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EXAMINATION OF GENDER DIFFERENCES IN BASELINE CHARACTERISTICS AND 12 MONTH DEATH AND REHOSPITALIZATION OF AFRICAN AMERICAN PATIENTS ADMITTED FOR ACUTE MYOCARDIAL INFARCTION

by

SAADIA KHIZER, MD
FATEMA JINNAH MEDICAL COLLEGE

A Thesis Submitted to the Graduate Faculty
of Georgia State University in Partial Fulfillment
of the
Requirements for the Degree
MASTER OF PUBLIC HEALTH

Atlanta, Georgia

July 2007

APPROVALS

EXAMINATION OF GENDER DIFFERENCES IN BASELINE CHARACTERISTICS AND 12 MONTH DEATH AND REHOSPITALIZATION OF AFRICAN AMERICAN PATIENTS ADMITTED FOR ACUTE MYOCARDIAL INFARCTION

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Date

DEDICATION

For Khizer,

without whose support I could have never accomplished this.

ACKNOWLEDGEMENTS

Many thanks are owed to Dr. Susmita Parashar, the co-principal investigator of PREMIER at GMH who allowed me access to the specific database and whose ideas were always helpful. I owe my deep gratitude to Emir Veledar of Emory University for his help with SAS programming for data analysis. Thanks to Dr. Laura Kimble for her knowledge and helpful insight of AMI. I owe special thanks to my parents who always instilled in me value of better and higher education. Finally, thank you to my committee chairperson, Dr. Karen Gieseker, whose knowledge and insight has been invaluable to my research in this area.

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EDUCATION

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EXPERIENCE

Emory University School of Medicine
Atlanta, GA
Lead Research Coordinator, Susmita Mallik MD **May 2006- Present**

- Conducting a prospective observational study of patients with acute myocardial infarction (AMI) in a nationwide study TRIUMPH (Translational Research Investigating Underlying disparities in recovery from acute Myocardial infarction: Patient Health status) at GradyMemorial Hospital.
- Administering various related instruments that included Seattle angina questionnaire, Modified Fagerstorm Test for Nicotine Dependence, Morisky Simplified Self-Report Measure of Adherence, Speilberger State Trait Anger Scale, Health literacy Instrument REALM card etc.
- Abstracting pertinent information from medical records i.e. chart abstraction, reading ECGs, screening and enrolling patients, conducting follow ups for another related study.
- In process of writing papers and abstracts related to the study
- Preparing paperwork for IRB approval of new randomized clinical trial.

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- Worked on HELP project on Jail Diversion for the Mentally Ill in Hall County. Performed literature review and developed database and surveys for the program.
- Worked on ECSEL project for Aggressive Community Treatment of homeless in Atlanta.
- Coordinated on a project for collection and analysis of data for Georgia HealthCare workforce and education University System of Georgia Task Force on Health Professions Education. Published the report.

Sir Ganga Ram Hospital,
Lahore, Pakistan
Physician **1995 - 1996**

- Worked as a physician at the hospital. Job rotation included medical, surgical, gynecological and pediatric wards. Took histories, made diagnosis and prescribed medication.

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NOTE ON TERMS

Throughout the thesis, several terms regarding heart disease will be used, sometimes interchangeably.

*Coronary heart disease*_ comprises of angina, acute myocardial infarction and hypertension. It is also called Coronary Artery Disease CAD.

Acute Myocardial infarction (AMI) _ an acute episode of CAD that leads to ischemia of heart muscle and its death

*Angina*_ discomfort, heaviness, pressure, aching, burning, numbness, fullness, squeezing or painful feeling usually in chest

ABSTRACT

Saadia Khizer
Examination of gender differences in baseline characteristics and 12-month death and re-hospitalization of African American patients admitted for Acute Myocardial Infarction
(Under the direction of Dr. Karen Gieseker)

Coronary heart disease, including acute myocardial infarction (AMI), is the nation's leading cause of death. This study examined the characteristics and outcomes of 397 African American (AA) patients within one year of hospitalization due to AMI at Grady Memorial Hospital (GMH) in Atlanta. The PREMIER study, a nationwide registry, maintained by John Spertus MD, included data from patient interviews, medical records, and clinical characteristics like diabetes, hypertension, smoking, angina frequency and quality of life was used. Patient characteristics, associated with a major adverse event (MAE) within one-year post AMI were evaluated using SAS. Results showed a trend of higher odds of younger age, hypertension, and diabetes in women than men at the time of hospitalization. Although this study did not show any gender differences in the outcomes of AA patients following AMI, a trend of effect modification by gender on various variables was seen. Further research is recommended to examine factors contributing to gender differences in outcomes after an AMI.

Key Words:
Acute myocardial infarction, heart attack, coronary artery disease, gender differences/disparities, African Americans

EXAMINATION OF GENDER DIFFERENCES IN BASELINE CHARACTERISTICS AND 12 MONTH DEATH AND REHOSPITALIZATION OF AFRICAN AMERICAN PATIENTS ADMITTED FOR ACUTE MYOCARDIAL INFARCTION

Chapter I-Introduction

According to the American Heart Association about 1.2 million Americans will have a first or recurrent heart attack in 2007 and about 452,000 of these people will die. Coronary artery disease (CAD), which includes acute myocardial infarction (AMI), angina and hypertension, is the nation's leading cause of death (American Heart Association 2006). Although often considered a men's disease, CAD is a problem for women; in fact, more than 233,000 women die annually from coronary heart disease. Deaths from cardiovascular diseases in women exceed the total number of deaths caused by the next gender specific 16 causes of mortality.

A heart attack is called an acute myocardial infarction (AMI) in scientific language. The heart is a muscle that needs oxygen to survive. An AMI occurs when the blood flow that supplies oxygen to the heart muscle is severely reduced or cut off completely. This blockage is often a result of thickening and hardening of coronary arteries that supply the heart with blood from a buildup of fat, cholesterol and other substances that together are called plaque. The slow process of hardening of arteries over time is called atherosclerosis. The breaking off of plaque in a coronary artery can lead to the formation of a blood clot that can block the artery and shut off blood flow to the

particular area of the heart muscle the artery supplies. When the heart muscle is starved for oxygen and nutrients, the process is called ischemia. Ischemia can be reversible, but prolonged ischemia leads to cellular death. The death of part of the heart muscle as a result of ischemia is called an AMI.

The National Registry of Myocardial Infarctions (NRMI) reports that women have worse outcomes than men after having an AMI (Lambrew and Bowlby 1997). Data show that women under the age of 50 have twice the mortality of men after having a heart attack (Vaccarino et al. 1998). It has been further shown that these variances likely reflect increased severity of the disease in younger women. Studies have shown an increased mortality rate in younger women compared to men after an AMI despite adjusting for medical history, clinical severity, hospital treatments and procedures (Ayus and Arieff 2001; Bodi et al. 2004; Daly et al. 2006; Holliday 2000; Franche et al. 2004; Jani et al. 2006; Vaccarino et al. 1999).

Gender differences in mortality, short-term outcomes and symptom presentation following an AMI have been documented in the literature (Vaccarino et al. 1998; Vaccarino et al. 1999; Rosengren et al. 2001; Bodi et al. 2004). However, there has been limited research on gender differences in the AMI outcomes in the African American (AA) population. In order to specifically target interventions to AA men and women with AMI, gender differences in AMI outcomes in AA have to be studied.

The understanding of gender differences in AMI outcomes may lead to more appropriately formed services to a minority population that already have poorer outcomes after AMI than Caucasian population (Sabatine et al. 2005; Skinner et al. 2005). The aim of the study was to examine *gender differences in outcomes of the AA patients admitted*

to Grady Memorial Hospital for AMI during the 12 months after an AMI. This research, hypothesized that *there would be gender differences in the outcomes of AA patients post AMI within one year after AMI.* So the null hypothesis will be that gender differences do not exist in outcomes in this AA population within one year after AMI. To address the hypothesis, the following research questions were evaluated.

1. Are there gender differences in characteristics of the AA patients admitted for an AMI?
2. Do these gender differences affect the outcomes of the patients post AMI within 12 months of AMI?
3. What is the contribution of gender, demographics, co-morbidities, pre- and post- AMI chest pain, and pre- and post- AMI quality of life to odds of having a major adverse event (i.e. being re-hospitalized or/and death) in first 12 months after AMI in AA patients?

This study was unique since it focused exclusively on an AA population. The study examined if gender differences among AMI patients admitted to Grady Memorial Hospital, Atlanta, GA were similar to what has been documented for the total population in United States.

Evidence on the gender differences in outcome of AMI patients in the total population, the racial disparities irrespective of gender in post AMI patients, and the usefulness of understanding of these gender differences are outlined in Chapter II – Review of Literature. The process of systematically answering the research questions is discussed in Chapter III – Methods and Procedures, and answers to the research questions are found in Chapter IV – Results and Findings. The thesis concludes with Chapter V -

Discussion and Conclusion, which involves interpretation of the data and subsequent recommendations for further research and for incorporating findings in public health.

Chapter II-Review of Literature

Coronary artery disease (CAD)

CAD, also called coronary heart disease is the most common type of heart disease, affecting more than 13 million Americans annually (AHA. 2004). CAD is the result of the narrowing of the coronary arteries which occurs when the arteries become clogged, thereby restricting blood flow to the heart. Without adequate blood flow, the heart becomes starved of oxygen and the vital nutrients it needs to work properly. This thickening and hardening of coronary arteries, known as atherosclerosis, is caused by plaque formation, which results from a combination of buildup of fat, cholesterol and other substances.

The most common symptom of CAD is angina or "angina pectoris." Angina can be described as a discomfort, heaviness, pressure, aching, burning, numbness, fullness, squeezing or painful feeling in the chest. It can be mistaken for indigestion or heartburn. Angina is usually felt in the chest, but also may be felt in the left shoulder, arms, neck, back or jaw. A diagnosis of angina requires determination of the likelihood of CAD and an assessment of the severity of presentation. The likelihood of significant CAD in patients presenting with acute chest pain syndrome is related to the physician's assessment of the patients' symptoms as angina, evidence of prior AMI or other indicators of CAD; and the sex, age, and number of major risk factors for atherosclerosis.

CAD is comprised of high blood pressure (hypertension), angina (chest pain) and an AMI that is defined as an acute episode leading to ischemia of heart muscle.

Hypertension is defined as systolic pressure 140 mm Hg or greater and/or diastolic pressure 90 mm Hg or greater, taking antihypertensive medication, or being told at least twice by a physician or other health profession that person is hypertensive. According to National Health and Nutrition Examination Survey (NHANES) 1999-2004, in 2007 15,800,000 people will suffer from CAD, 7,900,000 from AMI and 8,900,000 with chest pain or angina (Rosamond et al. 2007).

CAD causes roughly 1.2 million AMIs each year, and more than forty percent of those suffering from an AMI die. According to the American Heart Association, over 7 million living Americans have suffered an AMI in their lifetime. Figure 2 shows the prevalence of CAD by age and gender. As can be seen from the figure, CAD is more prevalent in men than women of all age groups.

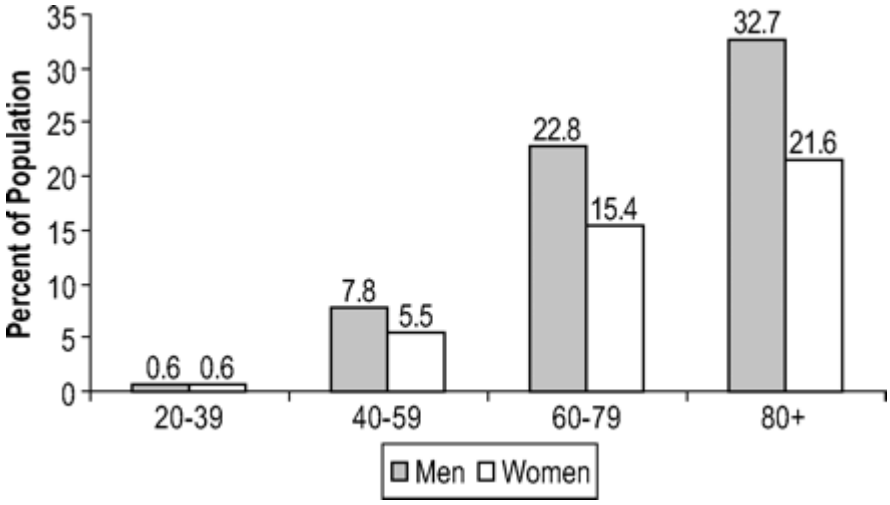


Figure 1: Prevalence of CAD by age and sex (NHANES: 1999–2004). Source: NCHS and NHLBI.

CAD is the single largest killer of American males and females; about every 26 seconds an American will suffer a coronary event, and about every minute someone will die from an AMI. Total mortality as a result of CAD was 452,300 in 2004 (Rosamond et al. 2007).

According to the data from the National Center for Health Statistics (NCHS) and the National Heart, Lung, and Blood Institute **(**NHLBI**),** from 1994 to 2004 the death rate from CAD declined 33%; however the decline in actual number of deaths was only 18%. The death rate is decreasing but the raw number of people with CAD has increased and hence a smaller 18% decrease in deaths is seen. In 2004, the overall CAD death rate was 150.5 per 100,000 population compared to 267.8 in 1999 (Donna L. Hoyert and Sherry L. Murphy 2001; Rosamond et al. 2007). The death rates per 100,000 in 2004 were 194.4 for white males and 222.2 for black males; for white females, the rate was 115.4, and for black females it was 148.6 (Rosamond et al. 2007).

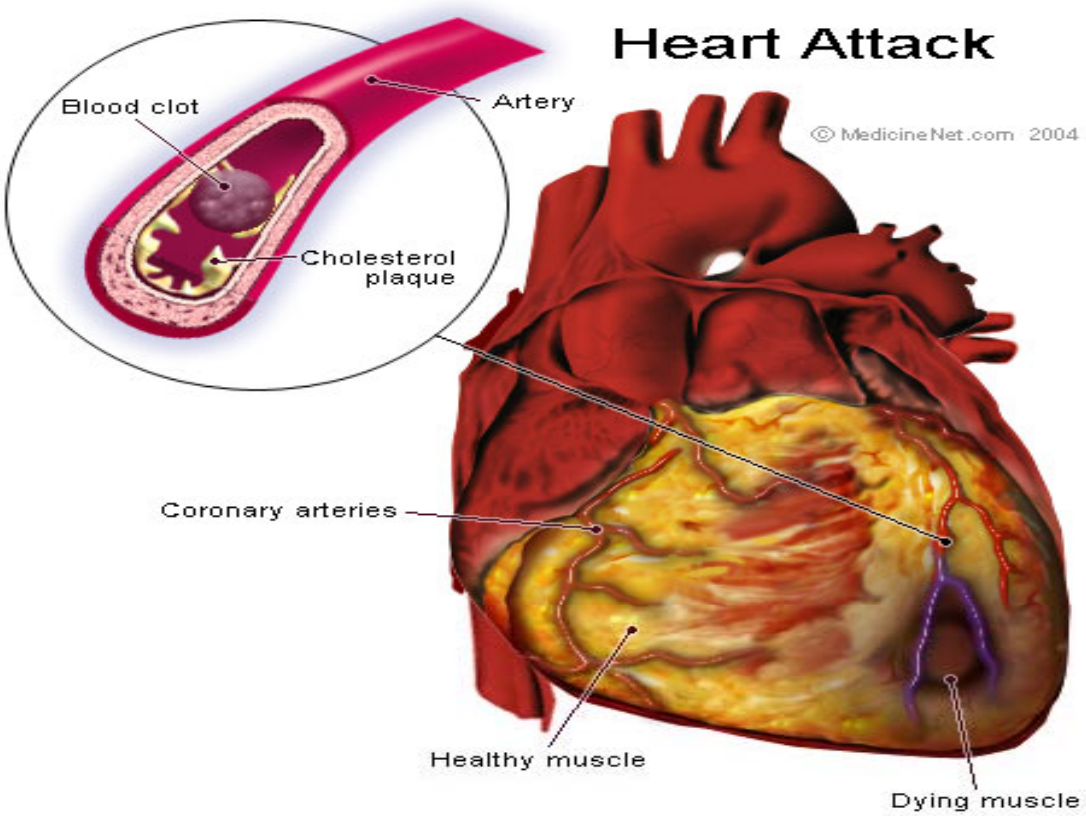
CAD comprises more than half of all cardiovascular events in men and women under age 75. The lifetime risk of developing CAD after age 40 years is 49% for men and 32% for women (AHA. 2004). The incidence of CAD in women lags behind men by 10 years for total CAD and by 20 years for more serious clinical events such as AMI and sudden death (AHA. 2004).

Acute Myocardial Infarction (AMI)

The term AMI is derived from *myocardium* (the heart muscle) and *infarction* (tissue death due to oxygen starvation). The phrase "heart attack" is sometimes used incorrectly to describe sudden cardiac death, which may or may not be the result of AMI.

AMI is the irreversible necrosis of the heart muscle secondary to prolonged ischemia. AMI is the rapid development of myocardial necrosis caused by a critical imbalance between the oxygen supply and demand of the myocardium. Ischemia occurs when the heart muscle is starved for oxygen and nutrients. The death of part of the heart muscle as a result of ischemia is called an AMI (Elliot 2005). Figure 3 shows the process of plaque formation.

Figure 2: Plaque formation in coronary arteries



www.medicinenet.com/heart_attack/article.htm

The estimated annual incidence of AMI is 565,000 new attacks and 300,000 recurrent attacks annually (Boland 2002). Average age at first AMI is 65.8 years for men

and 70.4 years for women. Among Americans ages 40 to 74 years, NHANES data found the age-adjusted prevalence of self-reported AMI and electrocardiographically verified AMI to be higher among men than women but angina prevalence to be higher in women than in men. Age-adjusted rates of self-reported AMI increased among African-American men and women and Mexican-American men but decreased among white men and women from 1999 to 2004 (Lethridge-Cejku 2006).

An AMI is diagnosed on the basis of symptoms like angina, changes in electrocardiogram (ECG) results and certain blood tests. The ECG is a noninvasive test that is used to reflect underlying heart conditions by measuring the electrical activity of the heart. Additional therapeutic decisions after diagnosis such as administration of an intravenous thrombolytic or performing percutaneous coronary intervention (PCI) often are made based on the severity of ECG changes. (Emedicine, 2006).

The classic symptoms of AMI include chest pain, shortness of breath, nausea, vomiting, palpitations, sweating, and anxiety or a feeling of impending doom. Patients frequently feel suddenly ill. Women often experience different symptoms than men. The most common symptoms of AMI in women include shortness of breath, weakness, and fatigue (McSweeney et al. 2003). Approximately one third of all AMIs are silent, without chest pain or other symptoms (Services and Medicine 1990).The risk of a recurrent AMI decreases through secondary prevention measures involving strict blood pressure management and lifestyle changes, chiefly smoking cessation, regular exercise, a sensible diet for patients with heart disease, and limitation of alcohol intake (AHA 2006).

Cardiac markers also help to differentiate AMI from other causes of angina or chest pain. This categorization is valuable because patients with angina may or may not

have diagnostic changes on their ECG. The cardiac enzymes used in the diagnosis of AMI are troponin and creatine kinase isoenzyme (CKMB). CK-MB shows an increase above normal in a person's blood test about six hours after the start of a heart attack. It reaches its peak level in about 18 hours and returns to normal in 24 to 36 hours. The peak level and the return to normal can be delayed in a person who's had a large heart attack, especially if they don't get early and aggressive treatment.

There are certain troponins specific to heart muscle whose presence in blood can detect minor heart muscle injury, which is not detected by CK-MB. Normally the level of troponins in the blood is very low. It increases substantially within several hours (on average four to six hours) of muscle damage. It peaks at 10 to 24 hours and can be detected for up to 10 to 14 days (AHA 2006). Overall the combination of presentation, ECG changes and blood tests is critical for accurate diagnosis of an AMI.

Patients are usually discharged post-AMI with several long-term medications that are designed to prevent secondary cardiovascular events (i.e. further AMIs, congestive heart failure or a cerebrovascular accident) (Brilakis, Reeder, and Gersh 2003). Depending on their gender and clinical outcome, people who survive the acute stage of an AMI have 1.5 to 15 times higher chances of illness and death than that of the general population. The risk of another AMI, sudden death, angina, heart failure, and stroke is substantial for both men and women (Rosamond et al. 2007). A Mayo Clinic study found that cardiac rehabilitation after an AMI is underused, particularly in women and the elderly. Women and elders were 55% less likely to participate in cardiac rehabilitation as compared to men and younger participants respectively (Witt et al. 2004). Only 32% of

men and women age 70 or older participated in cardiac rehabilitation, in comparison to 66% of 60- to 69-year-olds and 81% of those under age 60 (Witt et al. 2004).

On the basis of pooled data from the Atherosclerosis Risk in Communities (ARIC) Study, the Cardiovascular Health Study (CHS), the Framingham Heart Study (FHS), and studies of the National Heart Lung and Blood Institute (NHLBI) statistics indicate that 18% of men and 23% of women at age 40 and older die within one year after their first AMI. At ages 40 to 69, 8% of white men, 12% of white women, 14% of black men, and 11% of black women die within first year. At age 70 and older, 27% of white men, 32% of white women, 26% of black men, and 28% of black women die within the same time frame (Rosamond et al. 2007).

Risk factors of AMI

According to the American Heart Association (AHA 2006) extensive clinical and statistical studies have identified several risk factors for coronary heart disease and AMI. Some are major risk factors (i.e., those that research has shown significantly increase the risk of heart and cardiovascular disease) while others are contributing risk factors (i.e., those associated with increased risk of cardiovascular disease, but for which significance and prevalence have not yet been precisely determined). Some of the risk factors can be treated, modified or controlled while others cannot. The more risk factors a person has, the greater the chance of having an AMI. Also, the greater the level of each risk factor, the greater the risk of occurrence of an AMI (Smith et al. 2001).

The major risk factors for an AMI that cannot be changed are increasing age, male gender, genetics, and race (Sabatine et al. 2005; Conigliaro et al. 2000; Rosamond

et al. 2007). AA have more severe high blood pressure than Caucasians and a higher risk of heart disease (Douglas et al. 2003; Burt et al. 1995). AMI risk also is higher among Mexican Americans, American Indians, native Hawaiians and Asian Americans. This may be partly due to higher rates of obesity and diabetes in these populations (Douglas et al. 2003). Not surprisingly, most people with a strong family history of heart disease have one or more of the other risk factors as well (Rosamond et al. 2007). The major risk factors that can be modified, treated or controlled include smoking, high blood cholesterol, high blood pressure, physical inactivity, obesity, overweight and diabetes mellitus. Some of the contributing factors to these risks include stress and alcohol (Smith et al. 2001). Additionally depression has been found to be associated with greater risk for a subsequent cardiac event after AMI and a greater risk for death after the event (Parashar et al. 2006).

Some racial and gender differences in the outcomes of AMI can be explained on the basis of distribution of the above-mentioned risk factors among various populations. Specifically, higher prevalence of hypertension, diabetes, and obesity among AA can be partially responsible for poor prognosis after AMI (Sonel et al. 2005). Moreover, in AA, the high prevalence of obesity and obesity-related conditions such as hypertension and type II diabetes, have been reported to contribute to their higher death rate from CAD. In addition, the high prevalence of obesity contributes to higher prevalence of hypertension in AA. AA have a more severe course of hypertension and an earlier onset of hypertension than Caucasians (AOA 2005; Burt et al. 1995). Interestingly, cultural factors related to dietary choices, physical activity, and acceptance of excess weight between AA and other racial-ethnic groups, appear to play a role in interfering with

weight loss efforts. Although both AA and whites report that they exercise less as they get older, AA women of all ages report participating in less regular exercise than white women (AOA 2005). This lack of physical activity in AA women can also be a factor in poorer outcomes after AMI.

Studies have shown that there is an association between lower socioeconomic status (SES) and a worse AMI outcome. The SES encompasses the economic, social and physical environments in which individuals live and work, as well as the demographic and genetic factors. Measures for SES may include income, education, occupation, or employment. Patients of low SES have higher mortality after AMI compared to those who have higher SES in terms of income and access to healthcare (Alter et al. 2006; Chang 2007). Patients' baseline clinical status largely explained the relationship between SES and mortality among patients with AMI. The reasons for worse outcomes following AMI in groups with lower SES can be partially explained in part by greater co-morbidities among persons with low SES. Although the association between low SES and other risk factors is not yet clearly understood which can be counted as a contributing risk factor (Alter et al. 2006; Bernheim et al. 2007; Lynch et al. 1996; Kraus, Borhani, and Franti 1980; Rahimi et al. 2007).

Racial differences in outcome of AMI patients

According to the findings from NHANES III 1999-2000 even though AMI declined 28% among whites, the decrease among blacks was only 19% (Douglas et al. 2003). Despite modern treatments and advances in health care technology, racial disparities are observed in the prognosis of patients suffering from AMI (Conigliaro et al.

2000; Cooper et al. 2000; Douglas et al. 2003). Even after adjustment for baseline characteristics like age and gender, non-white patients had a significantly worse prognosis than white patients, regardless of treatment approach. Many studies also note that blacks are less likely than whites to receive many evidence-based treatments, particularly those that are costly or newer (Conigliaro et al. 2000; Sonel et al. 2005; Venkat et al. 2003). As mentioned earlier, the higher prevalence of hypertension, diabetes, and obesity among AA also contribute to poor prognosis in AA after AMI (Sonel et al. 2005).

Gender differences in AMI

CAD in women receives less attention as a cause of morbidity and mortality than in men (Eleanor Levin, 2005). Men have more coronary events in middle age in contrast to women, yet CAD is the leading cause of death in middle-aged women (Tunstall-Pedoe et al. 1996; Eaker et al. 1993). A mounting body of literature has described gender differences in symptom presentation, treatment and outcomes after AMI. CAD is present in one of nine women aged 45-64, and the ratio increases to one in three women after age of 65. CAD occurs approximately 10 years later for women than men, with the AMI occurring as much as 20 years later. Although men under 65 are more susceptible to AMI than women of comparable age, women in this age group who suffer from an AMI are more likely to die (Brezinka and Kittel 1996; Eaker et al. 1993).

Overall, the characteristics and statistics of AMI are different in women than in men. Women with AMI are older at the time of the AMI than men, on average, by at least 5 years. Women have different symptom presentation than men, and tests to detect AMI

function differently in women than in men (Greenland and Gulati 2006; Greenland et al. 1991). Women are generally reported to have higher case fatality rates in the hospital, at 30 days and 1 year after an AMI. Some attribute poorer outcomes in women to older age alone.

Additionally, some studies suggest that women receive less intense approaches to treatment than men once they are recognized as having an AMI; this also contributes to poorer outcomes in women (Gan et al. 2000; Vaccarino et al. 2005). This less aggressive approach to treatment is in part responsible for adverse short term outcomes in women.

Various studies observed significant gender differences in reports of several symptoms associated with acute coronary syndrome. These studies concluded that men are less likely to complain of neck pain, back pain, jaw pain, and nausea than women (Goldberg et al. 1998; Kam et al. 2002). Conversely, men are more likely to report diaphoresis than women. Women are more likely than men to report chest discomfort rather than chest pain and rate the severity of pain lower than men (Chen et al. 2005; McSweeney et al. 2003).

Figure 3 shows the incidence of AMI by age, race and sex while Figure 4 shows the annual rate of first AMIs. Both incidence and rate are higher in Black men and women than White men and women. Women of both races however show lower incidence and annual rate compared to men

Figure 3: Incidence of AMI by age, race, and sex (ARIC Surveillance, 1987–2001).
Source: NHLBI (Ross and Stier 1999)

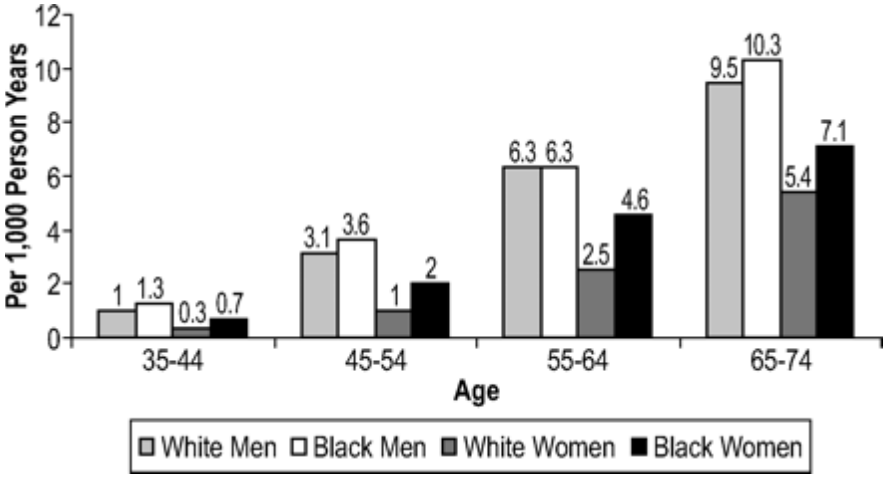
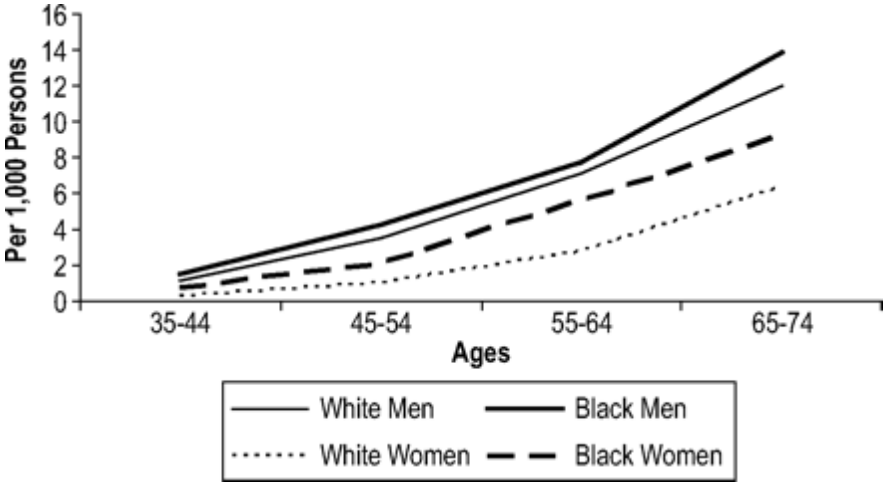


Figure 4: Annual rate of first AMIs by age, sex, and race (ARIC: 1987–2000).
Source: NHLBI's ARIC surveillance study, 1987–2000; .



Most of the studies cited herein have adjusted for factors that influence outcome (e.g., age, diabetes and cardiac diagnosis). Studies therefore demonstrate that women may be more likely than men to experience atypical symptoms (e.g. chest discomfort rather than chest pain, pain/discomfort only in areas of the body other than the chest, pain/discomfort that first starts in the arm(s), and unexplained anxiety) associated with

AMI. Although difference in symptom presentation has been observed, it is not yet fully established if it has any association to the poorer outcomes post AMI in women (Kam et al. 2002; Chen et al. 2005; Goldberg et al. 1998; DeVon and Zerwic 2002; McSweeney et al. 2003).

There is a marked difference in outcomes after AMI between men and women in different age groups. It has been demonstrated consistently that younger women have a particularly adverse prognosis compared with men, and this persists after the adjustment for risk factors (Vaccarino et al. 1998; Vaccarino et al. 2001; Vaccarino et al. 1999; Vaccarino et al. 2005). It has been widely accepted that the younger the age of the patients, the higher is the risk of death among women relative to men. Therefore although AMI affects men in greater numbers, the short-term outcomes for women are comparatively worse. (Vaccarino et al. 1999; Ayus and Arieff 2001; Vaccarino et al. 2001; Rosengren et al. 2001; O¨zgu¨r, Belgin, and O¨ zgu¨r 2002).

These gender differences are partially explained by greater co-morbidity in women which also leads to less frequent use of invasive procedures in women (Gottlieb et al. 2000; Simon et al. 2006; Mehilli et al. 2002). Studies showed that women with AMI are older, have more prevalence of hypertension and diabetes, thereby leading to lesser use of invasive procedures. The reason for lesser use of invasive procedures is less tolerance of surgery and lower success rates in the presence of these co-morbidities. These procedures have been shown to provide better outcomes after AMI but their lesser use in women can be responsible for poorer outcomes (Gottlieb et al. 2000).

Disparities in management of AMI also may explain the gender differences in the outcomes post AMI. Comprehensive consideration of certain social, personal and medical

factors can explain some but not all gender and racial disparities in outcome of AMI (Sabatine et al. 2005; Iribarren et al. 2005). Rates of reperfusion therapy, coronary angiography, and in-hospital death after AMI vary according to race and sex (Skinner et al. 2005; Vaccarino et al. 2005). Numerous studies have shown that women with AMI are less likely to receive evidence-based care compared with men. According to AHA, there are eight evidence-based interventions for treatment and management of AMI patients once they are admitted to the hospital. These include prescription of aspirin and beta blocker medications at hospital arrival and discharge, prescription of enzyme inhibiting drugs, thrombolytic agent (medication to dissolve a blood clot blocking a heart artery) within 30 minutes of hospital arrival, angioplasty (opening of a blocked artery in the cardiac catheterization lab) within 120 minutes of hospital arrival and smoking cessation counseling (Mosca L 2004).

The employment of evidence-based medicine reduces mortality in male and female patients with AMI. In addition it also leads to a decrease in mortality rates at one year post AMI. However, evidence-based procedures are used less often with women. Greater use of evidence based care and treatment in women might narrow the post-AMI sex mortality gap (Jani et al. 2006; Mehta et al. 2002).

A number of studies have shown that women exhibit more delay in seeking care after AMI (Holliday 2000; Leslie et al. 2000; Gurwitz et al. 1997; Rosenfeld 2005; Bouma et al. 1999). Women's delay in seeking treatment for AMI symptoms results in higher rates of mortality and morbidity for women (Rosenfeld 2004). Since women usually have vague symptoms for AMI and often do not recognize them as a threat they delay in seeking care. According to a nursing study, women delayed presentation from

one hour to 168 hours (median 6.25 hours) (Holliday 2000). The decision to seek help was influenced by beliefs about personal susceptibility to AMI and beliefs about the way AMI presents (Holliday 2000).

In summary, the combination of older age at presentation, greater delays in seeking medical treatment and lower intensity of treatments after the hospitalization contribute to worse AMI outcomes in women. Even though gender differences have been established extensively for presentation, treatment and outcome of AMI, these differences have not been established exclusively in any minority population, including AA. This gap in literature served as a motivator to explore these gender differences in an exclusively AA population.

Quality of life (QOL) measurements for AMI patients

QOL is an important outcome measure after hospital admission for AMI. A number of predictors and measurements have been used in various studies. The physical and mental QOL scores of Short Form-36 (SF 36) have been used to identify clinical, demographic, and psychosocial characteristics of patients. The SF 36 is one of the most widely evaluated measurements. The SF 36 was developed in the US as part of the medical outcomes study and has been further tested and validated in a British population (Brown et al. 1999).

Another QOL measurement used in certain studies related to AMI is the MacNew Heart Disease Health-related Quality of Life Questionnaire (Stefan Höfer 2004). It has been shown to be specifically valuable for assessment of health status in heart disease for

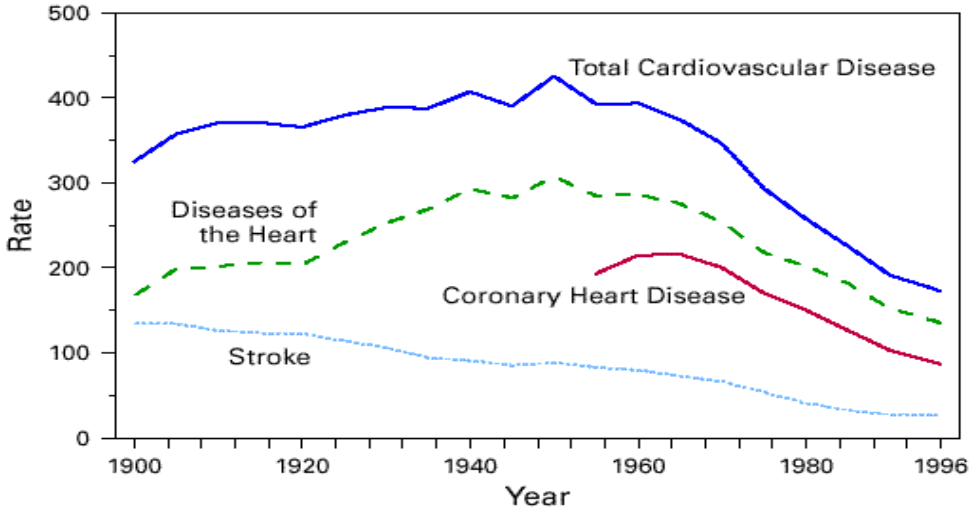
individual patient. This assessment tool evaluates how daily activities and physical, emotional, and social functioning are affected by CAD and its treatment (Hofer S 2006).

The Seattle Angina Questionnaire (SAQ) is a disease specific functional instrument that measures health related quality of life (QOL) outcomes. Its validity as a responsive, reliable, reproducible and prognostic measure of patients' perspectives of how their coronary disease impacts their symptoms, function, satisfaction with treatment, and quality of life has been demonstrated (Spertus et al. 1995). SAQ is sensitive to clinical change and a valuable measure of outcome in cardiovascular research. It is a 19-question self-administered instrument that measures five dimensions of CAD; Physical limitation scale, angina stability scale, angina frequency scale, treatment satisfaction scale, and disease perception/ quality of life (QOL) scale.

Public Health and AMI

CAD has been the leading cause of death in United States since 1921. Since 1950, age-adjusted death rates due to CAD have declined 60%, becoming one of the most important public health achievements of the 20th century (CDC 1999). Age-adjusted death rates per 100,000 persons for all diseases of the heart have decreased by 56%. Age-adjusted death rates for CAD continued to increase into the 1960s, and then declined. In 1996, 621,000 fewer deaths occurred from CAD than would have been expected had the rate remained at its 1963 peak (National Heart 1998).

Figure 5: Mortality due to heart disease from 1990-1996 (CDC 1999).



Despite remarkable progress, CAD remains the leading cause of disability and death. Although many trends have been positive, trends for some important indicators of cardiovascular health such as risk of heart failure and stroke after AMI and obesity in adults have not improved substantially.

According to CDC major public health challenges for the 21st century for CAD include reducing risk factor levels and preventing the development of adverse risk factors. Continued research is needed to understand the determinants (social, psychological, environmental, physiologic, and genetic) of CAD risk factors. The racial/ethnic disparities in CAD mortality have to be reduced. Promotion of policy and environmental strategies that enhance healthy behavior is essential. Identification of new

or emerging risk factors and determining their potential for public health intervention is also crucial (CDC 1999).

Recent estimates suggest that cardiovascular diseases cost the United States $110 billion annually. The average cost to traditional health insurers for the first 90 days following an AMI is $38,501. Medicare spends over $14,000 per patient on hospital bills in the year after an AMI, plus additional amounts for physicians and outpatient care. Moreover, these amounts are rising at a rate of four percent annually (David Cutler 1998).

Basically, a mounting body of literature shows that burden of AMI is heavier in AA population for both genders, compared to Caucasian population. They suffer in terms of higher incidence, prevalence and prognosis over time following an AMI and this is more true in the case of Black women.

Some economic studies, focusing on AMI mortality, have shown that heart attacks are expensive to treat. It was concluded that the increasing intensity of medical treatment extends the lives of AMI patients (David Cutler 1998). Such treatment is also responsible for the increased costs. Also the clinical and economic burden of AMI is not limited to the acute event only but extends to post acute cardiac events over the years. Mean 10-year discounted inpatient medical costs for AMI patients have been shown to be in vicinity of $ 50, 000 (Eisenstein 2001).

All this points to the fact that prevention of first AMI and then ensuing AMI will greatly contribute positively to public health. This can be achieved partly by educating the public about the symptoms, risks, seeking treatment and the secondary prevention after first AMI (Mosca et al. 2000). This study will be a first step in determining the

various contributing factors to the various outcomes of AMI in AA. A better understanding of these factors will lead to better health education about primary and secondary prevention of AMI. This will ultimately lead to the main goal of public health i.e. social justice, by reducing the health disparities by gender and race.

Chapter III-Methods and Procedures

Objectives of the Thesis

Having established the background on the CAD, gender differences in the symptoms, presentation and outcomes of an AMI, the remaining Chapters of the thesis will focus on specific research carried out by the author, which included secondary data analysis of data from one site (GMH) of a multi-center registry; the Prospective Registry Evaluating outcomes after Myocardial Infarction Events and Recovery (PREMIER) program. Patients were prospectively enrolled between January 1, 2003 and June 28, 2004 from 19 U.S. hospitals as part of the PREMIER study. The data analyzed for this thesis was specific to AA AMI patients admitted to Grady Memorial Hospital (GMH) in Atlanta, Georgia in same time period.

The objective of the study was to examine the *gender differences in outcomes of the AA patients admitted with an AMI.* The answers to the following research questions are pertinent to address this aim. The data analysis addressed the following research questions:

1. Are there gender differences in characteristics of the AA patients admitted with AMI?
2. Do these gender differences affect the outcomes of the patients within 12 months post AMI?

3. What is the contribution of gender, demographics, co-morbidities, pre- and post- AMI chest pain, and pre- and post- AMI quality of life to odds of being re-hospitalized and/or death in first 12 months after AMI in these AA patients?

Background Research Description of the PREMIER Registry

The research questions were addressed by using data from PREMIER. The PREMIER Registry was created with funding from CV Therapeutics, Inc, Palo Alto, CA, and R-01 HS11282-01 from the Agency for Healthcare Research and Quality, Rockville, MD. The principal investigator for the GMH study site is Dr. Viola Vaccarino.

Participants were prospectively enrolled between January 1, 2003 and June 28, 2004 from 19 U.S. hospitals as part of the PREMIER study. The primary goal of PREMIER is to provide deep understanding of patients' health status (presentation, QOL and function) one year after AMI. PREMIER identifies a broad number of insights into how current care might be improved to optimize patient centered health outcomes after AMI. It has been designed to explicitly describe patient-centered health status outcomes 1 year after discharge and to document the determinants and trajectory of that recovery. It directly addresses an important knowledge gap in improving the patient-centered outcomes of AMI care. This will, in the long-term, lead to realization of the goals of the Institute of Medicine for improving the quality of American health care.

All patients with positive troponin or elevated creatine kinase myocardial band fraction in the initial 24 hours of admission were screened for eligibility. Subjects were included if they were ≥18 years of age, had elevated cardiac enzymes/biomarkers within

24 hours of arrival to the study hospital, and had additional clinical evidence of AMI (e.g. prolonged ischemic symptoms, and ST changes in the admitting electrocardiogram). Subjects were excluded if they were transferred to the study institution from another facility greater than 24 hours after their original presentation; were unable to provide or refused consent; did not speak English or Spanish; were discharged/expired before being contacted by the site coordinator; or were already enrolled in PREMIER and had a subsequent readmission.

A comprehensive chart abstraction was performed at each site during the AMI admission to describe patient demographics, medical history, clinical status, hospital treatments and discharge recommendations. In addition, patients were interviewed during hospitalization to collect information on socio-demographic, behavioral, psychosocial and health status measures. The follow-up interviews were conducted 12 months after patient's admission to reassess relevant clinical and behavioral characteristics by phone. The participants later selected for the contribution of risk factors and their changes over period of 12 months had most data available. Figure 8 provides a schematic of the variables collected for the PREMIER registry.

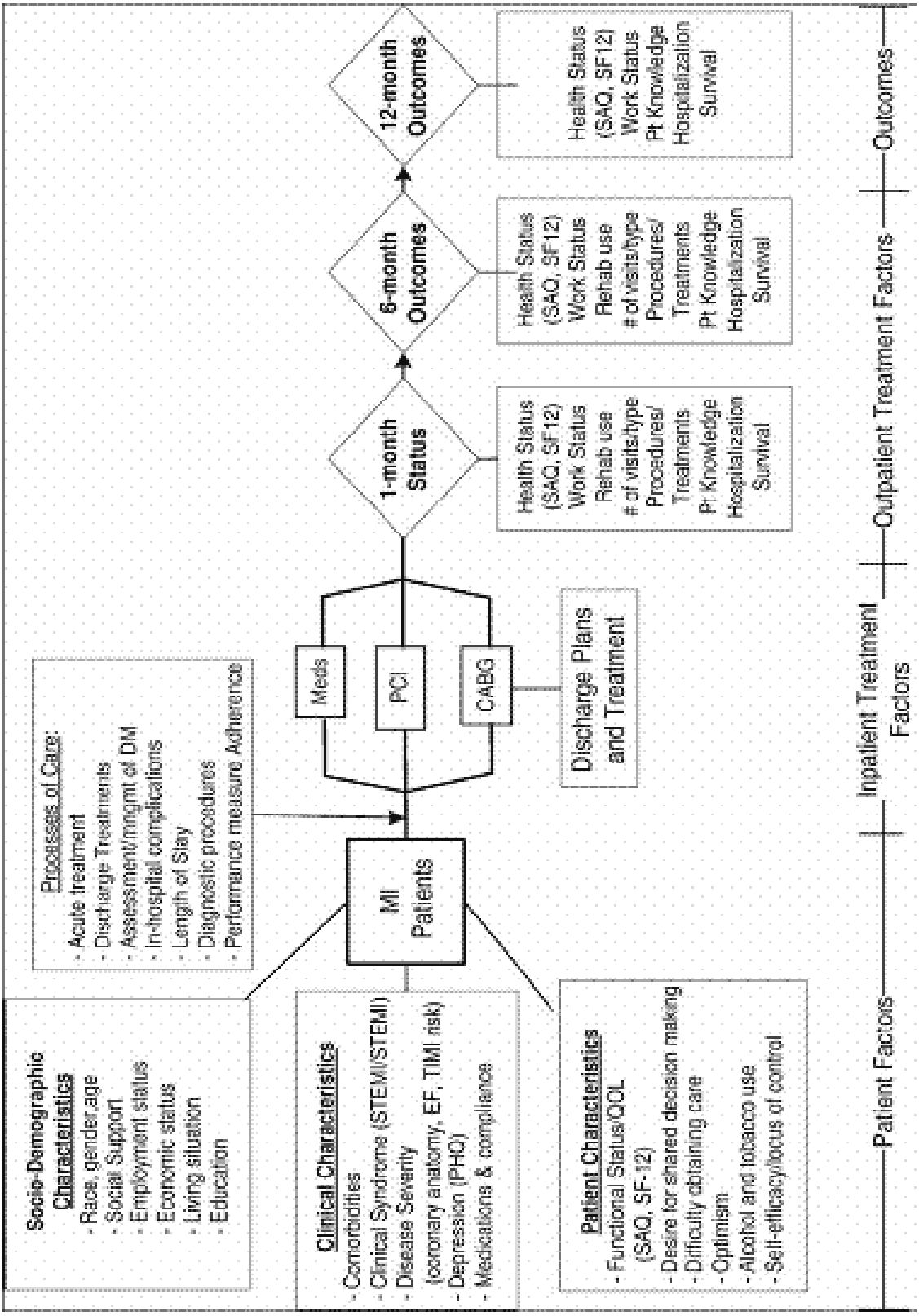


Figure 6: Variables collected for the PREMIER registry (Spertus et al. 2006).

Secondary Data

The data of PREMIER for GMH patients were obtained by permission of Dr. Susmita Parashar, the co-principal investigator of GMH site. GMH site had an existing SAS® (Statistical Analysis Software) database. There were a total of 440 AMI patients enrolled from GMH in Atlanta. Of these 440 patients, 397 AA patients were identified and selected for inclusion in this analysis. Patients had signed an informed consent at the time of enrollment and the Institutional Review Board of Emory University and Grady Research Oversight Committee approved the research protocol. The data used by the researcher were de-identified of names, date of birth and social security numbers to ensure the privacy of patients.

Study Variables and Instruments

The following variables relevant to the research questions were included in the study dataset. Gender was the self identified gender of the participant and was labeled male or female. Age was measured in years and was obtained from the medical record. Education was measured as less than or more than high school according to patient's response to the specific question. Smoking was defined by the patient's response to the specific question asked regarding their smoking habits and labeled as current, former or never smoker. Hypertension, diabetes, hypercholesterolemia, prior AMI and family history of CAD were obtained from the medical records. Angina frequency and quality of life were measured from the score of Seattle Angina Questionnaire (SAQ).

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For purposes of this thesis, two components of SAQ, (the angina frequency scale and QOL scale) were taken into account. The angina frequency score corresponds to questions 3 and 4 in SAQ that ask about frequency of chest pain over the last four weeks and frequency of taking nitroglycerine over the last four weeks. The responses are coded sequentially 1 to 6 in order of increasing health status, with 1 denoting the response associated with the lowest health status. If at least one question response is present then the angina frequency is computed by standardizing the mean response as follows:

Angina Frequency = 100*(Mean Response – 1)/5

The score is categorized as daily/weekly if it falls between 0 and 60, monthly if it falls between 70 and 90, and none if it is100.

The QOL score corresponds to questions 9, 10 and 11 in the SAQ that ask about patient's enjoyment of life over the last four weeks, satisfaction with chest pain and how worried they are about having a heart attack. The responses are coded sequentially 1 to 5 in order of increasing health status, with 1 denoting the response associated with the lowest health status. If the responses to questions are not values 1, 2, 3, 4 or 5 then the response is set to missing. If at least two responses are present then the disease perception/QOL score is computed by standardizing the mean response as follows:

Disease Perception = 100*(Mean Response – 1)/4

The score is then categorized as poor/fair if it is less than 50, good if between 50 and 74, great if between 75 and 100, and excellent if it is100.

Adverse Outcome

The outcome variable named Major Adverse Event (MAE) was a combination of all cause re-hospitalization and mortality. This was not restricted to deaths due to cardiac event only because dataset did not document cause of mortality. For re-hospitalization, if only those due to cardiac event were taken, it came to a very small number, thus all cause re-hospitalizations were also included.

Statistical Analyses

The analysis was done using SAS Version 9.1. To describe the study sample, we performed independent t-tests and Pearson chi-square statistics to assess the differences across genders for continuous and categorical variables, respectively. The initial data set had 440 patients. When only the AA participants were selected the number reduced to 397. So the study sample for the initial analysis comprised of 397 AA patients hospitalized with AMI.

To address research questions univariate logistic regression and multivariate logistic regression analyses were performed. Results were documented with chi-square and odds ratio. For all of the statistical tests performed, p-values of .05 and 95% confidence intervals were used to determine the significance between the variables.

In order to run these tests a further subset of 132 patients was created. These were the patients who had information for the time of hospitalization and over the period of one year following the AMI. These were the patients who were not lost to follow-up and had data for one month, six month or one year in addition to the baseline data at the time of hospitalization. These also included the patients who had either died or were

hospitalized over the period of one year.

In order to determine the independent association of each covariate to gender, a univariate logistic regression analysis was performed. This univariate analysis provided a method for justifying our selection of each covariate into the multivariate analysis. For the multivariate analysis the same subset of 132 patients was used.

Logistic regression

Multivariate analysis was performed on the subset of 132 patients who had a large amount of information at both the time of hospitalization with AMI and one year following it. Logistic regression can be used to predict a dependent variable on the basis of continuous and/or categorical independents and to determine the percent of variance in the dependent variable explained by the independents. This was done using forward selection method in SAS. In this method one variable is added at a time to the model to ascertain the significance of each variable independent of others. It also takes into consideration what change is brought by addition of new variable to the level of significance.

The multivariate analyses tested all independent variables simultaneously to determine the association of gender with MAE adjusting for potential confounders (e.g. age, education, smoking, history of hypertension, diabetes etc.). The only difference in co-variables tested in multivariate, was that for SAQ QOL and angina frequency that score was taken which had been recorded the latest; whether it be at 6 months or one year. This was done to maintain the same sample size and to avoid any further reduction of sample size for analysis purposes. Variables analyzed included age, smoking, and

education, family history of CAD and past medical history of hypertension, diabetes, AMI or hypercholesterolemia.

Gender was analyzed in a manner that considered female sex as the exposure variable. Using a median split, age was analyzed as a dichotomous variable with age more than 56 years as the exposure variable. Education was also analyzed as dichotomous variable with having less than high school education as the exposure variable. Smoking was evaluated as a dichotomous variable with a positive history of smoking as the exposure variable. Similarly, history of hypertension, diabetes and previous AMI were analyzed each as dichotomous variable with presence of the history as exposure variable. The family history of CAD variable was also dichotomized with a positive family history of CAD as the exposure variable. Finally, the SAQ angina frequency and quality of life were analyzed as continuous variables. Considering the small sample size, SAQ score for both categories was analyzed from 12-month follow up. However if data for the 12-month follow up for a patient was missing then the SAQ score from the 6-month follow up of that patient was used.

Chapter IV- Findings and Results

Descriptive characteristics of study population at baseline

For the initial analysis for this thesis, 397 AA patients met the eligibility criteria at baseline that is time of hospitalization with AMI (Table1). Of these, 205 (52%) were men and 192 (48%) were women. The median age of the subjects was 56 years. The majority of subjects were non-or former smokers (65%), had more than high school education (56%) and an annual income of less than $10,000 (71%). Moreover, the majority did not have co-morbidities like diabetes (62%) and hypercholesterolemia (81%), or family history of CAD (72%). However, there was a preponderance of patients with hypertension (84%). A majority of the patients did not report high frequency of angina (25%) or poor quality of life (12%) at the time of hospitalization with an AMI.

Figure 7: The process of creating the final dataset and subset

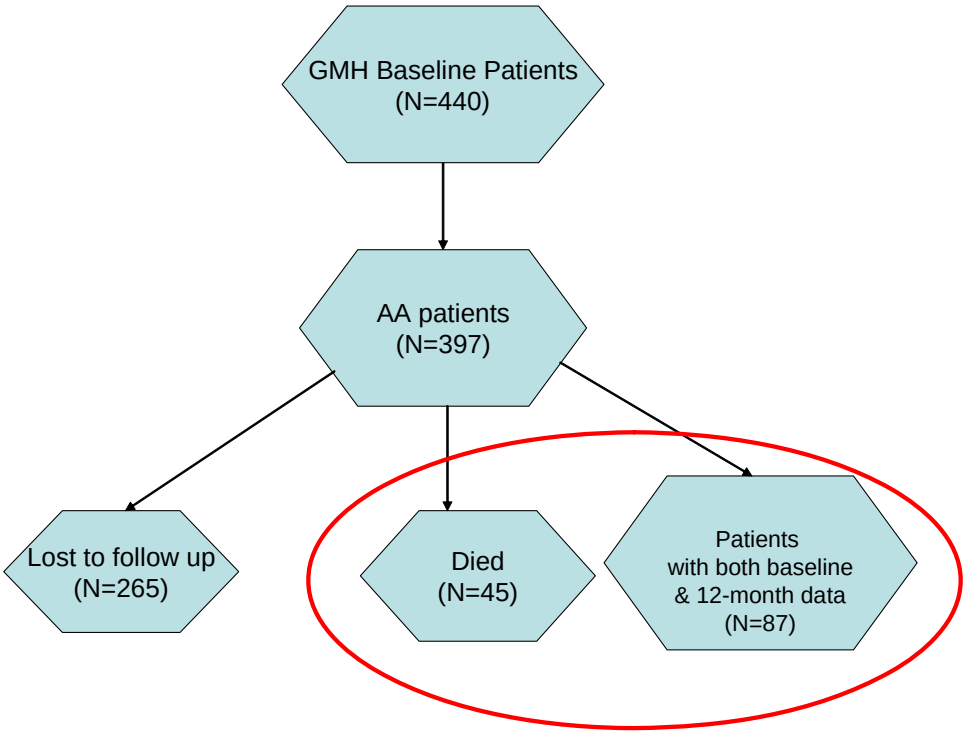

Table 1: **Descriptive analysis of the study sample at baseline (N=397)**

Variable	N (%)
Sex	
Female	192 (48.4)
Male	205 (51.6)
Age	
56 and less	216 (54.4)
Greater than 56	181 (45.6)
Education	
Less than High School	172 (44.0)
More than High School	219 (56.0)
Income	
Less than 10,000	249 (70.5)
More than 10,000	104 (29.5)
Diabetes	
Yes	150 (38.0)
No	245 (62.0)
Prior MI	
Yes	108 (28.8)
No	267 (71.2)
Hypertension	
Yes	314 (83.7)
No	61 (16.3)
Hypercholesterolemia	
Yes	147 (39.2)
No	228 (60.8)
Family History of CAD	
Yes	104 (27.7)
No	271 (72.3)
Smoking	
Current	170 (43.0)
Former	98 (24.8)
Never	127 (32.2)
SAQ Angina Frequency Category	
Daily/Weekly (0-60)	99 (24.9)
Monthly (70-90)	140 (35.3)
None (100)	158 (39.8)
SAQ Quality of Life Category	
Poor-Fair (0-<50[1])	162 (12.0)
Good (50-<75)	168 (42.9)
Great (75-<100)	41 (10.5)
Excellent (100)	21 (5.4)

Tables 2 and 3 show the comparison of study patients when stratified by gender Table 2 shows the chi-square analysis and associated p-values, while Table 3 gives the odds ratio (OR) and 95 % confidence interval (CI).

Nearly 56% of all the women were more than 56 years old while only 36% of the men were older than 56 years. Moreover, almost 45% of women had diabetes whereas only 32% men were diabetics. Almost 90% of women had hypertension compared to 80% of men. Approximately 40% of women were non smokers compared to 24% of men. In addition, 37% of women were current smokers, compared to 50% of men who were current smokers. The distribution of the afore-mentioned variables i.e. age, hypertension, smoking and diabetes were statistically significant (all $p<0.01$). Comparatively, more women had hypercholesterolemia (45% vs. 35%) than men, but this was not statistically significant. Almost 70% of the patients had an annual income of less than $10,000 so this is mainly below poverty line population.

Additionally, women were almost as likely as men to have family history of CAD (30% vs. 26%) and prior history of an AMI (27% vs. 31%). Moreover there was no major difference among women and men in the two components of SAQ, the angina frequency scale and QOL scale.

Certain interesting results can be gleaned from the odds ratios in Table 3. In this study sample women with an AMI had less odds of being younger than 56 years of age. Female patients with AMI were 80% more likely to have diabetes than males with AMI (OR 1.3; 95% CI 1.1-1.6). Also, women with an AMI were significantly more likely to have hypertension (OR 2.2; 95% CI 1.1-1.7).and high cholesterol than males with an AMI respectively (OR 1.42; 95% CI 1.0-1.5). Interestingly, there was not much of a

difference among those with history of prior AMI with respect to suffering from an AMI. However, women with an AMI were 23% more likely to have family history of CAD compared to men with AMI. Women with AMI were 70% less likely to be current smoker (OR 0.3; 95% CI 0.1-1.2) and former smokers (OR 0.5; 95% CI 0.1-1.7) compared to men with an AMI but this was not statistically significant.

Conversely, women with an AMI did not have a difference in angina frequency and quality of life as measured by SAQ from men with an AMI. In summary women with an AMI had higher odds of being younger, having diabetes, hypertension, family history of CAD, smoking, and high cholesterol level compared to men with an AMI.

Table 2: Gender differences in characteristics of study sample from PREMIER registry at time of hospitalization with AMI (N=397)

Variable	N (%) Women	N (%) Men	Chi-Square	P-value
Age				
56 and less	85 (44.3)	131 (63.9)	15.4	< 0.001*
Greater than 56	107 (55.7)	74 (36.1)		
Education				
Less than High School	83 (43.9)	89 (44.1)	0.0	1.0
More than High School	106 (56.1)	113 (55.9)		
Diabetes				
Yes	86 (44.8)	64 (31.5)	7.4	0.007*
No	106 (55.21)	139 (68.5)		
Income				
Less than $10,000	124 (72.9)	125 (68.3)	0.9	0.3
More than $10,000	46 (27.1)	50 (31.7)		
Prior MI				
Yes	49 (26.6)	59 (30.9)	0.8	0.4
No	135 (73.4)	132 (69.1)		
Hypertension				
Yes	164 (89.1)	150 (78.5)	7.7	0.008*
No	20 (10.9)	41 (21.47)		
Hypercholesterolemia				
Yes	80 (43.5)	67 (35.1)	2.8	0.1
No	104 (56.5)	124 (64.9)		
Family History of CAD				
Yes	55 (29.9)	49 (25.7)	0.8	0.4
No	129 (70.1)	142 (74.4)		
Smoking				
current	71 (37.2)	99 (48.5)		
former	42 (22.0)	56 (27.5)	12.8	0.002*
never	78 (40.8)	49(24.0)		
SAQ Angina Frequency Category				
Daily/Weekly (0-60)	45 (23.4)	54 (26.3)	0.6	0.7
Monthly (70-90)	71 (37.0)	69 (33.7)		
None (100)	76 (39.58)	82 (40.0)		
SAQ Quality of Life Category				
Poor-Fair (0-<50[1])	75 (40.0)	87 (42.7)		
Good (50-<75)	86 (45.7)	82 (40.2)	1.6	0.7
Great (75-<100)	17 (9.0)	24 (11.8)		
Excellent (100)	10 (5.3)	11 (5.4)		

Table 3: Univariate analysis of study sample from PREMIER registry at time of hospitalization with AMI (N=397)

Variable	N (%) Women	N (%) Men	OR	95% CI
Age				
56 and less	85 (44.3)	131 (63.9)	0.5	0.3-0.7
Greater than 56	107 (55.7)	74 (36.1)	REF	
Education				
Less than High School	83 (43.9)	89 (44.1)	1.0	0.8-1.2
More than High School	106 (56.1)	113 (55.9)	REF	
Income				
less than 10,000	124 (72.9)	125 (68.3)	1.1	0.9-1.5
more than 10,000	46 (27.)	50 (31.7)	REF	
Diabetes				
Yes	86 (44.8)	64 (31.5)	1.8	1.1-1.6*
No	106 (55.2)	139 (68.5)	REF	
Prior MI				
Yes	49 (26.6)	59 (30.9)	0.8	0.7-1.1
No	135 (73.4)	132 (69.1)	REF	
Hypertension				
Yes	164 (89.1)	150 (78.5)	2.2	1.1-1.7*
No	20 (10.8)	41 (21.5)	REF	
Hypercholesterolemia				
Yes	80 (43.5)	67 (35.1)	1.4	1.0-1.5*
No	104 (56.5)	124 (64.9)	REF	
Family History of CAD				
Yes	55 (29.9)	49 (25.7)	1.2	1.0-1.4*
No	129 (70.1)	142 (74.4)	REF	
Smoking				
Current	10 (26.3)	19 (41.3)	0.3	0.1-1.2
Former	15 (39.5)	19 (41.3)	0.5	0.1-1.7
Never	13 (34.2)	8 (17.4)	REF	
SAQ Angina Frequency Category				
Daily/Weekly (0-60)	45 (23.4)	54 (26.3)	0.9	0.5-2.2
Monthly (70-90)	71 (37.0)	69 (33.7)	1.1	0.5-1.3
None (100)	76 (39.6)	82 (40.0)	REF	
SAQ Quality of Life Category				
Poor-Fair (0-<50[1])	75 (39.9)	87 (42.7)	0.9	0.5-3.2
Good (50-<75)	86 (45.7)	82 (40.2)	1.1	0.4-2.7
Great (75-<100)	17 (9.0)	24 (11.8)	0.8	0.5-4.5
Excellent (100)	10 (5.3)	11 (5.4)	REF	

Descriptive characteristics of study sample at one year

A subset of the baseline sample was created for further in-depth analysis. This subset consisted of those 132 patients who had data at both the baseline (time of hospitalization) and 12 months after an AMI. This dataset included the patients who had died over the year and this was the group with the information regarding the outcome variable MAE both at the baseline and over the period of 12 months post AMI. Tables 4 & 5 present the gender differences in the subset population. Interestingly, there were no significant differences among men and women with an AMI in this subset sample (Table 4). However, when OR with 95% CI were calculated (Table 5), women with an AMI had lower odds of being younger (OR 0.6; 95% CI 0.3-1.3) and higher odds of having hypertension (OR 2.3; 95% CI 1.0-2.0) compared to men with an AMI although this was not statistically significant. Women with an AMI had lower odds of having less than high school education compared to men (OR 0.9; 95% CI 0.8-1.5). Women with an AMI in this sample also had lesser odds of being current (OR 0.5; 95% CI 0.2-1.4) or former smokers compared to men (OR 0.6; 95% CI 0.2-1.6). Both men and women seemed to have similar frequency of angina at the time of hospitalization; however women with an AMI showed higher odds of higher angina frequency at one year post AMI compared to men (OR 2.6; 95% CI 0.5-12.2). Same was true for QOL at baseline and one year post AMI (similar in men and women at baseline and poorer in women at one year).

Table 4: Univariate Analysis at one year Post AMI in study sample subset (N=132)

Variables	N (%) Women	N (%) Men	Chi square	P-Value
Age				
<=56	27 (43.6)	39 (55.7)	1.9	0.2
> 56	35 (56.5)	31 (44.3)		
Education				
<High school	27 (45.0)	33 (48.5)	0.2	0.7
>High school	33 (55.0)	35 (51.5)		
Income				
<10,000	33 (63.5)	34 (60.7)	0.1	0.8
> 10,000	19 (36.5)	22 (39.3)		
Diabetes				
Yes	31 (50.0)	25 (35.7)	2.7	0.1
No	31(50.0)	45 (64.3)		
Prior MI				
Yes	19 (30.7)	21 (30.0)	0.0	0.9
No	43 (69.3)	49 (70.0)		
Hypertension				
Yes	55 (88.7)	54 (77.1)	3.1	0.1
No	7 (11.3)	16 (22.9)		
Hypercholosterolemia				
Yes	22 (35.4)	26 (37.1)	0.1	0.8
No	40 (64.5)	44 (62.7)		
Family History CAD				
Yes	17 (27.4)	18 (25.7)	0.1	0.8
No	45 (72.6)	52 (74.3)		
Smoking				
Current	10 (26.31)	19 (41.3)	2.5	0.3
Former	15 (39.5)	19 (41.3)		
Never	13 (34.2)	8 (17.4)		
SAQ Angina Frequency at baseline				
Daily	22(35.5)	22(31.4)	0.5	0.8
Monthly	18(29.0)	24(34.3)		
None	22(35.5)	24(24.3)		
SAQ Quality of Life at baseline				
Poor	27 (45.8)	29 (42.0)		
Good	26 (44.07)	25 (36.2)		
Great	3 (5.08)	12 (17.4)	4.7	0.2
Excellent	3 (2.34)	3 (4.3)		

Variables	N (%) Women	N (%) Men	Chi square	P-Value
SAQ Angina Frequency at 1 Month				
Daily	5 (11.6)	6 (13.0)	0.9	0.6
Monthly	7 (16.3)	11 (23.9)		
None	31 (72.1)	29 (63.0)		
SAQ Quality of Life at 1 Month				
Poor	8 (18.0)	4 (8.70)		
Good	6(13.6)	11 (23.9)	3.0	0.4
Great	22 (51.2)	22 (47.8)		
Excellent	7 (16.3)	9 (19.6)		
SAQ Angina Frequency at 6 Month				
Daily	4 (9.3)	12 (23.5)	3.8	0.1
Monthly	4 (9.3)	6 (11.8)		
None	35 (81.4)	33 (64.7)		
SAQ Quality of Life at 6 Month				
Poor	2 (5.13)	9 (18.0)		
Good	8 (20.5)	13 (26.0)	4.5	0.2
Great	19 (48.7)	17 (34.0)		
Excellent	10 (25.6)	11 (22.0)		
SAQ Angina Frequency at 1 year				
Daily	7 (15.2)	3 (6.25)	2.2	0.3
Monthly	8 (17.4)	11 (22.9)		
None	31 (67.4)	34 (70.8)		
SAQ Quality of Life at 1 year				
Poor	7 (17.1)	4 (8.5)		
Good	5 (12.2)	5 (10.6)	1.8	0.6
Great	17 (41.5)	24 (51.1)		
Excellent	12 (29.3)	14 (29.8)		

Table 5: Univariate analysis at one year Post AMI in study sample subset (N=132)

Variables	N (%) Women	N (%) Men	OR	95% CI
Age				
<=56	27 (43.6)	39 (55.7)	0.6	0.3-1.3
> 56	35 (56.5)	31 (44.3)	REF	
Education				
<High school	27 (45.0)	33 (48.5)	0.9	0.8-1.5
>High school	33 (55.0)	35 (51.5)	REF	
Income				
< 10,000	33 (63.5)	34 (60.7)	1.1	0.7-1.4
> 10,000	19 (36.5)	22 (39.3)	REF	
Diabetes				
Yes	31 (50.0)	25 (35.7)	1.8	0.5-1.1
No	31(50.0)	45 (64.3)	REF	
Prior MI				
Yes	19 (30.7)	21 (30.0)	1.0	0.7-1.5
No	43 (69.4)	49 (70.0)	REF	
Hypertension				
Yes	55 (88.7)	54 (77.1)	2.3	1.0-2.0*
No	7 (11.3)	16 (22.9)	REF	
Hypercholosterolemia				
Yes	22 (35.4)	26 (37.1)	1.0	0.7-1.5
No	40 (64.5)	44 (62.9)	REF	
Family History CAD				
Yes	17 (27.4)	18 (25.7)	1.1	0.6-1.4
No	45 (72.6)	52 (74.3)	REF	
Smoking				
Current	22 (36.0)	33 (47.1)	0.5	0.2-1.4
Former	19 (31.1)	22 (31.4)	0.6	0.2-1.6
Never	20 (32.8)	15 (21.4)	REF	
SAQ Angina Frequency at baseline				
Daily	22 (35.5)	22 (31.4)	1.1	0.5-2.5
Monthly	18 (29.0)	24 (34.3)	0.8	0.4-1.9
None	22 (35.5)	24 (24.3)	REF	

Variables	N (%) Women	N (%) Men	OR	95% CI
SAQ Quality of Life at baseline				
Poor	27 (45.8)	29 (42.0)	0.9	0.2-5.0
Good	26 (44.1)	25 (36.2)	1.0	0.2-5.6
Great	3 (5.1)	12 (17.4)	0.3	0.1-2.0
Excellent	3 (2.3)	3 (4.4)	REF	
SAQ Angina Frequency at 1 Month				
Daily	5 (11.6)	6 (13.0)	0.8	0.2-2.9
Monthly	7 (16.3)	11 (23.9)	0.6	0.2-1.8
None	31 (72.1)	29 (63.0)	REF	
SAQ Quality of Life at 1 Month				
Poor	8 (18.0)	4 (8.7)	2.6	0.5-12.2
Good	6(14.0)	11 (23.9)	0.7	0.2-2.8
Great	22 (51.2)	22 (47.8)	1.3	0.4-4.1
Excellent	7 (16.3)	9 (19.6)	REF	
SAQ Angina Frequency at 1 year				
Daily	7 (15.2)	3 (6.3)	2.6	0.6-10.8
Monthly	8 (17.4)	11 (22.9)	0.8	0.3-2.2
None	31 (67.4)	34 (70.8)	REF	
SAQ Quality of Life at 1 year				
Poor	7 (17.1)	4 (8.5)	2.0	0.5-8.7
Good	5 (12.2)	5 (10.6)	1.2	0.3-5.0
Great	17 (41.5)	24 (51.1)	0.8	0.3-2.2
Excellent	12 (29.3)	14 (29.8)	REF	

Contribution of various co-variables to MAE

The outcome variable for further analysis named Major Adverse Event (MAE) was a combination of all cause re-hospitalization and mortality. In the subset of 132 patients, 41% had suffered an MAE within the year after an AMI. Table 6 presents the contribution of various demographic and risk factors to the incidence of MAE in the subset population by giving us the odds ratio and 95% CI. In the subset sample, 42% (n=26) of women and 40% (n=28) of men had suffered with MAE over the year. Women had slightly higher odds of suffering MAE compared to men although this was not statistically significant. Similarly, younger age also seemed to be associated more with occurrence of MAE over one year following AMI (OR 1.1; 95% CI 0.8-3.3) although again not statistically significant. Interestingly, patients suffering with MAE had 50% lesser odds of having less than high school education compared to those who did not have MAE (OR 0.5; 95% CI 0.2-1.0).

Although patients with MAE had higher odds of having diabetes (OR 1.3; 95% CI 0.6-2.6) , hypertension (OR 2.2; 95% CI 0.8-6.1) , higher cholesterol levels (OR 1.1; 95% CI 0.5-2.2) and being former smokers compared to those who did not have an MAE, none of these were statistically significant. Similarly, those suffering MAE had higher odds of reporting poorer quality of life at the time of hospitalization compared to those who did not, although this was not statistically significant (OR 3.5; 95% CI 0.4-31.8). Conversely, patients having MAE had lower odds of having a prior AMI (OR 0.6; 95% CI 0.3-1.3). Interestingly, patients having MAE had similar odds of having a positive family history of CAD to those who did not have MAE although this also was not statistically significant (OR 1.0; 95% CI 0.4-2.1).

Interestingly, although angina frequency at the time of hospitalization was not significantly associated with MAE, patients with MAE over the year showed 7.2 times more odds of having angina daily during the month after AMI compared to those who did not have MAE (OR 7.2; 95% CI 1.4-36.5) and this was statistically significant. Also, patients suffering with MAE over the year had higher odds of reporting poorer quality of life, at one (OR 3.5; 95% CI 0.4-31.8), six (OR 2.3; 95% CI 0.5-10.5),and 12 months (OR 1.8; 95% CI 0.4-7.5) post AMI, although none of these were statistically significant. Similarly, patients who had MAE over the year had higher odds of reporting having angina daily at six (OR 2.6; 95% CI 0.8-8.3) and 12 months (OR 2.9; 95% CI 0.7-12.2) post AMI, compared to those who did not have MAE, although none of these were statistically significant.

Table 6: Univariate Analysis of Patients with Acute Myocardial Infarction (AMI) by MAE (Major Adverse Event) over one year post AMI (N=132)

Variables	MAE n (%)	No MAE n (%)	OR	95% CI
Gender				
Female	26 (48.2)	36 (46.2)	1.1	0.5-2.2
Male	28 (51.85)	42 (53.8)	REF	
Age				
<=56	31 (57.4)	35 (44.9)	1.7	0.8-3.3
> 56	23 (42.59)	43 (55.1)	REF	
Education				
<High school	19 (35.9)	41 (54.7)	0.5	0.2-1.0*
>High school	34 (64.2)	34 (45.3)	REF	
Diabetes				
Yes	25 (46.3)	31 (39.7)	1.3	0.6-2.6
No	29 (53.7)	47 (60.3)	REF	
Prior MI				
Yes	13 (24.1)	27 (34.6)	0.6	0.3-1.3
No	41 (75.9)	51 (65.4)	REF	
Hypertension				
Yes	48 (88.9)	61 (78.2)	2.2	0.8-6.1
No	06 (11.1)	17 (21.8)	REF	
Hypercholesterolemia				
Yes	20 (37.0)	28 (35.9)	1.1	0.5-2.2
No	34 (63.0)	50 (64.1)	REF	
Family History CAD				
Yes	14 (25.9)	21 (26.9)	1.0	0.4-2.1
No	40 (74.0)	57 (73.1)	REF	
Smoking				
Current	20 (37.0)	35 (45.5)	1.1	0.4-2.7
Former	22 (40.7)	19 (24.7)	2.2	0.9-5.6
Never	12 (22.2)	23 (29.9)	REF	
SAQ Angina Frequency at baseline				
Daily	16 (29.6)	28 (35.9)	0.9	0.4-2.0
Monthly	20 (37.0)	22 (28.2)	1.4	0.6-3.3
None	18 (33.3)	28 (35.9)	REF	
SAQ Quality of Life at baseline				
Poor	23 (45.1)	33 (42.9)	3.5	0.4-31.8
Good	20 (39.2)	31 (40.3)	3.2	0.4-29.7
Great	07 (13.7)	08 (10.4)	4.4	0.4-47.0
Excellent	01 (2.0)	05 (6.5)	REF	

Variables	MAE n (%)	No MAE n (%)	OR	95% CI
SAQ Angina Frequency at 1 Month				
Daily	09 (22.0)	02 (4.2)	7.2	1.4-36.5*
Monthly	09 (22.0)	09 (18.7)	1.6	0.6-4.6
None	23 (56.1)	37 (77.0)	REF	
SAQ Quality of Life at 1 Month				
Poor	07 (17.0)	05 (10.4)	1.8	0.4-8.2
Good	10 (24.4)	07 (14.6)	1.8	0.5-7.3
Great	17 (41.5)	27 (56.3)	0.8	0.3-2.5
Excellent	07 (17.0)	09 (18.8)	REF	
SAQ Angina Frequency at 6 Month				
Daily	11 (22.5)	05 (11.1)	2.6	0.8-8.3
Monthly	07 (14.3)	03 (6.7)	2.8	0.7-11.7
None	31 (63.3)	37 (82.2)	REF	
SAQ Quality of Life at 6 Month				
Poor	07 (14.6)	04 (9.8)	2.3	0.5-10.5
Good	15 (31.2)	06 (14.6)	3.3	0.9-12.0
Great	17 (35.4)	19 (46.3)	1.2	0.4-3.5
Excellent	09 (18.8)	12 (29.3)	REF	
SAQ Angina Frequency at 1 year				
Daily	07 (15.2)	03 (6.3)	2.9	0.7-12.2
Monthly	10 (21.7)	09 (18.8)	1.4	0.5-3.8
None	29 (63.0)	37 (75.0)	REF	
SAQ Quality of Life at 1 year				
Poor	07 (15.9)	04 (9.1)	1.8	0.4-7.5
Good	03 (6.8)	07 (15.9)	0.4	0.1-2.0
Great	21 (47.7)	20 (45.5)	1.1	0.4-2.8
Excellent	13 (29.6)	13 (29.6)	REF	

*statistically significant at <0.05

Gender stratification by MAE

For further in-depth analysis of relevant socio-demographic and risk factors, the subset population was stratified by gender. Table 7 gives us the contribution of demographic and risk factors, and the SAQ scores by showing OR and 95% CI in women while Table 8 shows the same for men.

Contribution of co-variables in women

Table 7 shows the contribution of various variables to having MAE over the year following AMI in women only of the study sample. This subset consists of 62 women. Women who suffered MAE over the year had twice the odds of being younger than 56 compared to those who did not have MAE although this was not statistically significant.

Although not statistically significant, women having MAE within the year after an AMI had twice the odds of having hypertension (OR 2.0; 95% CI 0.3-10.8), family history of CAD (OR 1.9; 95% CI 0.6-5.7) and former smoking (OR 2.1; 0.6-7.5). Interestingly, diabetes had no association with MAE in this subset sample although this was not statistically significant (OR 1.0; 95% CI 0.4-2.7).

The women suffering with MAE had five times higher odds of experiencing angina monthly at the time of hospitalization, compared to those who did not have MAE (OR 5.3; 95% CI 1.4-20.9). This revealed a significant association between angina frequency at hospitalization and MAE. Although women who had MAE showed more odds of reporting higher angina frequency at one, six and 12 month than those who did not have MAE, none of these was statistically significant. This could be the result of decreasing sample size over time due to deaths. Similarly, women who had MAE had

twice the odds of reporting poorer QOL compared to those who did not have MAE but this was also not statistically significant.

Table 7: Univariate Analysis of Women with Acute Myocardial Infarction (AMI) by MAE (Major Adverse Event) over one year post AMI (N=62)

Variables	MAE n (%)	No MAE n (%)	OR	95% CI
Age				
<=56	14 (53.8)	13 (50.0)	2.1	0.7-5.8
> 56	12 (46.2)	13 (50.0)	REF	
Education				
<High school	11 (42.3)	16 (47.1)	0.8	0.3-2.3
>High school	15 (57.7)	18 (52.1)	REF	
Diabetes				
Yes	13 (50.0)	18 (50.0)	1	0.4-2.7
No	13 (50.0)	18 (50.0)	REF	
Prior MI				
Yes	5 (19.2)	14 (38.9)	0.4	0.1-1.2
No	21 (80.8)	22 (61.1)	REF	
Hypertension				
Yes	24 (92.3)	31 (86.1)	2.0	0.3-10.8
No	02 (7.7)	05 (13.9)	REF	
Hypercholosterolemia				
Yes	08 (30.8)	14 (38.9)	0.7	0.2-2.0
No	18 (69.2)	22 (61.1)	REF	
Family History CAD				
Yes	09 (34.6)	08 (22.2)	1.9	0.6-5.7
No	17 (65.4)	28 (77.8)	REF	
Smoking				
Current	09 (34.6)	13 (37.2)	1.3	0.4-4.5
Former	10 (38.4)	09 (25.7)	2.1	0.6-7.5
Never	07 (26.9)	13 (37.2)	REF	
SAQ Angina Frequency at baseline				
Daily	08 (30.8)	14 (38.9)	1.5	0.4-5.4
Monthly	12 (46.2)	06 (16.7)	5.3	1.4-20.9*
None	16 (23.1)	16 (44.4)	REF	
SAQ Quality of Life at baseline				
Poor	13 (54.2)	14 (40.0)	1.9	0.2-23.0
Good	10 (41.7)	16 (45.7)	1.3	0.1-15.6
Great	00 (00.0)	03 (8.6)	0.0	0.2**
Excellent	02 (4.1)	02 (5.7)	REF	

Variables	MAE n (%)	No MAE n (%)	OR	95% CI
SAQ Angina Frequency at 1 Month				
Daily	04 (20.0)	01 (4.4)	6.3	0.6-63.6
Monthly	04 (20.0)	03 (13.1)	2.1	0.4-11.1
None	12 (60.0)	19 (82.6)	REF	
SAQ Quality of Life at 1 Month				
Poor	05 (25.0)	03 (13.1)	4.2	0.2**
Good	03 (15.0)	03 (13.1)	2.5	0.4**
Great	10 (50.0)	12 (52.2)	2.1	0.4**
Excellent	02 (10.0)	05 (21.7)	REF	
SAQ Angina Frequency at 6 Month				
Daily	03 (13.0)	01 (5.0)	3.2	0.3-33.6
Monthly	03 (13.0)	01 (5.0)	3.2	0.3-33.6
None	17 (73.9)	18 (90.0)	REF	
SAQ Angina Frequency at 1 year				
Daily	05 (20.8)	02 (9.1)	2.7	0.5-15.9
Monthly	04 (16.7)	04 (18.2)	1.1	0.2-5.0
None	15 (62.5)	16 (72.7)	REF	
SAQ Quality of Life at 1 year				
Poor	05 (22.7)	02 (10.5)	2.5	0.3-18.3
Good	02 (9.1)	03 (15.8)	0.7	0.1-5.5
Great	09 (40.9)	08 (42.1)	1.1	0.3-4.9
Excellent	06 (27.3)	06 (31.6)	REF	

* Statistically Significant at 0.05
** Fisher's exact test p-value

Contribution of co-variables in men

Table 8 shows the contribution of various variables to having MAE over the year following AMI in men of the subset sample. This subset consists of 70 men. Age was no longer statistically associated with higher chances of suffering MAE in men. However, men having MAE had 70% smaller odds of having less than high school education compared to those who did not suffer MAE within the year after an AMI (OR 0.3; 95% CI 0.1-0.8).

Although none of the other co-variables were statistically significant there were some interesting trends. Men who suffered MAE showed almost 2.5 times higher odds of having hypertension (OR 2.4; 95% CI 0.7-8.4). Similarly men who had MAE had higher odds of having diabetes (OR 1.7; 95% CI 0.6-4.5), high cholesterol level (OR 1.5; 95% CI 0.5-4.0) and former smoking (OR 2.4; 95%CI 0.7-9.4) than those who did not have MAE. Interestingly, those who suffered MAE had lesser odds of having history of prior AMI (OR 0.0; 95% CI 0.3-2.5) and family history of CAD (OR 0.5; 95% CI 0.2-1.6) compared to those who did not.

The men, who suffered MAE within the year of AMI, showed a trend of association with higher odds of having higher angina frequency at almost all levels i.e. one(OR 8.2; 95% CI 0.8-79), six (OR 2.7; 95% CI 0.7-10.8) and a year (OR 2.9; 95% CI 0.2-34.6) post-AMI compared to those who did not suffer MAE.

Table 8: Univariate Analysis of Men with AMI by MAE (Major Adverse Event) over one year post AMI (N=70)

Variables	MAE n (%)	No MAE n (%)	OR	95% CI
Age				
<=56	17 (60.7)	22 (52.4)	1.4	0.5-2.7
>56	11 (39.3)	20 (47.6)	REF	
Education				
<High school	08 (29.6)	25 (61.0)	0.3	0.1-0.8*
>High school	19 (70.3)	16 (39.0)	REF	
Diabetes				
Yes	12 (42.8)	13 (31.0)	1.7	0.6-4.5
No	16 (57.1)	29 (69.1)	REF	
Prior MI				
Yes	8 (28.5)	13 (31.0)	0.9	0.3-2.5
No	20 (71.4)	29 (69.1)	REF	
Hypertension				
Yes	24 (85.7)	30 (71.4)	2.4	0.7-8.4
No	04 (14.3)	12 (28.6)	REF	
Hypercholesterolemia				
Yes	12 (42.9)	14 (33.3)	1.5	0.5-4.0
No	16 (57.2)	28 (66.7)	REF	
Family History CAD				
Yes	05 (17.9)	13 (30.96)	0.5	0.2-1.6
No	23 (82.1)	29 (69.05)	REF	
Smoking				
Current	11 (39.3)	22 (52.3)	1.0	0.3-3.7
Former	12 (42.9)	10 (23.8)	2.4	0.7-9.4
Never	05 (17.9)	10 (23.8)	REF	
SAQ Angina Frequency at baseline				
Daily	08 (28.6)	14 (33.3)	0.6	0.2-1.9
Monthly	08 (28.6)	16 (38.1)	0.5	0.2-1.6
None	12 (42.9)	12 (28.6)	REF	
SAQ Quality of Life at baseline				
Poor	10 (37.0)	19 (45.2)	0.4	0.3-1.2
Good	10 (37.0)	15 (35.7)	0.5	0.1-2.4
Excellent	00 (0.00)	03 (7.1)	0.0	0.0-2.6
Great	07 (25.9)	05 (11.9)	REF	
SAQ Angina Frequency at 1 Month				
Daily	05 (23.8)	01 (4.0)	8.2	0.8-79
Monthly	05 (23.8)	06 (24.0)	1.4	0.3-5.5
None	11 (52.4)	18 (72.0)	REF	

Variables	MAE n (%)	No MAE n (%)	OR	95% CI
SAQ Quality of Life at 1 Month				
Poor	02 (9.5)	02 (8.0)	0.8	0.1-8.5
Good	07 (33.3)	04 (16.0)	1.4	0.2-8.5
Great	07 (33.3)	15 (60.0)	0.4	0.1-1.8
Excellent	05 (23.8)	04 (16.0)	REF	
SAQ Angina Frequency at 6 month				
Daily	08 (30.8)	04 (16.0)	2.7	0.7-10.8
Monthly	04 (15.4)	02 (8.0)	2.7	0.4-17.0
None	14 (53.9)	19 (76.0)	REF	
SAQ Quality of Life at 6 Month				
Poor	05 (19.2)	04 (16.6)	1.5	0.3-8.8
Good	07 (26.9)	06 (25.0)	1.4	0.3-7.0
Great	09 (34.6)	08 (33.3)	1.4	0.3-6.2
Excellent	05 (19.2)	06 (25.0)	REF	
SAQ Angina Frequency at 1 year				
Daily	02 (9.09)	01 (3.8)	2.9	0.2-34.6
Monthly	06 (27.3)	05 (19.2)	1.7	0.4-6.7
None	14 (63.6)	20 (76.9)	REF	
SAQ Quality of Life at 1 year				
Poor	02 (9.09)	02 (8.0)	1.0	0.1-9.2
Good	01 (4.6)	04 (16.0)	0.3	0.02-2.8
Great	12 (54.6)	12 (48.0)	1.0	0.3-3.7
Excellent	07 (14.9)	07 (28.0)	REF	

*Statistically Significant at <0.05

Occurrence of MAE over the year following AMI

Table 9 shows the results of the multiple logistic regression model which predicts the association of all the variables to MAE while adjusting for all other variables by giving OR and 95% CI in the subset population. Multivariate analysis was performed using multiple regression model; MAE= gender, age, hypertension, diabetes, hypercholesterolemia, prior AMI, family history of CAD, smoking, SAQ angina frequency and SAQ QOL.

Women and men had an equal likelihood of suffering from MAE over one year after AMI. Women had lesser odds of suffering an AMI over the year compared to men; however this association was not statistically significant (OR 0.9; 95% CI 0.3-2.5).

Patients who had MAE within the year after AMI were 2.7 times as likely to be younger than 56 compared to those who did not have MAE (OR 2.7; 95% CI 1.1-6.9). Patients who suffered MAE had six times higher odds of being former smokers than those who did not have MAE (OR 6.11; 95% CI 1.4-27.5).

Although for the other factors, 95% CI was not statistically significant there were number of interesting trends in the point estimates. Interestingly, patients who suffered MAE had fewer odds of having diabetes (OR 0.4; 95% CI 0.1-1.2). In addition, less than high school education showed a trend of being protective (OR 0.7; 95% CI 0.2-2.4).

Surprisingly, those who suffered MAE had smaller odds of having a family history of CAD (OR 0.9; 95% CI 0.3-2.5), prior AMI (OR 0.6; 95% CI 0.2-2.0), and hypercholesterolemia (OR 0.7; 95% CI 0.2-2.4). In contrast, patients who had MAE had three times higher odds of having hypertension (OR 3.1; 95% CI 0.2-2.4).

As far as SAQ scores were concerned, although none of the associations were statistically significant, the analysis showed rather intriguing results. All patients who had suffered MAE, had lower odds of having angina daily at the time of hospitalization than those who did not suffer MAE (OR 0.77; 95% CI 0.2-3.4). In contrast, those who suffered MAE had 50% higher odds of having angina monthly at the time of hospitalization compared to those who did not suffer MAE (OR 1.5; 95% CI 0.4-6.0). Also, the patients with MAE had nine times higher odds of reporting poor SAQ QOL at the time of hospitalization compared to those who did not suffer MAE (OR 9.2; 95% CI 0.6-133.3). The last recorded SAQ angina frequency, whether at 6 months or 12 months (OR 1.4; 95% CI 0.2-12.7), was also positively associated with having MAE. In contrast, strangely the SAQ QOL was negatively associated with MAE at all levels in the total sample.

Table 9: Multivariate Analysis of Patients with Acute Myocardial Infarction (AMI) by MAE (Major Adverse Event) over one year post AMI (N=132)

Variables	MAE n (%)	No MAE n (%)	OR	95% CI
Gender				
Female	26 (48.1)	36 (46.2)	0.9	0.3-2.5
Male	28 (51.9)	42 (53.9)	REF	
Age				
<=56	31 (57.4)	35 (44.9)	2.7	1.1-6.9*
> 56	23 (42.6)	43 (55.1)	REF	
Education				
<High school	19 (35.9)	41 (54.7)	0.7	0.2-2.4
>High school	34 (64.2)	34 (45.3)	REF	
Diabetes				
Yes	25 (46.3)	31 (39.7)	0.4	0.1-1.2
No	29 (53.7)	47 (60.3)	REF	
Prior MI				
Yes	13 (24.0)	27 (34.6)	0.6	0.2-2.0
No	41 (75.9)	51 (65.4)	REF	
Hypertension				
Yes	48 (88.9)	61 (78.2)	3.1	0.7-14.2
No	06 (11.1)	17 (21.8)	REF	
Hypercholesterolemia				
Yes	20 (37.0)	28 (35.9)	0.7	0.2-2.4
No	34 (63.0)	50 (64.1)	REF	
Family History CAD				
Yes	14 (25.9)	21 (26.9)	0.9	0.3-2.5
No	40 (74.0)	57 (73.1)	REF	
Smoking				
Current	20 (37.0)	35 (45.5)	0.9	0.2-03.7
Former	22 (40.7)	19 (24.7)	6.1	1.4-27.5*
Never	12 (22.2)	23 (29.9)	REF	
SAQ Angina Frequency at baseline				
Daily	16 (29.6)	28 (35.9)	0.8	0.2-3.4
Monthly	20 (37.0)	22 (28.2)	1.5	0.4-6.0
None	18 (33.3)	28 (35.9)	REF	
SAQ Quality of Life at baseline				
Poor	23 (45.1)	33 (42.7)	9.2	0.6-133.3
Good	20 (39.2)	31 (40.3)	4.4	0.3-56.1
Great	07 (13.7)	08 (10.4)	6.5	0.4-108.1
Excellent	01 (2.0)	05 (6.5)	REF	

Variables	MAE n (%)	No MAE n (%)	OR	95% CI
SAQ Angina Frequency at 6-12 months				
Daily	07 (13.5)	04 (7.8)	1.4	0.2-12.7
Monthly	12 (23.1)	09 (17.7)	1.2	0.3-4.9
None	33 (63.4)	38 (74.5)	REF	
SAQ Quality of life at 6-12 months				
Poor	07 (14.0)	04 (8.7)	0.9	0.1-7.1
Good	06 (12.0)	07 (15.2)	0.4	0.1-2.3
Great	22 (44.0)	21 (45.7)	0.9	0.3-3.0
Excellent	15 (30.0)	14 (30.4)	REF	

*Statistically significant at <0.05

Chapter V-Discussion and Conclusion

CAD in women receives less attention as a cause of morbidity and mortality than in men although it is the leading cause of death in middle-aged women. A mounting body of literature has described gender differences in symptom presentation, treatment and outcomes after AMI and the fact that an AMI occurs approximately 20 years later for women than men. Although men under 65 are more susceptible to AMI than women of comparable age, women in this age group who suffer from an AMI are more likely to die (Bodi et al. 2004). Previous studies have shown that the combination of older age at presentation, greater delay in seeking medical treatment and lower intensity of treatments after the hospitalization apparently all contribute to poorer outcomes in women.

Gender differences at the time of hospitalization with AMI

The data of patients at the time of hospitalization shows some interesting results. An interesting finding is that men who were admitted with AMI are younger than their female counterparts. This is in accordance with the studies and science showing that AMI occurs almost 20 years later for women than men. This fact stays true in case of this study sample.

Women in this population are not only older but also have greater odds of being diabetic, hypertensive, having higher cholesterol level and family history of CAD. Age is a factor that plays a role in having more diabetes in women. All above mentioned variables are known risk factors of AMI and the data shows it is true in this population

also. The data also strengthens the concept that those who present with above mention co-morbidities have higher likelihood of having an AMI. Hypertension has been shown to be more prevalent in AA population. Looking at the total population, hypertension was prevalent in this AA sample also. Hypertension was also associated with higher trend of poorer prognosis after AMI in AA.

It was expected to find an association between higher angina frequency and women; it did not show up significantly in the results. This however changes in later results. The knowledge component might be contributing to this lack of association at the time of hospitalization. The patients might not have been able to recognize angina as a threat or a symptom therefore unable to associate it with AMI, especially at the time of first AMI. Also studies suggested that the tendency of women to not complain of severity of chest pain as quickly as men might be contributory to this lack of association at the time of hospitalization. This coincides, to a degree, to previous literature that women suffer or report lesser chest pain intensity than men. Comparatively, more women reported poorer QOL at the time of hospitalization with AMI than men.

The subset sample of 132 patients (who had data both at the time of hospitalization and six and/or one year) also showed interesting results. Men are still younger in this sample though not statistically significantly so because of smaller sample size. The gender differences noted in prevalence of certain risk factors held true for this sample also despite the smaller size. Certain risk factors, such as high cholesterol in women at the time of hospitalization, no longer showed positive association in the subset population. Conversely, both diabetes and hypertension stayed higher in women than men in both samples. This slight difference might be due to loss to follow-up of those

who were younger or had high cholesterol. Another reason could be that patients less than 56 years, crossed over to older age group or they controlled their cholesterol with diet and medicines. In the subset sample more women reported poorer quality of life at one month compared to men. This change in reporting might have been brought by higher awareness of the symptoms like angina in women after an AMI.

Contribution of various variables to MAE

When the study sample of 132 patients was stratified by MAE, certain interesting associations between various variables and MAE were revealed. Gender was not associated with the major adverse event in the total population. Younger age, though not statistically significant, seems to be associated with poor outcomes. This has been shown in the literature; younger patients especially younger women have a poor prognosis after AMI.

The relationship of poor outcome after an AMI and education was the most fascinating finding in this population. Those with less than a high school education had better outcomes over the year after AMI compared to those with more than a high school education. This can be related to the fact that those who have less than a high school education may get more physically challenging jobs compared to individuals with higher education levels. This may keep them in better physical shape thereby protecting them from an AMI. Women who are more educated might take it a sign of weakness to show their angina and inadvertently delay their hospital arrival. The awareness of heart disease in women and its consequences is a key to overcoming this factor as has been shown by previous studies. Although not statistically significant (probably due to smaller sample

size) diabetes, hypertension and high cholesterol levels showed a trend of being associated with poorer outcomes.

Angina frequency, when reported daily after one month of AMI was a very strong predictor of poor outcome in total population. The patients whether male or female, who had angina daily one month after AMI, showed higher chances of a poorer outcome. This high association did not stay statistically significant at six month or 12-month even though point estimate was still very high. This might be attributed to loss of these patients to death in short term and also to the subsequent smaller sample size. Angina frequency has been shown to be associated with AMI in previous studies and seems to be a strong predictor in this population. This association did not stay significant when men and women were analyzed separately, which may be a result of the smaller sample size.

Gender differences in the outcome of patients

When the major adverse event was stratified by gender, the results changed from those of the total population. Looking at various results, even though gender is not directly or blatantly associated with worse outcomes in the study population; it comes into play while interacting with other variables. Although the results for certain variables are not statistically significant, when the subset sample is stratified by gender, these variables show effect modification. There seems to be a trend that gender is impacting outcome of AMI by effect on variables.

Effect modification means that the degree of association between an exposure and outcome differs in different subgroups of the population. The variables showing most

effect modification in this study by gender include age, education, diabetes, hypertension QOL at baseline and angina frequency at baseline and one month after an AMI.

Younger age of women seems to be more highly associated with poor outcome compared to men. This study therefore shows what has been previously established in literature. Similarly, higher angina frequency, both at baseline and one month after AMI, shows greater association with poor outcome in women compared to men. Women also showed a trend of association of poorer QOL at baseline and worse outcomes compared to men.

Conversely hypertension, diabetes and high cholesterol level seem to have greater association with poor outcome following an AMI in men compared to women. This again is not statistically significant probably due to small sample size and needs further elucidation by in depth studies that explore interaction between gender and these risk factors.

The multivariate analysis does not show any association between gender and poor outcomes after an AMI. However younger age is significantly associated with poor outcomes. At the time of hospitalization with AMI although more women were in older age group than men, majority of those who experienced MAE were in younger age group. This has been shown time and again that younger women suffer poorer prognosis after AMI in the short term.

Although smoking was not shown to have any statistical significance in prior analysis, former smokers turned out to be strongly associated with poor outcome after an AMI over a period of one year. This can be attributed to the idea that former smokers were comparatively heavy smokers or they had quit recently.

The logistic regression on women of the subset sample while controlling for other factors revealed significant association between poorer QOL at the time of hospitalization and poor outcomes following an AMI which was statistically significant. This was similar to the total sample of both men and women as explained earlier. However, this was not the case for the men only sample while adjusting for all other factors. Conversely, the men only analysis showed significant association between poor prognosis and higher frequency of angina at one year. The significant relationship between QOL and poor outcomes ceased to exist in men and was replaced by higher frequency of angina at the time of hospitalization. This might lead to the speculation that either men are better reporters of angina or that they experience more intense angina as a symptom of AMI compared to their women cohorts. Studies have also shown angina to occur more often in men than women in the total population. The study shows that this may be true for this AA sample also.

Limitations of the study data

The biggest limitation of the study is sample size. This is a small sample and the subset created for further analysis was even smaller. This was done partly due to high rate of loss to follow up. It is not therefore known as to what were the outcomes of patient who were lost to follow up. A further study can be done to compare the baseline characteristics of those who were lost to follow up and those who stayed in the study. Gender was not directly associated with poor outcomes; however a trend of effect modification was revealed which can be further elucidated by more studies of a larger sample. The patients who were lost to follow up might have been very different from the

patients who remained in the study. Various causes leading to their loss to follow-up might be directly or indirectly related to the findings of the study thereby influencing the outcomes in unexpected manner.

Another limitation can be that all these are only GMH patients; thereby maybe different from rest of AA population in terms of SES. These patients belonged to low SES i.e. below the poverty line. The dynamics working there and affecting the outcomes of AMI can be inherently different from the total population. Lower SES although not directly related to AMI and its outcomes can affect this sample in different ways that are not yet properly understood. Understanding of these interactions between lower SES and AA sample dynamics could be crucial to the further elucidation of the factors leading to various outcomes post AMI. This study was also limited to only one hospital, so the results might be generalized to only a population similar to this study population.

Strengths of the study

The major strength of the study is its AA population. This study is unique in the sense that although all predictors and variables have been studied in both AA and Caucasian populations, this has not been done in an exclusive AA population. So racial disparity is not part of equation in this particular sample and thereby might provide better insight into the outcomes of AMI. Moreover not only for AA but also for population in general, this study provides a focused group to analyze significance of various risk factors and predictors in a comparatively controlled population sample.

Conclusion

The study failed to show a direct association between gender and poor outcomes following an AMI in this AA sample. However, the study does show that gender is an effect modifier for various variables like age and education along with risk factors like diabetes, hypertension and high cholesterol level and their association with poorer outcomes following an AMI in this AA population. This needs to be examined in depth and in a larger sample size in order to further elucidate the interaction between gender and various variables. Gender differences exist in the characteristics of the AA population at the time of hospitalization. Some differences exist in higher prevalence of existing co-morbidities like diabetes, hypertension and high cholesterol level in women that have been previously established in total population, while others like less than high school education warrant further research. Relationship of experiencing angina frequency daily after one month of AMI in both men and women warrants further research and analysis in a bigger population.

This study points out the concept that any health education and interventions for better outcomes of AMI in AA should be focused uniquely for gender. The optimum results for any health education or public health intervention in this area can be achieved if they are gender-specific and this study points us to need of further understanding of gender dynamics happening after an AMI in AA population. The education and awareness of significance of various co-morbidities and angina in public in general, and AMI patients in particular may prove to be a major step towards improving the outcomes after AMI. Public health is all about social justice and equity whether it is in public setting or clinical setting. The ultimate goal of public health is to improve the health of

masses with a multidisciplinary approach. Improving the outcomes of the post-AMI AA patients should include educating the masses by increasing awareness about risk factors and symptom presentation while keeping in mind the existing baseline gender and racial disparities.

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