Research Paper

Retrospective Study of Atypical Presentation in Cases Diagnosed As Acute Myocardial Infarction

Medical Science

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ABSTRACT

Introduction: AMI presentation is consider fundamental part for diagnosis as a history of chest pain usually lead the ED physicians to think about it or at least he/she is considered as one of differential diagnosis from all life threatening conditions in thorax region. In many patients, physician might face a challenge or may depend on his experience or technology to figure out the cause of illness if the patient came without chest pain although he/she finally diagnosed as AMI. Objectives: In this study we have determined the prevalence of AMI in KB in north Malaysian. In addition to that this study focused on three main atypical presentations which include atypical chest pain, shortness of breathing and epigastric pain. Others objectives include the outcome of each clinical presentations as well as clinical approached in ED or medical ward. Furthermore, the study compared the duration of admission for all typical and atypical presentations mentioned above. One of the objectives of this study it assessed and correlated the common risk factors in term of co-morbidities which might affect the initial AMI presentation.

Methodology: The study design was a retrospective study of patients presenting for treatment in Hospital Universiti Sains Malaysia from January 1, 2011, to December 31, 2012. This study non experimental research design using data collected from patient's files of folders. Data collection for this study took place during eight weeks period from June 1, 2013, through August 1, 2013. Total of 442 patients with confirmed as AMI enrolled from 1st of January 2011 to 31st of December 2012 in HUSM. Data was analyzed by using SPSS version 22. Main Outcome Measures: Prevalence of atypical AMI presentation include; atypical chest pain, SOB, epigastric pain and others, Mortality rate and how patients were approached in compare to those came with classical chest pain.

Results: Results from data of AMI patients were noticed atypical presentation more common, than typical chest pain (58.6% vs. 41.4%). Mean age of AMI with typical chest pain was found younger than AMI with less chest pain or those without chest pain (58.57 vs. 63.12 years). Time to perform ECG, or started management also was influenced by initial presentation this was appear faster e.g. in DOOR to ECG; in typical presentation 10 minutes, while in atypical presentation the mean time was 37.27 minutes. Also the duration of admission was found to be longer in AMI with atypical presentation (5 vs. 6 days). The mortality rate was higher in atypical presentation when it compared with typical chest pain (9.7% vs. 2.5%).

Conclusions: Our results data were shown AMI without classical presentations were common and patients at risk to be delayed in term of approach as well as management. Patients were treated less aggressively in atypical presentation; also they could be delayed or stayed longer in ED before admission. Moreover, usually they carry poor prognosis and high mortality rate.

CHAPTER 1
INTRODUCTION
1.1 GENERAL INTRODUCTION
Myocardial infarction is also known as heart attack. It is a condition of heart muscles death when one or more coronary arteries which supply oxygen-rich blood to the heart muscle become suddenly blocked. Blockage results from plaques made of fats and cholesterol. The accumulation of this plaque is known as coronary artery disease (Stricker and Goldberg, 2003).

The accumulation of plaque is a process and also can produce chest pain symptom known as angina pectoris A myocardial infarction occurs when a plaque rupture suddenly and it causes a rapid accumulation of clotting factors at the rupture site which leads a sudden obstruction of blood flow in the coronary artery. Sudden obstruction prevents blood reaching the heart muscle. The heart muscles start to die if there is no vital supply of oxygen-rich blood. The longer the obstruction persists, the greater the amount of heart muscle dies. Myocardial Infarction is a medical emergency. If not treated on time it may lead permanent damage of heart muscles (Doering, 1999; Cheng, 2001; Aymong et al., 2007; Burke and Virmani, 2007; Boles et al., 2013).

In spite of all technology and facilities in many centers which provide a top medical care but still heart disease is keeping as a leading cause of death worldwide. Acute Myocardial Infarction (AMI) is considered as hot topic for many studies to assess and evaluate the influence of prevalence, or factors which increase the incidence were taken in many countries with different nations.

Many guidelines either local to specific medical centers or international such as American College of Cardiology updating annually or may be shorter based on many studies published about AMI. Many studies recently took place and assessed the emergency department (ED) in different ways where the patients have to be seen for the first time. These studies focused on ED response since they receive a call for help when the patient in pre-hospital setting as well as in hospital (Ahmar et al., 2008; Hutchison et al., 2013; Ong et al., 2013; Takeuchi et al., 2013).

Acute coronary syndrome (ACS) which include AMI and unstable angina (UA) are common diagnosis in developed countries; usually they share same pathophysiology with different in management. AMI presentations might be acute chest pain or nonspecific symptoms like lethargic or shortness of breath (SOB), and epigastric pain considered as one thing that influence the approach, process, or even the outcome (Vitulano et al., 2012).

Time to diagnosis or start treatment of AMI is considered crucial and critical part in American Heart Association (AHA) guideline as the outcome depends on how the case is approached. Measurement of quality in different centers is evaluated by door to ECG, door to needle, or PCI for AMI patients. Any delay in these procedures results in poor prognosis and increase the possibility of complications including death of patients (Zegre Hemsey et al., 2012; Thang et al., 2014).

No doubt clinical presentation of AMI affected the ED physician diagnosis, starting of treatment and disposition. For clinical purpose many literature divided presentation of AMI in general into two groups; typical presentation for those who came with typical chest pain, and atypical presentation if patient has less severe pain or even had initial symptoms like SOB, giddiness, syncope. This classification aim to help and facilitate diagnosis in ED by identify patients with AMI whom come with atypical presentation in order to decrease missing cases or even avoid delayed in management or disposition.

Many of these atypical symptoms were discussed in many stud-

ies and further studies expected to continue analysis for better outcome of patients. It was found that in pre-hospital setting AMI with atypical presentation has got longest time for arrival to ED, approach at ED, less aggressively treated and also higher mortality rate (Zegre Hemsey et al., 2012).

GHAPTER 2
LITERATURE REVIEW
2.1 BACKGROUND
Abdominal pain is one of the common symptoms that let the patients seeking medical advice. In last decades abdominal pain increasing as symptoms as the age of population in the world increasing and studies in 80s and 90s shows elderly patients came with abdominal pain at least 50% were hospitalized and 30-40% had underlining surgical condition. These studies also showed 40% of these patients were misdiagnosed revealed overall mortality rate of approximately 10%. Although most of the cases has been classified as benign conditions with non serious etiologies but there were respective numbers which reached 10 percent from those presented with abdominal pain to Emergency Department had a critical surgical or medical causes which needed urgent intervention or aggressive medical management(Cartwright and Knudson, 2008).

Evaluation of patients came with abdominal pain challenged before the advance technology like computed tomography and ultrasonography which improved the outcome to figure out actual diagnosis of wide spectrum conditions causing abdominal pain. Advance technologies become one of the routine investigations in many centers in developed countries like US or Australia(Esses et al., 2004).

Many of abdominal pain originally due to abdominal organs e.g. peptic ulcer, billiary disorders, and pancreatic pathologies, other few of these cases are referral abdominal pain from pathologies located outside abdominal cavity (Zdzienicka et al., 2007). Although the later sometime is more serious as it reflecting a diseases like acute coronary artery, esophageal pathologies and lungs pneumonia which usually clinically missed or mistaken with other differential diagnosis (Canto et al., 2002; El-Menyar et al., 2011).

2.2 Acute coronary Syndrome
2.2.1 Definition
ACS is spectrum of diseases, including UA, ST –elevation myocardial infarction (STEMI); usually referred to as Q wave myocardial infarction) and non STEMI or (non Q wave myocardial infarction). The last two are grouped under name of AMI (Daida, 2005).

2.2.2 Diagnosis of AMI
Diagnosis of AMI at ED setting usually is challenging generally depends on three components. History plus physical examination is considered one and the first tool of diagnosis, such as ischemic pain as symptom is crucial of assuming the original of this pain due to impaired of coronary artery perfusion or to rule out others pain in thorax or out of thorax. Beside history, examination of cardiovascular system (CVS) to look for tenderness or detecting others causes of chest pain which might mimic ischemic pain beside check the vital signs which is reflecting the cardiac condition. The second important thing to diagnose AMI is bedside 12 leads ECG which need interpretation with other criteria (history, examination and blood tests). The third diagnostic criteria are cardiac enzymes which now consider the main part to establish the AMI diagnosis especially when the history unreliable and/or ECGs show no changes (Achar et al., 2005; Daida, 2005).

2.2.3 AMI symptoms and presentations
AMI has wide spectrum of symptoms which clinically divided into typical chest pain and other symptoms which related to ischemia or malfunction of heart e.g. mild chest pain, dyspnoea, epigastric, pain, sweating, nausea, (Schelbert et al., 2008).

Patients presented with typical chest pain and diagnosed as AMI usually has better approach regardless of the outcome and usually treated within target time of management of AMI in contrast to other cases presented with symptoms like SOB , nausea, epigastric pain or dyspepsia has had less sense to find diagnosis when it needed further investigations to establish or reject AMI, that worsen the outcome or delayed disposition or even lead to wrong approach (Dorsch et al., 2001).

Many studies were done and shown there were respective numbers of patients diagnosed as AMI although presented with atypical presentations; it was shown 20.2% of all patients admitted with final diagnosis of AMI presented with symptoms other than chest pain. Also was revealed those who came with atypical presentation has had higher mortality rate compared with the group presenting with typical chest pain. Also they were less likely to have treatment in suitable time which leads to poor prognosis among them (Dorsch et al., 2001; Brieger et al., 2004).

Based on Data from the Framingham study which shown up to 25% of acute myocardial infarcts occurred among the participants over 30 years of follow up were firstly apparent after an examination of the ECG. In almost half of these patients diagnosed AMI had atypical symptoms (Dorsch et al., 2001).

Dyspnoea or SOB as symptoms it is quite common compare with other atypical clinical presentation symptoms. In one study was found AMI patients came with SOB as main presentation in 19%. In other study SOB appeared in 31% from total presentations. Other study was shown epigastric pain was included with other atypical presentation in 2% from all total clinical presentation (Dorsch et al., 2001; El-Menyar et al., 2011).

Abdominal pain in general has wide spectrum of cause which usually clinically differentiated based on location, charter, and examination. Although of present of advance diagnostic tools and facilities in developed world, there are non ignorable proportion of patients has abdominal pain with unclear causes which might lead to delay in approach of such patients (Cartwright and Knudson, 2008). Epigastric pain specifically has been reported to many underline causes one of that AMI (El-Menyar et al., 2011)

2.2.4 Age and AMI presentations
In many studies were shown that the impact of age on AMI presentation, elderly people has uncommon typical presentation and chest pain is less as classical symptoms. If we go in details of these studies, is revealed that the mean age of groups increase from 60s in 1070 to become 75s in 1980s and expected to be more in our era which further increase the incidence of atypical presentation of AMI (Then et al., 2001; Ahmed et al., 2012).

Atypical presentations increase with elderly due to present of many co-morbidities e.g. DM, IHD, Cancers which are common among them, hence presentation of them delayed to ED and delayed reperfusion or missed reperfusion therapy in AMI that why the investigators notice they got worse outcome compare to young people (Canto et al., 2002; Eagle et al., 2002).

AMI presentation without chest pain delayed arrives to hospital (mean 7.9 vs. 5.3) and they have higher thrombolysis in myocardial infarction (TIMI) score compare with typical chest pain. Patients presented without chest pain less like to be diagnosis specifically either AMI or UA and in some cases diagnosed as other diseases some of them (Canto et al., 2000).

2.2.5 Impact of gender on AMI patients

In typical presentation, study shows there was no difference between women and men in final diagnosis AMI (Milner *et al.*, 2002). In one of study, shows men had higher incidence (40% vs. 38%) than women patients to come with classical AMI chest pain (Canto *et al.*, 2000; Then *et al.*, 2001). In other study gives details that women usually come late by 12 hours after symptoms started compare to male (El-Menyar *et al.*, 2009).In other which reveal women usually came with non—ST-segment elevation myocardial infarction (NSTEMI) or UA higher than men whom has high incidence to present with STEMI compare with women (El-Menyar *et al.*, 2013). Overall, mortality rate in AMI show women has had higher percentage of death in cases diagnosed as AMI (Canto *et al.*, 2002).

2.2.6 AMI presentations and diabetic mellitus

Diabetic patients was found had has higher rate of silent AMI, in one study was found 39% from 826 diabetic patients were asymptomatic in term of presentation, in other study was detected 51% from 151 diabetic patients with dyspnoea, and in 44% from 760 diabetic patients with angina. Furthermore it shown that diabetic patients carried worse outcome in compare with non diabetic when they came with SOB as symptom of AMI (Brieger *et al.*, 2004; Zellweger *et al.*, 2004).Study shows Patient with DM and had AMI usually treated less aggressively and had higher mortality rate, this appeared in one study conducted on DM patients with AMI (Trichon and Roe, 2004).

2.2.7 Others AMI risk factors which impact clinical presentation

Clinical presentation of AMI also will be more as atypical in group of patient whom they are suffering from hypertension, smoking, hyperlipidaemia, chronic kidneys disease and history of IHD. Studies show presence of these risk factors increase the incidence of atypical presentation with poor outcome (Ali *et al.*, 2011; Brunori *et al.*, 2014).

2.2.8 AMI presentation and outcome

Early diagnosis is essential to improve risk stratification which in many cases depend on clinical judgment which usually vague in cases presented with atypical symptoms. In many cases, AMI patients were found either had one or both of ECG and cardiac enzymes are normal or sometimes not relevant to clinical situation of patients (Soiza *et al.*, 2006). Generally atypical presentation of AMI without chest pain is common and associated with high mortality rate (El-Menyar *et al.*, 2011; Brunori *et al.*, 2014).

CHAPTER3
Research Objectives and Study purposes

3.1 Objectives of the study
3.1.1General objectives

Determine the prevalence as well as issues related to approach, management and risk factors of AMI patients.

3.1.2 Specific objectives

• To determine the prevalence of atypical AMI in different clinical presentations presented to Emergency department in Hospital Universiti Sains Malaysia in Kota Bharu city.
• To evaluate the risk factors in different (typical and atypical) clinical presentations in AMI patients.
• To evaluate approach of AMI patients in ED in term of door to ECG performance, door to needle and disposition.
• To evaluate the outcome as mortality rate and duration of admission of patients diagnosed as AMI.

3.2Study purposes

The purpose of this study is to evaluate atypical AMI presentation including SOB and epigastric pain, as most of studies either focusing on atypical symptoms in general or evaluate specific symptoms like shortness of breath or atypical chest pain.

Chest pain is defined to typical and atypi cal by (1) the presence of substernal chest pain or (2) discomfort that was provoked by exertion or emotional stress and (3) was relieved by rest and/or nitroglycer in. Chest pain was called "typical" angina if patient had all three criteria and atypical or non-angina if less than three criteria were present (Am J Cardiol. 2010).

Although epigastric pain is rare alone as symptoms of AMI but it occur widely secondary to other causes leading to miss diagnosed of many cases of AMI. In this study prevalence of AMI presentations will be evaluated. In addition to that it will show the different in approach between different AMI presentations. Also the study assesses the relation of AMI presentations and the risk factors, outcome in term of mortality, of AMI in different clinical presentations.

Aim of this study to improve awareness among doctors in emergency Department when they dealing with AMI patients when they come atypically as well as others management to pick up atypical presentation of AMI which will help in risk stratification of these patients.

CHAPTER 4
MATERIALS AND METHODS
4.1. Setting

The study was conducted in the ED Hospital Universti Sains Malaysia (HUSM) in the period between first of August 2012 up to end of October 2014. Approval of the ethics committee was obtained prior to data collection.

HUSM is located among a well-appointed site in a heart of Kubang Kerian, area in Kota Bharu a big city in the North East of Malaysia with population of 1.5 to 2 million. HUSM strive to provide the best services and treatment. Efforts that are on-going are to provide medical services, learning and research with the best efficiency to all patients. The ED HUSM provides the service for all kind of illness over 24 hours. This service is encompasses clinical and administrative aspects for all individual in emergency and critical situations for trauma and non-trauma conditions which are range from critically ill to minor ailments, the service is provided 24hours every day.

It involves rapid accessibility to the services where the patient is triaged, provisionally diagnosed, stabilized, managed and referred appropriately to the corresponding medical specialty or discharged home by ED staff. The component of the service provided by ED HUSM: pre-hospital care services which include: Ambulance service: primary emergency response and inter-facility transfer, Medical direction, provided by Medical Emergency Coordinating Centre (MECC) and HUSM dispatcher unit, Mass casualty incident and disaster management. Medical stand by the ED HUSM provides hospital based services which include: Triage services, Emergency clinical, social care and Observational medicine in the Trauma Ward.

The ED is composed three main Zones; Red Zone where the critically ill patients are seen, Yellow Zone and Green zone for non-risk patients. The triage system in emergency depends on the three levels triage.

4.2. Study design

The design is a retrospective study of patients presenting with AMI patients visited ED HUSM from January 1, 2011, to December 31, 2012. Patients' folders were reviewed and data was collected for this study over eight weeks period from June 1, 2013, through August 1, 2013.

4.3. Study population

The study population have been included all patients diagnosed as AMI whom came to HUSM from January 1.2011 to December 31, 2012.

4.4 Inclusion and Exclusion criteria s
4.4.1 Inclusion criteria
Patients diagnosed by ED or medical team as AMI based on history plus ECGs changes and/or cardiac markers.
Both genders.
Age more than 18 years.

4.4.2 Exclusion criteria
AMI Patients referred or diagnosed or started treatment before registered in ED HUSM.

Patients whom developed AMI at the ward after admission.

4.5 Ethical approval
This study was undertaken as a dissertation study for the of Master of Medicine (Emergency Medicine) under the HUSM and approved by the department board review and Human Research Ethics Committee, Universti Sains Malaysia (USM) on the 20th August 2013 (FWA Reg. No: 00007718; IRB Reg. No: 00004494).

4.6 Sample size
By using formula for calculating the sample size based on a previous study result which reveal AMI was found atypical presentation of 78% in NSTEMI and 91% in STEMI (Canto *et al.*, 2002). In this study sample was calculated in all objectives and highest sample size was chosen the formula show sample of all atypical should be 254 to 274 candidates. Data collection yielded from 600 subjects of ACS patients. From this sample 442 subjects were Included in this study.

$$n = \left[\frac{z^*}{\Delta}\right] P(1-P)$$

$$= \left[\frac{1.96^2}{0.05}\right] 0.22(1-0.22)$$

$$= 264 \pm 10\%$$

4.7 Study variable
The dependent variables in this study are time from registration, time from performing ECG, time for starting treatment of AMI, time of reviewing by medical doctor and duration of admission. Other variables include risk factor (DM, HPT, IHD, HLP, and SMOKING). Other variables are final diagnosis and outcome. All these variables overweight based on initial presenting symptoms which included typical chest pain, atypical chest pain, short of breath, epigastric pain and others clinical presentations.
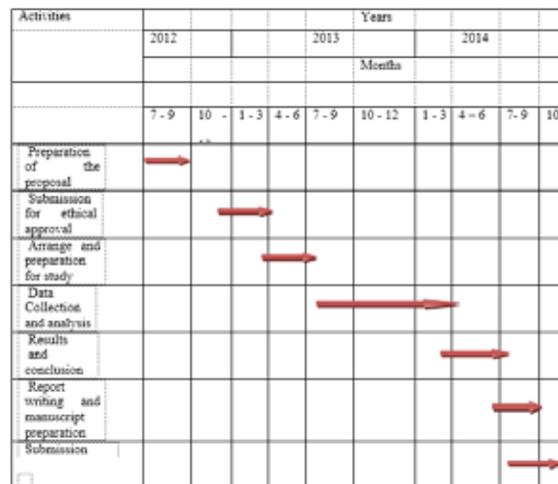
4.8 flow Chart
Retrospective Study Of Atypical Presentation In Cases Diagnosed As Acute Myocardial Infarction (AMI)
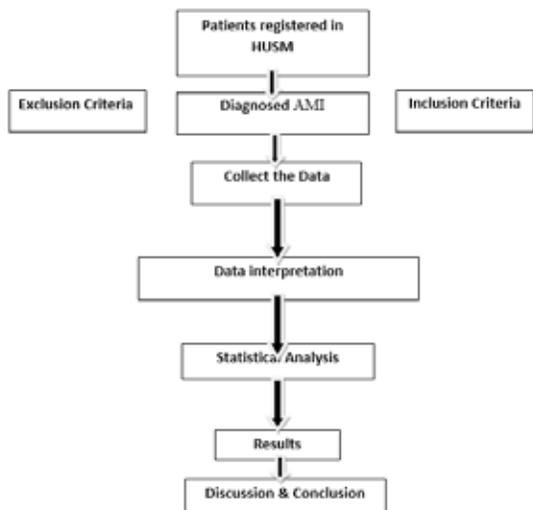
4.8 Gantt chart
Retrospective Study Of Atypical Presentation In Cases Diagnosed As Acute Myocardial Infarction (AMI)

Milestone of Research Activities
1. End of September 2013: Completion of phase 1 Data Collection.
2. End of December 2013: Completion of phase 2 Data Collection
3. End of June 2014: Completion of phase 3 Data Collection.
4. End of July 2014: Data Analysis.
5. July 2014: Preparation of Research Presentation.
6. October 2014: Report submission.

4.9 Data collection
Starting from ED registration office, folders of patients whom are included in the study based on inclusion criteria are identified. The folders then retrospectively followed at HUSM Record Unit after patients discharged or dead. For purposes of this study, data was collected by modified data form structural sheet which cover the information will be needed for achievement the purpose of study.

Data was collected by using structural form patients ED folders as well as medical review when they reviewed patient at ED or later in the ward. In this study all patients diagnosed as AMI were selected and included during specific time (2011/2012). Diagnosis of AMI was based firstly on history plus physical examination this considered one and the first tool of AMI diagnosis, such as ischemic pain as symptom is crucial of assuming the original of this pain due to impaired of coronary artery perfusion or to rule out others pain in thorax or out of thorax. The second important thing to diagnose AMI is bedside 12 leads ECG which need interpretation with other criteria (history, examination and blood tests). The third diagnostic criteria are cardiac enzymes which now consider the main part to establish the AMI diagnosis especially when the history unreliable and/or ECGs show no changes (Achar *et al.*, 2005; Daida, 2005).

Starting from demographic picture of patients including age, sex and race. All patients above 18 years old regardless their gender or ethnicity are included. Chief complaint or the main problem which let the patient visited ED has been identified then has been divided based on initial compliant into two groups, first those who came with typical chest pain and the second those who came with atypical presentations, the later was subgrouped more into four groups for the purpose of this study which include mild chest pain, SOB, epigastric pain as symptoms of ACS and others symptoms uncommon symptoms which was collected in one group e.g. lethargic, LOC, syncope and giddiness.

Beside the main complaint risk factors also are identified which include diabetic mellitus, hypertension, hyperlipidaemia, ischemic heart disease. Time of registration was included to determine starting of investigations and management, also to know duration and time to be seen by medical team at ED and total time spent in ED and finally to see how long patient have been admitted in the hospital. Time was calculated from the moment that the patient was registerd in ED until disposition to different medical wards.

The initial and unique investigation for this study was ECG (door to ECG), and the time to perform ECG was measured in minutes which are calculated from the time patients were registered in ED until ECG was performed. The second time is to indentify how fast management of AMI started by using time of given anti-coagulant or thrombolytic (door to needle) which calculated in hours from the moment patient was registered in ED until patient was received thrombolytic or anticoagulant.

The time was taken since patient was registered to be seen by medical doctor was calculated in hours. Also the duration of staying in ED was measured in hours by subtracting the disposition from arrival time to ED.

All patients diagnosed as AMI were grouped into NSTEMI and STEMI based on final diagnosis. Following these patients the duration of admission was calculated in days. The last variable included in this study was outcome or discharge status which either a live patient or dead. This was details based on different presentations in both STEMI and NSTEMI.

In this study, in order to reduce mistake during data collection, we spent suitable time in patients the recording of data, and ensure accurate records of each single patient's by figure out accurate data as possible as could be, then completed recording of the data and to avoid bias or confounding.

4.10 Data analysis

Data was analyzed by using SPSS version 22.The prevalence of the patients whom fit the criteria will be analysis by using frequency and explore of each type of AMI presentation. Other part was analyzed by using chi-square (X^2) test. Other parts which include analysis to evaluate time to action in all different AMI presentation nonparametric tests Mann-Whitney U test are used.

CHAPTER 5
RESULTS

5.1 General Review

Statistical analysis was done using Statistical Package for Social Sciences (SPSS) version 22. Out of the 107102 patients presented to ED over two years (2011/2012), 442 of patients diagnosed as AMI was included in the this study. Analysis base on demographics, clinical presentation of AMI patients which divided into two groups; first group is typical clinical presentation, the second group divided in to sub-groups which include four of atypical AMI presentations these are; chest pain with less severity, SOB, epigastria pain and other presentation. Last one is a group of very rare symptoms were collected in one group, these like syncope, LOC and lethargic.

Data was analyzed in different ways; these include; descriptive analysis, this was used to analyze the data by using proportion. Student-t test and Pearson chi-square (X^2) test were used for categorical or numerical variables whenever applicable. Risk factors were analyzed using nonparametric test because the variables not normally distributed. Statistical significance was defined as a *P* value of less than 0.05.

T test was not valid to assess the association between some variables e.g. duration of admission, because the data is not normally distributed, therefore the nonparametric test Mann-Whitney U Test was used to compare between different groups.

5.2 Descriptive study based on demographic

Table 5.1 shows that percentages of AMI based on age groups, the result shows higher percentage of cases between 61 to 80 years old (49.8%) followed by 41.7% for those between 41 to 60 years old.

Table 5. 1The distribution of the patients diagnosed as AMI according to age

Age	Frequency	Percentage
18-40	16	3.7
41-60	185	41.7
61-80	220	49.8
More than 81	21	4.8

Figure 5. 1 shows distribution of AMI by gender. Results shows, 79% of the patients were male while 21% are of the opposite gender. There is clear evidence that male about four times more female.
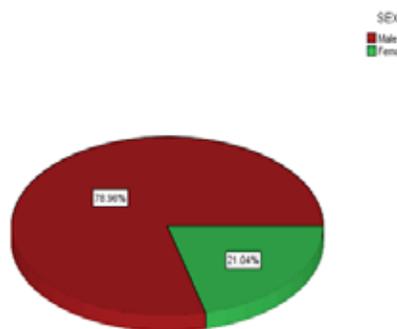

Figure 5. 1 the distribution of patients diagnosed as AMI based on gender

Figure 5.1 shows the distribution of respondents by race. By studying the results, 96.4% of AMI patients were Malay, followed by 3.2% of patients were Chinese, Hence, it is easy to see that the majority of the patients were Malay.
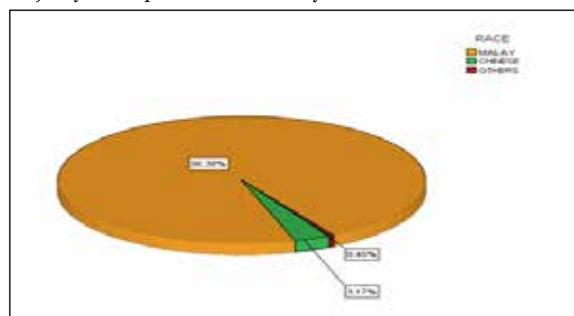
Figure 5. 2 the distribution of AMI patients according to race

Table 5.2 shows the prevalence of AMI patients in two years (2011/2012) which is 0.21 from total patients in two years (207102) were visiting ED. also shows prevalence of typical and atypical AMI presentations which are 0.09 and 0.13 respectively. In analysis of atypical the result reveals atypical chest pain and SOB as AMI presentation has had same prevalence which is 0.05, followed by epigastric pain as a presentation of AMI which 0.02.

The formula for calculating prevalence

Prevalence=	persons with a given health indicator during a specified time period	X 100
	population during the same time period	

Table 5.2 The prevalence of AMI patients in two years (2011/2012)

Variables	N	Prevalence
AMI Patients	442	0.21
Typical Chest Pain	183	0.09
Atypical Presentations	259	0.13
Atypical Chest Pain	105	0.05
SOB	96	0.05
Epigastric Pain	37	0.02
Others clinical presentation	21	0.01

Table 5.3 shows percentage of different AMI presentations. Generally typical chest pain has had higher percentage with 41.4% from total of patients diagnosed AMI during study period over two years and total AMI patients with atypical presentations 59.6%, It is appear that p value is statistically significant (< 0.001). For more details atypical chest pain is consider is the commonest symptom among all atypical AMI presentations followed by SOB as AMI symptoms (23.8% and 21.7) respectively.

Table 5.3 The percentages of different AMI presentations patients in two years

Variables	N	Percentage	P value
Typical Chest Pain	183	41.4	<0.001
Atypical Presentations	259	58.6	
Atypical Chest Pain	105	23.8	
SOB	96	21.7	
Epigastric Pain	37	8.4	
Others clinical presentations	21	4.8	

Table 5.4 shows the mortality rate among the patients diagnosed as AMI within two years. Those came with chest pain either typical or atypical had similar percentage 2.5%. It shows mortality rate was same although they had had different number of patients in term of presentation. In patients whom SOB as the main complaint had the highest mortality rate 3.9% from the total of AMI patients, while in epigastric pain as clinical presentation of AMI patients had a rate of 2% of death from total number of AMI patients.

Table 5. 4 The mortality rate among AMI patients based on main initial clinical presentation

Variable	Live % (n)	Dead % (n)	P value
Typical Chest Pain	38.9(172)	2.5 (11)	0.001
Atypical presentations	48.9 (216)	9.7 (43)	0.001
Atypical Chest Pain	21.4(95)	2.7 (12)	0.716
SOB	17.8 (79)	3.8 (17)	0.063
Epigastric Pain	6.3 (28)	2.0 (9)	0.019
Others clinical presentation	3.3 (15)	1.3 (6)	0.019

Table 5.5 shows the final medical diagnosis distributed based on initial presentation in Emergency Department. It shows AMI with typical chest pain has had higher percentages in both STEMI 18.8 % and NSTEMI 22.6 %, followed by atypical chest pain which is 6.8% in STEMI and 16.9% in patients diagnosed NSTEMI. Generally the results of typical chest pain, atypical chest pain and SOB as presentations of AMI patients are statistically significant P <0.001.

Table 5.5 Final diagnosis of AMI patients based on main initial clinical presentations

Variable	NSTEMI(%)	STEMI(%)	Total patients	*P* value
Typical Chest Pain	22.6	18.8	183	<0.001
Atypical presentations	13.6	45.0	259	<0.001
Atypical Chest Pain	16.9	6.8	105	<0.001
Shortness of breath	18.6	3.2	96	<0.001
EpigastricPain	5.4	2.9%	37	0.416
Others clinical presentation	4.1	0.9	21	0.052

Table 5.6 shows AMI patients with typical chest pain patients has been investigated faster than other when the median time to perform ECG was 10 minutes, with Z statistic is -11.486 and p value < 0.001. in contrast, AMI patients who came with atypical symptoms all has median time longer than typical chest pain with the longest median time in patients came with epigastric pain which was taken 40 minutes to perform ECG, with the Z statistic -6.290 and p value <0.001.

Table 5. 6 Door to ECG time in minutes in different clinical presentations of AMI patients based on main initial complaint (n=442)

Group of main presentation	Minimum	Maximum	Median (IqR)	Z-statistic[a]	P-value
Typical chest pain Yes No	4 10	55 300	10.00 (4) 25.0 (34)	-11.486	< 0.001
Atypical presentations SOB Yes No	10 3	180 300	20.00 (29) 10.50 (19)	-3.557	< 0.001
Atypical chest pain Yes No	15 5	300 299	22.00 (30) 10.00 (16)	-4.871	< 0.001
Others clinical presentation Yes No	10 10	300 300	30.00 (36) 13.00 (20)	-2.363	0.018
Epigastric pain Yes No	5 10	150 300	40.00 (59) 12.00 (18)	-6.290	< 0.001

[a]Multiple Mann-Whitney Test was appliedt

Table 5.7 Shows typical chest pain patients has been managed for AMI first which were received treatment (door to needle) within 1 hour since they arrived to ED, with Z statistics is -10.516 and p value < 0.001, while all AMI patients with other presentation were delayed by 1 to 2 hours.

Table 5. 7 Door to Needle time in different clinical presentations of AMI patients based on main initial complaint (n=442)

Group	Minimum	Maximum	Median (IqR)	Z-statistic[a]	P-value
Typical chest pain Yes No	0.5 1	2 90	1.00 (1) 3.00 (3)	-10.516	<0.001
Atypical presentations Atypical chest pain Yes No	1 0.5	90 48	2.00 (2) 2.00 (2)	-3.648	< 0.001
SOB Yes No	1 1	48 90	3.00 (7) 2.00 (2)	-7.321	< 0.001
Epigastric pain Yes No	2 1	22 90	2.00 (2) 2.00 (2)	-0.579	0.552
Others clinical presentation Yes No	3 1	48 90	3.00 (7) 2.00 (2)	-1.818	0.069

[a]Multiple Mann-Whitney Test was applied

Table 5.8 shows the duration in hours that have been taken of AMI patients in different presentations before they were checked by medical team. The result reveals AMI with typical presentation and epigastric pain have been seen first in ED, that within 2 hours since they arrived to ED with Z statistics are -7.535 and -1.210, respectively and p value < 0.001 for the former. Other AMI patients who came with various atypical presentations have been seen 1 hour later from the AMI patients with typical presentation.

Table 5. 8 Door to review time in hours by medical officer in different clinical presentations of AMI patients based on main initial complaint (n=442)

Group	Minimum	Maximum	Median (IqR)	Z-statistic[a]	p-value
Typical chest pain Yes No	1 1	6 24	2.00 (1) 3.00 (2)	-7.535	<0.001
Atypical presentations Atypical chest pain Yes No	1 1	11 24	3.00 (1) 2.00 (2)	-3.134	0.002
SOB Yes No	1 1	9 24	3.00 (2) 2.00 (2)	-4.257	< 0.001
Epigastric pain Yes No	1 1	7 24	2.00 (2) 2.00 (1)	-1.210	0.226
Others clinical presentation Yes No	1 1	24 20	3.00 (3) 2.00 (1)	-1.587	0.112

[a]Multiple Mann-Whitney Test was applied

Table 5.9 shows the time in hours before patients were admitted in different medical wards. It is appeared that AMI with typical chest pain has had the shortest time in ED with median time 4hours with Z value -6.787 and p value is < 0.001.followed by epigastric pain, atypical chest pain and other AMI presentations with median time of 5 hours. In SOB group patients stayed longer than all other presentation with median time 6 hours before patient admitted with Z statistics -4.359 and p value is < 0.001.

Table 5. 9 Duration of time in hours for AMI patients in ED before admission to ICU/wards

Group	Minimum	Maximum	Median (IqR)	Z-statistic[a]	p-value
Typical chest pain Yes No	1 1	10 15	4.00 (2) 5.00 (3)	-6.787	<0.001
Atypical presentations Epigastric pain Yes No	1 1	10 15	5.00 (3) 4.00 (3)	-0.956	0.335
SOB Yes No	1 1	15 13	6.00 (3) 4.00 (3)	-4.359	<0.001
Atypical chest pain Yes No	1 1	13 15	5.00 (2) 5.00 (4)	-2.727	0.006
Others clinical presentation Yes No	3 1	13 15	5.00 (2) 4.00 (3)	-0.442	0.658

[a]Multiple Mann-Whitney Test was applied

Table 5.10 Duration of admission in different medical wards with measuring time in days in different clinical presentations of AMI patients. Result shows AMI patients with all atypical presentations were stayed longer by one day in compare with typical presentations. Result shows the median duration of all atypical presentations about 5 days. Statistically AMI with epigastric pain as symptoms is significant with Z statistics is -2.170 and p value is 0.030.

Table 5.10 Duration of admission in ward time in days in different clinical presentations of AMI patients based on main initial complaint (n=442)

Group	Minimum	Maximum	Median (IqR)	Z-statistic[a]	p-value
Typical chest pain Yes No	1 1	24 71	4.00 (3) 5.00 (4)	-0.201	0.841
Atypical presentations Epigastric pain Yes No	1 1	15 71	4.00 (4) 5.00 (4)	-2.170	0.030
SOB Yes No	1 1	71 30	5.00 (4) 4.00 (3)	-1.266	0.206
Atypical chest pain Yes No	1 1	30 71	5.00 (2) 5.00 (4)	-0.430	0.667
Others clinical presentation Yes No	1 1	10 71	5.00 (3) 5.00 (4)	-1.587	0.112

[a]Multiple Mann-Whitney Test was applied

Tables 5.11 Shows analysis data in percentage of AMI patients based on their demographic. Based on age group the result shows typical chest is quite common in younger age this between (40 -60) with percentage reach 21.9% from all AMI cases. However, all other clinical presentations the most common cases occurred between 60-80 years. Result shows atypical chest pain is the most common among all other atypical presentations in this age (60 – 80), with percentage 13.6% from over all AMI patients.

In gender analysis male were more commonly came with typical chest pain which is 36.7% from all patients enrolled in the study, with less common atypical chest pain 18.1% and SOB 14.7%. Although, female less commonly came with typical chest pain, SOB in female group considers the most common symptom of AMI with percentage 7% from total of patients.

Table 5. 11 AMI with different clinical presentation in relation to demographic factors (n=442)

Vari-able	Typical chest pain N (%)	Atypical chest pain N (%)	Short-ness of breath N (%)	Epigas-tric pain N (%)	Others N (%)
Age 18-40	9 (2.0%)	6 (1.3%)	1(0.1%)	0 (0.0%)	0 (0.0%)
40-60	97 (21.8%)	43 (7.6%)	43 (7.6%)	12 (2.6%)	8 (1.8%)
61-80	71 (16.0%)	60 (13.5%)	53 (11.8%)	23 (5.2%)	13(2.9%)
> 80	6 (1.3%)	5 (1.0%)	8 (1.7%)	2 (1.8%)	0 (0.0%)
Gender Male Female	162 (36.7%) 21 (4.7%)	80 (18.1%) 25 (5.6%)	65 (14.7%) 31 (7.0%)	31 (7.0%) 6 (1.4%)	11(2.5%) 10(2.3%)

Table 5.12 analyzed by Chi Square (X^2) shows the relation between the risk factors in term of gender, DM, HTN, IHD, hyperlipidaemia and smoking and AMI presentations. it appears that the result is significant P <0.001, the second risk factor is DM which also significant with P value 0.03. Same result was found in HTN and smoking.

Table 5. 12 Table Shows the relation between risk factors and AMI presentation (n=442)

Variable	Typical (%)	Atypical (%)	P value
Gender Male Female	36.7 4.7	42.3 16.3	<0.001
DM Yes No	14.3 27.3	25.7 32.7	0.032
HTN Yes No	40.9 22.2	19.2 17.7	<0.001
IHD Yes No	18.8 22.9	25.9 32.4	0.869
HLP Yes No	12.5 28.9	12.9 45.7	0.055
Smoking Ex smoker Non Smoker	14.4 8.8 18.4	9.9 12.6 35.9	<0.001

CHAPTER 6
DISCUSSION
6.1 General outcome from study
The main purpose of this study is to increase awareness of atypical presentations of AMI. Atypical symptoms or presentations of AMI usually are a challenge to emergency staff. The different AMI presentations were evaluated in many ways to reveal the prevalence, percentages and also the outcome of each variable.

6.2 Demographics analysis
Analysis of demographics of this study shows many results which can be evaluated in different ways. In general age of patients enrolled in this study has shown elderly patients are more likely to have AMI these results were supported by many studies some of these studies were cited above, although these studies have been assess different races, they have shown same results, elderly more 60 years old have higher incidence of AMI(Canto et al., 2002; El-Menyar et al., 2011). this study show that AMI patient seem to be in younger population which due to increase percentage of DM as one of the risk factor in Kota Bharu in compare to other area in Malaysia (Mafauzy, 2006a; Mafauzy, 2006b).

It is appeared that younger patients whom were diagnosed AMI; had typical chest pain as main cardinal initial complaint in compare to others clinical presentations, With increasing age atypical presentation became more to reach above 63.3% in patients above 60 years old. Many studies supported this figures in which atypical was found more than 45% among elderly population (Calle et al., 1994; Eagle et al., 2002; Brieger et al., 2004). No doubt this result was influence by increasing of risk factors which is commonly seen in elderly population.

The second demographic was analyzed in this study is gender. It is revealed that, male more presented with classical chest pain 36.1%, while women seemed to present with atypical symptom this percentage was supported by studies shown female usually have atypical presentations (Canto et al., 2000; El-Menyar et al., 2009; El-Menyar and Al Suwaidi, 2009) which provided, the results show female more commonly presented with atypical presentation, this possible secondary to different in genetic variation and neurological morphology which affect also pain expression and perception (Keogh and Denford, 2009).

This study shows SOB was a leading initial presentation among female 7.0% in compare to classical chest pain 4.8% and chest pain with less severity or atypical chest pain 5.7%. In male the second common initial symptoms after classical presentation was atypical chest pain 18.1% while SOB in third place as presenting symptom in male gender 14.7%. Epigastric pain as main symptom was seen more in male than female (7.0% vs. 1.3%). This figures are found different to some extent but some studies show contrast figures, between atypical chest pain and SOB when it compare male and female (uli et al., 2002; El-Menyar et al., 2011).

6.3 The prevalence and percentage of initial presentation of AMI
A retrospective cohort study and chart review were performed to estimate the absolute and relative prevalence of the serious diagnoses that might cause a patient to present to the Emergency Department (ED) with a chief complaint of chest pain or other AMI symptoms . In study, we queried a database of 347,229 complete visits to the San Francisco General Hospital Emergency Department between July 1, 1993 and June 30, 1998 for visits by patients>35 years old with a chief complaint of chest pain and no history of trauma. Visits for chest pain that resulted in hospitalization were assigned to one of nine diagnostic groups according to final diagnoses as coded in the database. with a chief complaint of non-traumatic chest pain, 3271 (37.6%) resulted in hospitalization. Of the 3078 (94.1% of those hospitalized) assigned a final diagnosis, 329 (10.7% of hospitalizations, 3.8% of all visits) had acute myocardial infarction, 693 (22.5%) had either unstable angina or stable coronary artery disease. In 905 (29.4%) hospitalizations for chest pain, myocardial infarction was "ruled

out" and no cardiac ischemia or other serious etiology for the chest pain was diagnosed. Among patients presenting with chest pain, those in older age groups had dramatically increased risk of acute myocardial infarction. Women presenting with chest pain had a lower risk of acute myocardial infarction than men. In conclusion, the prevalence of acute myocardial infarction in the undifferentiated ED patient with a chief complaint of chest pain is only about 4% (Elsevier Inc, 2005).

In evaluation and analyzed this study in term of prevalence among all AMI patients over two years was 0.21 with those with typical chest pain has prevalence of 0.09, while SOB and atypical chest pain has been noted in 0.05 from total of patients visited ED during same period. The reason for low prevalence it seems to be lower populated town and it also refelect one center in Kota bharu.

In general the percentage of typical and atypical AMI presentations (41.4% vs. 58.6%) p value <0.001,this percentage not different in term of number when all atypical included in one group, these figures was supported by many studies (Then *et al.*, 2001) although other researchers (Zdzienicka *et al.*, 2007; El-Menyar *et al.*, 2011) in which typical presentation reached up to 83%, This differences and contrast results by different authors and centers assume because of increase mean of age in developed world population in last decades in many nations which increase the atypical AMI presentations as it was supported in different studies (Uretsky *et al.*, 1977; Canto *et al.*, 2000).

6.4 Typical versus atypical presentation AMI
The results of the present study reveal that, atypical chest pain and shortness of breath came with nearly similar percentages, 23.8 and 21.7% respectively, Other studies show SOB as symptoms of AMI in up to 19% from the total presentation which not far from our results (uli *et al.*, 2002; Zellweger *et al.*, 2004; El-Menyar *et al.*, 2011). Atypical chest pain was figure out in many publications range from 20 to 30% as from total AMI initial symptoms (Dorsch *et al.*, 2001). for patients with epigastric pain the percentage is 8.4% which same or less than other studies of AMI presentation (Uretsky *et al.*, 1977; El-Menyar *et al.*, 2011) which found 13% from the total of AMI patients which contradicted to study result assume to be increase of the mean age and other risk factors due to increasing age of patients in these studies which increase atypical presentation including epigastric pain as AMI symptoms.

6.5 STEMI and NSTEMI in different clinical presentations
This study generally AMI diagnosed as NSTEMI in 57.6% while STEMI diagnosed in 42.4%. In more details analysis the data have shown those who came with typical chest pain has got percentage of 41.4% in total both NSTEMI and STEMI with P value >0.001, this result it was totally different which show typical chest pain was more common and goes to 73% in NSTEMI and above 90% in STEMI (El-Menyar *et al.*, 2011). On other hand all atypical presentations have been reported in some studies which show atypical AMI presentation up to 58% (Ahmed *et al.*, 2012) possible to increase mean of age of this study which further increase risk factors.

In atypical chest pain NSTEMI and STEMI were 17% and 6.8% respectively (P value >0.001) which shows same different although our results of NSTEMI was double compare with studies was cited above; possible of increase male number in this study with whom pain either typical or atypical was main complaint (Keogh and Denford, 2009).

In data analysis of SOB as main symptoms, NSTEMI has been diagnosed in 18.6% and STEMI in 3.1% (P value <0.001) which same with studies published before. AMI patients in group of epigastric pain as main presenting symptom has been noticed

NSTEMI more common than STEMI 5.4%, 2.9% respectively, although, there are no studies to compare epigastric pain in both STEMI and NSTEMI; this due to underline pathology as NSTEMI causing ischaemia and narrowing of coronary arteries while NSTEMI produce totally necrosis which enhance pain receptors.

6.6 Time to action in different AMI clinical presentation
6.6.1 Door to ECG
When we evaluate these result with AHA guidelines 2005/2010 (Alspach, 2006), it shows that typical presentation was acceptable in view of time to perform ECG and it was longer in other presentations Door to ECG was evaluated in typical and atypical presentation to reveal the way of approach either between classical AMI presentations. In term of time, ECG performed faster in typical presentation (median 10 minutes). In contrast to that atypical presentation because most of symptoms did not assume secondary to AMI hence they triage in less critical zones or sometimes they were waiting for their calling time, e.g. SOB and atypical chest Pain have been reported median (20, 22 minute) respectively. Epigastric pain is the longest time interval for ECG with of median 40 minutes. Delay was caused by waiting time to rule out other possible diagnoses of epigastric pain such as acute dyspepsia or billiary diseases.

6.5.2 Door to Needle
When reviewing AHA 2010 guideline, which recommend window time for AMI patient to receive treatment based on centers and facilities which can be provided this result supported by other study done which show delay of treatment in atypical AMI presentation this study the median time that has been taken in typical or classical chest pain was 1 hours (Z -10.516, P > 0.001, while in epigastric was 2 hours (Z -3.932, P value >0.001, followed by atypical chest pain when the median time was 3 hours (- 3.648, P value >0.001). SOB median time taken to start thrombolytic or anticoagulant is quite long after 3 hours (Z – 7.321, P value > 0.001 (table 7). these results show all atypical patients have been delayed more 90 minute which beyond the recommended time should be (Uretsky *et al.*, 1977), this delay of 1 to 2 hour mainly due to most of patients of atypical presentation triage initially to green or yellow zones as their symptom did not resemble AMI presentation.

6.5.3 Door to review by medical officer
The time that was taken to be review by medical officer since patient registered in ED also was measured. Median time for medical officer to review the typical chest pain was 1 hours. Other atypical AMI presentations median time varied from 2 to 3 hours. For this finding, we couldn't found any studies specifically to compare AMI presentation. One study revealed the delay of examination of ACS with atypical presentation, it shows above 90% of patient with typical presentation will be seen within 1 hour, while those came with atypical presentation with percentage show 50% will reviewed after 1 hour (Uretsky *et al.*, 1977). Most of the centers, medical on call personal usually try to see and admit those cases in critical zones while cases in other zone will be waiting to be reviewed. This waiting cases includes cases of atypical presentation of AMI which assumed to be much stable than the critical cases.

6.5.4 Door to admission time
In this section of data analysis in this part was shown how long patient stayed in ED before disposition. Typical chest the median duration of admission was 4 hours. Atypical chest pain and epigastric pain as initial AMI symptom admitted after 5 hours while SOB and atypical chest pain were admitted 6 hours. This long duration of staying in ED possible also influenced by many factors which include access blocked and congestion in medical wards which delayed further of admission process. Other reason might be explained by the delay of confirmation of AMI before medical review.

6.6 Duration of admission to medical ward
In this part of study we compared the duration of admission in two groups; there was no much different between typical AMI presentation were admitted for 4 days while atypical presentation admitted for 6 days with exception of epigastric pain group in whom the median duration of admission was same as typical presentation. There are no published studies to compare AMI duration of admission.. Some of this delay it seem to be secondary to delay of diagnosis itself and hence starting management or sometime due to present of other risk factor with precipitate or complicated further AMI outcome e.g. uncontrolled DM or sepsis.

6.7 AMI presentations and risk factors
AMI pathophysiology is complicated and sometime take years to appear clinically. This manifestation of underline disease have been accelerated by present of four major modifiable traditional cardiovascular factors—smoking, diabetes mellitus, hypertension, and hypercholesterolemia; 50% of them will go on to develop coronary heart disease (CHD). (Braunwald, 1997; Hennekens, 1998).

Smoking is arguably the single most important modifiable and preventable cardiovascular risk factor and one of the strongest independent predictors of premature CHD. In a recent meta-analysis of 20 clinical trials involving 12 603 patients, smoking cessation was associated with a 36% reduction in all-cause mortality among patients with CHD (Critchley and Capewell, 2003). Diabetes mellitus has been elevated to a level of CHD equivalent, primarily based on long-term epidemiological data that non-diabetic patients with prior AMI have a cardiac event rate similar to that of diabetic patients without prior MI (Haffner *et al.*, 1998).

Treatment of isolated hypertension may have a demonstrated benefit, such as patients with prior AMI, heart failure, diabetes, or other medical conditions, blood pressure control is of paramount importance (*JAMA,* **288(23),** 2002a), For the most part, primary cardiovascular outcomes were similar regardless of the agent used, and a multi pharmacological approach (3 drugs on average) was frequently required.

Two recent trials of cholesterol-lowering therapies have changed the focus to basing treatment on risk rather than low-density lipoprotein cholesterol (LDL-C) levels. The Heart Protection Study *JAMA,* **288(23),** 2002b; *JAMA,* **288(23),** 2002c) a secondary prevention trial involving patients with atherosclerotic vascular disease, diabetes, or both, demonstrated improved cardiovascular outcomes irrespective of the initial baseline LDL-C level. The Anglo-Scandinavian Cardiac Outcomes Trial (ASCOT), a primary prevention trial of high-risk hypertensive patients (primarily older than 55 years) without evidence of CHD, demonstrated a 36% reduction in the combined primary end point of death and MI after only 3.3 years.

The final risk factor is the present of IHD, one study show patients who have had MI have a 5 to 7 fold increased risk of recurrent MI. Furthermore, patients with cerebro-vascular disease have a 2 to fold increased risk of MI (Criqui *et al.*, 1992; 1994).

Analysis risk factors of patients enrolled showed when patients has DM, smoking and IHD more prone to be presented with atypical symptoms. Other risk factors as HLP, and HPN show same percentages or reveres as in HPN 40% of them came with typical chest pain, this different due to reduce the mean age of AMI population in kota Bharu.

6.8 AMI presentations and outcome
For purpose of this study we compare the outcome in the mortality rate for AMI presentation. More details of data results, AMI with SOB as main initial presentation has the highest mor-

tality rate 3.8%, AMI with both typical chest pain and atypical chest had second mortality rate with percentage of 2.7%. AMI with epigastric pain has percentage of mortality rate 2.0% AMI with other clinical presentation has been noted with least mortality rate 1.3%, results was found different from some studies, e.g. it in Canto study 2000 when he was figure out MI mortality rate was up to 23.3%. Other studies like El-Menyar study 2011 was shown more or less same results (Canto et al., 2000; Dorsch et al., 2001; El-Menyar et al., 2011).

General picture may appear that epiastric pain as AMI symptom, almost 24.3% dead from 37 patients, this result when we compare with study published in 2008 in which 16% passed away when they came initially with epigastric pain (Munk *et al.*, 2008).

The outcome of AMI with DM had bad prognosis, when result shows 46.3% passed away from all AMI with DM, this supported by many studies in which DM patients have been noted bad prognosis (Zellweger *et al.*, 2004). This due most of DM patients presented with atypical AMI or silent AMI which delay management or even missed, other reason which worsen outcome was present of co-morbidities and risk factors like sepsis or renal failure due to DM. result shows the highest AMI mortality in those patients had background of HPT, 62% this figure supported by study El-Menyar2011. It seems to be secondary to underline pathopythiology caused by HPT, which lead to adance damage to coronary arteries and mainly right coronary arties which responsible from conduction system of the heart.

6.9 Limitation of study
This is retrospective study in which data have been collect from patients' folder for more than two years. Missing of data or even typing error might influence the accuracy of the result analysis.

This study was done in one medical center in Malaysia which might influence the study outcome. Also the study population mainly was Malay without taken the different races in Malaysia which had different socio/ genetics different.

Furthermore, the sample size which might influence some of groups especially those with rare presentation and appear with no significant difference in some part of data analysis.

Recommendations
First from this study we noticed AMI with CNS symptoms had the worse prognoses which need study in this group of patients.

Need for multicenter study to increase the power of the study.

CHAPTER7
CONCLUSION AND RECOMMENDATIONS
This study was answered objectives of the study. The AMI with atypical presentations is common which with co-morbidities. Most of the patients are not aware of the different types of symptoms indicating the presence of AMI and this leads to delay to seek medical advice and hence worsening the situation. There are two kinds of symptoms which might be associated with cardiac problems and are easy to identify and others are not easy to identify if they are associated with AMI or other diseases.

Since AMI is still one of the main causes of mortality in the world, there are so many AMI risk factors such as tobacco use, diabetes mellitus, and hypertension. Also the study shows AMI with atypical treated less aggressively in compare with AMI with chest pain with poor outcome.

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