	Cardiac/coronary care unit
CPG	Clinical practice guideline
CVD	Cardiovascular disease
DOSM	Department of Statistic Malaysia
ECG	Electrocardiogram
ECV	E-cigarette and vape
ED	Emergency department
GRACE	Global Registry of Acute Coronary Events
HDL	High-density lipid
HTAA	Hospital Tengku Ampuan Afzan
IREC	International Islamic University Malaysia Research Ethics Committee
LBBB	Left bundle branch block
LDL	Low-density lipid
MREC	Medical Research Ethics Committee
NGO	Non-governmental organisation
NHMS	National Health and Morbidity Survey
NSTEMI	Non ST-elevation myocardial infarction
n.d.	No date
OR	Odds ratio
PCI	Percutaneous coronary intervention
SD	Standard deviation
SHS	Second-hand smokers
STEMI	ST-elevation myocardial infarction
TG	Triglyceride
UA	Unstable angina
WC	Waist circumference

CHAPTER ONE

INTRODUCTION

1.1 BACKGROUND OF THE STUDY

Acute myocardial infarction (AMI) is a lethal manifestation of cardiovascular disease and can present as sudden death. Starting from the year 2000 until 2016, AMI already causes the majority cases of death and disability around the world (World Health Organization (WHO), 2018). According to the Malaysia National Cardiovascular Disease (NCVD) Acute Coronary Study Registry, there is a 10% mortality rate for patients who were admitted to hospital with ST-elevation myocardial infarction (STEMI) in 2006-2008. Recent data from Malaysia's Ministry of Health showed that ischemic heart disease was recorded with the highest number of mortality rate for males (15.3%), and second (9.9%) after pneumonia for females (Department of Statistics Malaysia (DOSM), 2017c).

AMI among the young is relatively infrequent but unfortunately, the numbers are growing and fast becoming the main cause of death for young adults over 35 years old (Lloyd-jones et al., 2010). In Malaysia, for adults between the age of 15 and 64, the commonest cause of death is cardiovascular diseases (Khazanah Research Institute, 2017). The general population of AMI patients in Malaysia also have a lower mean age of 58.6 (12.2) years old compared to 65 years old in other countries as shown in GRACE study (GRACE, 2005; Wan Ahmad, 2017).

1.2 STATEMENT OF THE PROBLEM

The occurrence of AMI cases among young adults around the world results in greater disease impact. The population between 20-60 years of age is usually the most productive especially with regards to family income and provision. The occurrence of AMI among individuals within this age range will absolutely affect daily living activity of the patient and also their family members, and finally contribute to the financial burden and causes psychological distress.

Until now, there is a lack of data on the occurrence of AMI and the clinical characteristics among young adults, especially in Kuantan, Pahang. At the same time, the preventive measures for cardiovascular diseases in young adults are still insufficient in our local practice. There is no clear consensus or guideline on the best approach to reduce mortality from acute myocardial infarction among young adults.

1.3 PURPOSE OF THE STUDY

This study aims to assess the characteristics and measure the occurrence of AMI cases among young adults in HTAA. The results of this study are hoped to shed light on the weight of the problem in Kuantan, Pahang, specifically. Thus, contribute to the limited data of AMI cases among young adults, to justify to the stakeholders in the health ministry regarding the urgency of developing appropriate preventive measures guideline such as scoring or risk stratification, to enable the primary care doctors to achieve better patient management and prognosis for this group of patients.

1.4 RESEARCH OBJECTIVES

General objective:

To assess the characteristics of AMI cases among young adults in Hospital Tengku Ampuan Afzan (HTAA), Kuantan, Pahang.

Specific Objective:

1. To describe the socio-demographic characteristics of young adult AMI patients in HTAA.
2. To measure the occurrence of AMI cases among young adults in HTAA.
3. To measure the distribution of factors associated with AMI cases among young adult patients such as smoking, hypertension, body mass index, waist circumference, hyperlipidaemia, diabetes mellitus, and family history of cardiovascular disease, and consumption of alcohol.
4. To describe the angiographic findings of the AMI cases among young adults in HTAA.

1.5 RESEARCH QUESTION

What are the characteristics of AMI cases among young adults admitted to HTAA, Kuantan, Pahang?

1.6 RESEARCH CONCEPTUAL FRAMEWORK

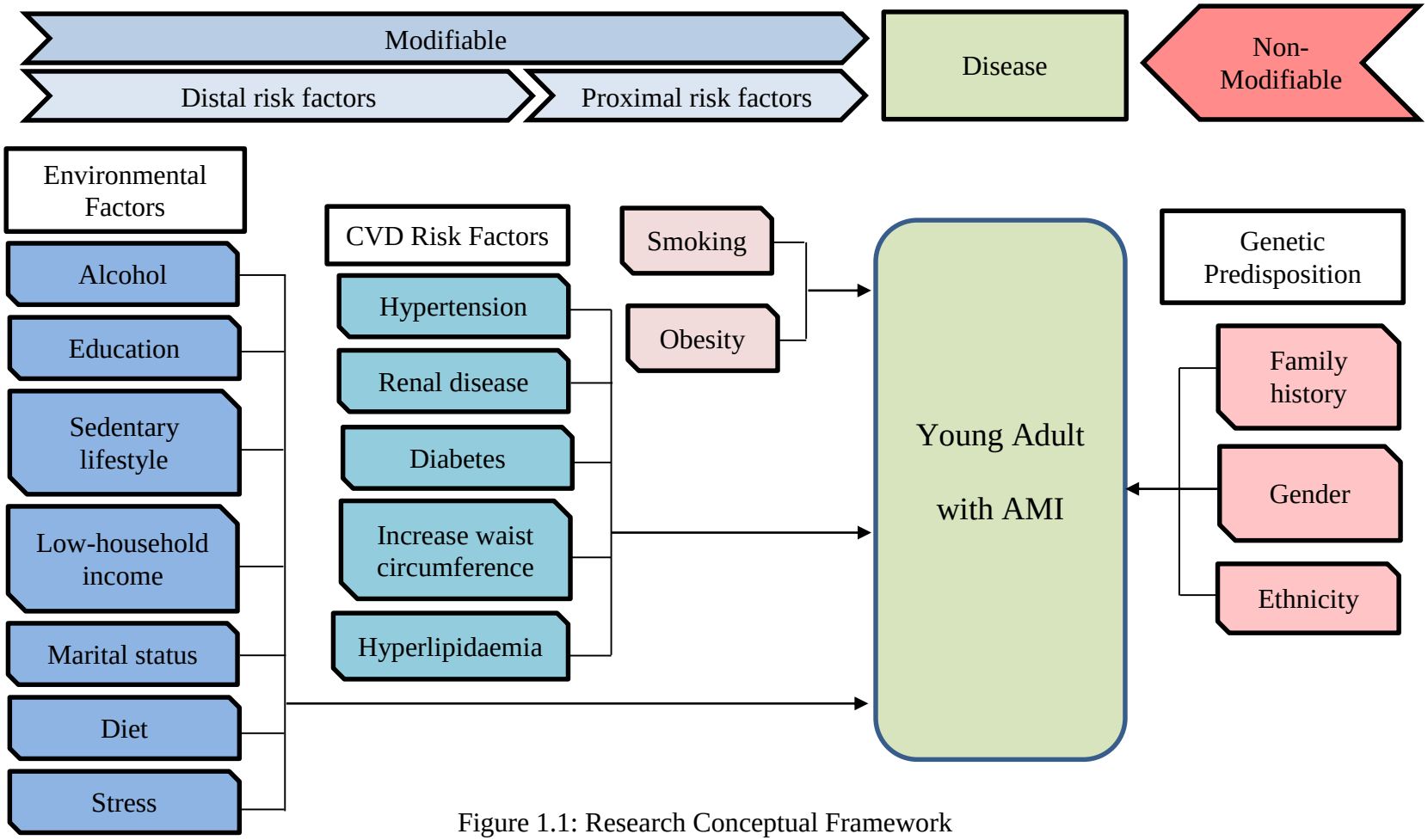

Figure 1.1: Research Conceptual Framework

1.7 DEFINITIONS OF TERMS

1.7.1 Acute Myocardial Infarction (AMI)

The diagnosis of AMI was based on the presence of evidence of myocardial necrosis as indicated by a rise and fall of serum cardiac biomarkers. It must also be accompanied by at least one of the followings: 1) Clinical history consistent with chest pain of ischemic origin; 2) ECG changes or presumed new LBBB; 3) Imaging evidence of new loss of viable myocardium or new regional wall motion abnormality; 4) Identification of an intracoronary thrombus by angiography or autopsy. The cases of AMI was diagnosed by the doctors in ED HTAA (Malaysia CPG on Management of UA/STEMI, 2011; Malaysia CPG on the management of STEMI, 2014).

1.7.2 Waist Circumference (WC)

Waist circumference measurement was made at the approximate midpoint between the lower margin of the last palpable rib and the top of the iliac crest (WHO, 2008). Normal WC is when the measurement is less than 90 cm for man and 80 cm for woman (Malaysia CPG on Management of Hypertension, 2013).

1.7.3 Body Mass Index (BMI)

Weight and height were measured without shoes and with light clothing. Body mass index (BMI) is calculated as weight (kg) divided by the square of height (m^2). The classification of BMI for Asian based on Malaysia CPG of Obesity (Ismail et al., 2004). Underweight is BMI less than 18.5 kg/m^2; normal is BMI 18.5 kg/m^2 to 22.9 kg/m^2; pre-obese is BMI 23 kg/m^2 to 27.4 kg/m^2; obese stage 1 is BMI 27.5kg/m^2 to 34.9 kg/m^2; obese 2 is BMI 35 kg/m^2 to 39.9 kg/m^2 ; and obese 3 is BMI more than 40 kg/m^2.

1.7.4 Hypertension

Patients were asked regarding a diagnosis of hypertension prior to AMI by a registered medical practitioner. Otherwise, hypertension was diagnosed when systolic blood pressure was found to be equal and/or above 140 mmHg or diastolic blood pressure equal and/or above 90 mmHg for more than 2 readings (Malaysia CPG on Management of Hypertension, 2013).

1.7.5 Hyperlipidaemia

Patients were asked regarding a diagnosis of hyperlipidaemia prior to AMI by a registered medical practitioner prior to AMI. Hyperlipidaemia is diagnosed when the total cholesterol is more than 5.2 mmol/L (Malaysia CPG on Dyslipidaemia 4rd Edition, 2017).

1.7.6 Diabetes Mellitus

Patients were asked regarding a diagnosis of diabetes mellitus prior to AMI by registered medical practitioner. The diagnosis is otherwise made during admission using standard local guideline in clinical practice guideline, the fasting blood sugar $\geq$ 7.0 mmol/L or random blood sugar $\geq$ 11.1 mmol/L (Malaysia CPG on Management of Type 2 Diabetes Mellitus, 2015).

1.7.7 Tobacco Smoking Status

The working definition used for tobacco-smoking status in this study from Raihan & Azmawati (2013):

- **Current smoker:** Someone who has reported to smoke 100 cigarettes in their lifetime and who is currently smoking at least one cigarette in the past 30 days.
- **Former tobacco smoker**: Reported as already not smoking for the past 6 months or more prior to presentation.
- **Never smoker:** 'Never smoker' is someone who smoked less than 100 cigarettes or never takes up smoking.
- **Second hand smoker:** known also as passive smoker. Usually refers to non-smoker in the environment of smoker. We also ask the number of smokers seen per week.

Other than cigarette smoking, subjects are classified into vape, e-cigarettes, or others.

1.7.8 E-cigarette, and Vape Smoking Status

An e-cigarette is defined as a battery-operated device which vaporizes a nicotine solution into a form of inhalable aerosol while vape is also a battery-operated device but vaporized non-nicotine solution into a form of an inhalable aerosol (Nik Mohamad et al., 2017)

- **Current smoker**– Has smoked at least a puff of e-cigarette and vape (ECV) in the last 30 days.
- **Former smoker** – Has smoked ECV but stopped more than 30 days ago.
- **Ever smoker**– Has smoked at least one puff of ECV.

1.7.9 Alcohol Consumption

Similar to tobacco-smoking status, alcohol users were classified thus:

- **Current alcohol consumption:** consumed alcohol for the past twelve (12) months prior to the survey
- **Ex-drinkers:** respondents who had claimed did not drink alcohol for the past twelve (12) months.

CHAPTER TWO

LITERATURE REVIEW

2.1 INTRODUCTION

Acute myocardial injury is frequently encountered in clinical practice and is associated with poor outcomes in both short term and long term. In Malaysia, it was reported that nearly a quarter of cardiac disease cases occur in the population below 50 years of age (Institute for Public Health, 2015). There are also differences in the mean age of overall AMI patients in western countries compared to Asian countries.

The mean age of AMI in Malaysia are as follows; 56 years for STEMI; 62 years for NSTEMI and 61 years for unstable angina (Wan Ahmad & Sim, 2013); meanwhile the mean age in the Global Registry of Acute Coronary Events (GRACE, 2005) for STEMI was 65 years and NSTEMI was 68 years old. GRACE study was an observational study looking at data of acute coronary syndrome (ACS) patients admitted into 102 hospitals in 14 countries stratified by age (Europe, North and South America, Australia and New Zealand). In India, concomitantly the mean age for AMI was 53 years old (Sharma, Ganguly, Bhawan, & Nagar, 2005), and in United State of America, the mean age of patients undergoing PCI for AMI is as late as 65 years (Chan et al., 2011). Generally, AMI in western countries manifests a decade later than in Asia.

2.2 PATHOGENESIS OF AMI

There are several known pathogeneses for AMI. However, the actual pathogenesis in young adults is still unclear. In general, the pathogenesis of AMI could be due to four factors. First is atherosclerotic plaque formation in the coronary artery. It is a slow

process that takes many years before it becomes clinically significant. AMI occurring among the elderly due to atherosclerotic formation is a well-recognized risk factor.

Studies done previously found that atherosclerotic lesions are present in 1 in 6 clinically healthy asymptomatic teenagers (Tuzcu et al., 2001). Unfortunately, the protection offered by being young has been eroded by the development of cardiovascular risk factors at an earlier age. The factors that accelerate the development of atherosclerotic plagues include hypertension, smoking, hyperlipidaemia, insulin resistance and positive family history of cardiovascular disease (L. Chen, Chester, & Kaski, 1995; Malmberg, Bavenholm, & Hamsten, 1994; Mukherjee et al., 2003).

Paradoxically, AMI cases in young adults can also occur suddenly without changes in the coronary artery vessel. Coronary artery dissection causes atypical chest pain and affects mainly the left anterior descending artery. Coronary artery aneurysm and septic vegetation from infected aortic valve have also been reported to cause AMI in young adults (Butler et al., 2005).

Furthermore, recreational drug used such as cocaine is widely associated with AMI and other cardiac complications. The unhealthy lifestyle of alcohol binge drinking also has been reported to be associated with the development of AMI (Gowda, Khan, Vasavada, & Sacchi, 2003; Lange & Hillis, 2001).

Finally, all diseases related to hypercoagulable states may cause thrombus formation in coronary vessels, such as antiphospholipid syndrome, nephrotic syndrome, and factor V Leiden mutation. In fact, the use of contraceptive pills in young women have been known to increase the risk of developing AMI because of its procoagulant activity (Jung & Scharrer, 2001; Osula, Bell, & Hornung, 2002; Petitti, 2003; Tanis et al., 2003).

2.3 RISK FACTORS OF AMI AMONG YOUNG ADULTS

In general, we could classify the AMI risk factors into non-modifiable and modifiable. Non-modifiable cardiovascular disease risk factors include age, sex, and family history of ischemic heart disease, while the modifiable risk factors include dietary pattern, smoking, physical activities, weight, environmental stress, lipid profile, blood pressure, uric acid level, cholesterol and blood glucose level. Smoking status, abdominal obesity, lack of daily consumption of fruits and vegetables, and poor physical activities are significantly related to acute myocardial infarction (Salim Yusuf et al., 2004).

The commonest risk factor of AMI among young adults that had been observed in the western population was smoking. This data was widely established by many western researches (Avezum et al., 2005). However, data from Malaysia is currently still lacking. The closest similar study regarding AMI cases among Malaysian young adults was by Zuhdi et al.(2013) in the National Health and Morbidity Survey (NHMS). He found that cardiovascular risk factors of hypertension, diabetes, and obesity are more common compared to the general population. In Malaysia general population (regardless of age),the commonest risk factor of AMI was also hypertension (Wan Ahmad, 2017). Thus, the data for our local community differs from the western countries where they had smoking as the number one risk factor that was prevalent in AMI cases among young adults.

It is already established that AMI is associated with hypertension, hyperlipidaemia and diabetes mellitus, illnesses that are common in advanced age groups. However, recent data from Malaysia published in 2011 brings an alarming note with the fact that 63% of the population aged 18 years and above had at least one cardiovascular disease risk factor (Institute for Public Health, 2011). Obviously, the

increased prevalence of risk factors for cardiovascular disease in the younger population has nullified the "protection" offered by being young.

In NHMS 2015, smoking prevalence from as early as 15 years of age was 22.8%. The highest prevalence based on age group was between 30-34 (29.3%). Concomitantly, for diabetes mellitus the prevalence among the Malaysian population aged 18 years and above was 17.5% which is on an increasing trend from 2011 to 2015. A similarly increasing trend was seen for hyperlipidaemia, which increased 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. 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.

Another significant cardiovascular risk factor is obesity. It was documented that 11.9% of Malaysian children were obese in 2015, increased from 6.1% in 2011 (Institute for Public Health, 2011, 2015). In another study done among a younger age group (adolescents aged 13-years old), found that the prevalence of overweight/obese among adolescents in Malaysia was 23.9%, with 8.5% of them being obese and 15.4% overweight (Hazreen et al., 2014). Most of these adolescents will carry on being obese and hence carry the increased risk of cardiovascular disease into later adult life.

An increase in the prevalence of AMI risk factors among younger adults in our population warrants the need to assess if there is a unique characteristic among young adults with AMI and population-specific characteristic.

2.4 EPIDEMIOLOGY OF YOUNG ADULTS CASES WITH AMI

The incidence and prevalence of a disease are among the fundamental measures in epidemiology. There are few studies looking at the epidemiology of AMI cases