ISSN: 1676-4285

Comparison of mortality in mexican-american females and mexican american males following acute myocardial infarction

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ABSTRACT

Acute myocardial infarction results in 7.2 million deaths per year world-wide. The treatment of AMI in the post-myocardial infarction period differs among the races and genders. This study investigated differences in mortality between Mexican American (MA) males and females, post-AMI who received BB therapy and those who did not receive BB therapy. Findings from this secondary analysis indicate that MA females experienced a higher mortality post-AMI compared to MA males. However, MA females taking BB therapy post-AMI had a reduced odds of mortality compared to MA males taking BB post-AMI. Interestingly, MA females were less likely to have received BB therapy post-AMI compared to MA males, despite its apparent benefit.

Descriptors: Gender disparity; Treatment of acute myocardial infarction

INTRODUCTION

Acute myocardial infarction (AMI) is a major public health problem in the industrialized world. In 2001 the World Health Organization reported 7.2 million deaths related to cardio-vascular disease globally. Six major clinical trials found that beta-blockers (BB) decrease mortality in post-acute myocardial infarction (AMI) patients (Baber et al., 1980, ISIS-1, 1986, Olsson et al., 1992; Freemantle et al., 1999; MIAMI, 1985, Krumholz et al., 1998). While the benefits of BB post-AMI have been demonstrated in global application, studies show that women benefit more from BB therapy than men. According to a meta-analysis conducted by Nohria et al. (1998), women treated with BB therapy had a 29-31% reduction in mortality post-AMI compared to a 5-7% reduction in men. While these studies reveal differences between genders these differences have not been studied in specific ethnic groups. This study investigated differences in mortality between Mexican American (MA) males and females, post-AMI who received BB therapy and those who did not receive BB therapy.

The incidence of AMI is estimated to be about 6 per 1000 people, and is thought to be responsible for approximately 600,000 deaths per year (American Heart Association, 1998). Roughly half of the cost of AMI is related to AMI prevention and treatment. The MA population, estimated to be approximately 30 million, is the largest minority group in the USA (US Bureau of the Census, 2000). The MA population experiences an increased incidence of CAD related AMI and subsequent mortality (Nichaman et al., 1993). Female MA have higher morbidity and mortality rates due to AMI than MA men (Nichaman et al., 1993). The great mortality risk from AMI in the MA population is attributed to a number of factors including, genetics, diabetes, socioeconomic status and the degree of control for hypertension (Nichaman et al., 1993).

The treatment of AMI in the post-myocardial infarction period differs among the races and genders. Currently BBs are considered one of the most efficacious therapies available to reduce mortality post-AMI (Miller, 2000). Post-AMI Mexican Americans were less likely to receive BB therapy than non-MA, however, MA women were less likely to receive BB therapy than MA men (Goff et al., 1993). Therefore, there is some evidence for possible differences in morbidity and mortality, between MA genders relative to BB therapy.

The heart requires tremendous amounts of energy and oxygen for its specialized contractile function. The contraction process of the heart itself accounts for approximately 75% of myocardial oxygen consumption (MVO_2). The remaining 25% is consumed by other cellular mechanisms such as active transport of ions across the myocardial cell membrane (Ganong, 1999). Diseases of the heart such as, CAD increase MVO_2 to such a point that compensatory mechanisms fail and the heart cells become ischemic leading eventually to tissue necrosis. Medications that lower the MVO2 can alleviate this ischemic process by diminishing the myocardial demand for oxygen by decreasing the work of the heart (Miller, 2000). BBs work by decreasing the heart rate of an individual and as a result, decrease the work and the MVO_2 of the heart.

METHODOLOGY

Population, Sample, and Setting

This secondary analysis used data from the Corpus Christi Heart Project (CCHP). The CCHP study that began in May1988 and ended

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in April 1997 recruited members for a public health surveillance program for hospitalized cases of CAD. The CCHP cohort consisted of a bi-ethnic population of MA and non-Hispanic Whites 25-81 years old who were residents of Nueces County, Texas. The ethnic makeup of Nueces county residents was 51% Hispanic, 41% non-Hispanic Whites. Of the Hispanic residents of Nueces county 95% were Mexican Americans (MA), 45% were females and 55% males. The median age of the MA population was 26 years and 35 years for non-Hispanic Whites. Intensive care units and coronary care units of the six acute care hospitals were monitored on a regular basis for patients admitted with suspect AMI.

The sample for this analysis consisted of 2,447 subjects who met the inclusion criteria. To be included in the sample a patient must have been MA and diagnosed with a definite or possible AMI. Those eliminated were non-MA and did not have evidence of a myocardial infarction.

Data Collection

Data for this study was extracted from the CCHP database without identifiers and was approved by The University of Texas Health Science Center-Houston Committee for the Protection of Human Subjects. Variables of interest were extracted from the CCHP database. The variables included ethnicity, BB-exposure, BB-non-exposure. Co-variables also extracted included, age, gender, tobacco use, medical history and pre-existing disease conditions such as diabetes, a history of congestive heart failure (CHF) and hypertension. Mortality was determined by reviewing the medical chart, local newspaper obituaries, death certificates at the Nueces County Health Department as well as periodic search of the national death index.

Post-AMI cohort members received a variety of medications including, BBs, Alpha-blockers, Calcium Channel blockers, Aspirin, Ace inhibitors, diuretics, and nitrates. The use of BB therapy during or following hospitalization was defined as a dichotomous variable (yes/no).

Gender (male/female), current cigarette smoking status (yes/no), history of congestive heart failure (yes/no), history of hypertension (yes/no), history of diabetes mellitus (yes/no), were defined as dichotomous variables. Ethnicity (Mexican American, non-Hispanic white and other) was classified using three categories. Age (25-81 years) and total serum cholesterol (mg/dl) were defined as continuous variables.

Data Analysis

SPSS (Statistical Package for the Social Sciences version 10.07) was used to compare all gender related differences in mortality amongst the identified cases. Univariate and multivariate analyses included, cross-tabulations with chi square tests (Pearson) and logistic regression analysis.

Findings - Effect of Beta Blockers on Mortality

The differences in mortality amongst MA males and females taking BB therapy post-AMI were evaluated. Among the 2,447 patients, in the study sample, a total of 355 deaths occurred and included 121 MA females and 234 MA males. The MA female patients hospitalized for AMI were on average older than MA males. The mean age for the study sample was 61.3 years; for MA females, 62.9 years; and for MA males, 60.7 years. The prevalence of preexisting disease among the study group is shown in Table 1. The MA females were more likely to have a history of diabetes mellitus, hypertension, and congestive heart failure post-AMI but were less likely to smoke when compared to MA males.

Differences in mortality within the male and female MA population, who have been treated with BB post-AMI and those not treated.

MA non-BB users experienced a 41.7% increased cumulative mortality compared to BB users post-AMI. When comparing mortality rates between MA females and males, despite BB usage, mortality was 33.5% versus 27.8%, respectively. Differences in the number of patients who were prescribed BB therapy was apparent. Amongst MA, males (56.6%) were more likely to have received BB therapy than MA females (44.9%) (Table 1). Male BB users had a cumulative mortality of 31.5% compared to 36.8% cumulative mortality for female BB users post-AMI.

Table 1 - Baseline characteristics of 2,447 Mexican American study subjects. Corpus Christi Heart Project 1988-1997.

Characteristic	Male MA (n=1715)	Female MA (n=732)
Age(years)		
Mean	60.7	62.9
Beta Blocker		
Yes	56.6% (744)	44.9% (329)
No	43.5% (971)	55.1% (403)
Risk behavior		
Tobacco Use		
Yes	32.3% (554)	27.2% (199)
No	59.9% (1028)	63.3% (463)
No response	7.8% (133)	9.6% (70)
Disease conditions		
History of DM		
Yes	20.3% (348)	30.3% (220)
No	48.3% (828)	41.7% (305)
No response	31.1% (532)	27.0% (198)
History of HTN		
Yes	45.5% (781)	58.3% (427)
No	31.4% (539)	19.8% (145)
No response	22.6% (388)	21.0% (154)
History of CHF		
Yes	18.1% (311)	20.4% (149)
No	81.7% (1402)	79.4% (581)
No response	0.1% (2)	0.3% (2)
Serum Cholesterol		
<200 mg/dl	38.8% (666)	54.6% (400)
^{3}200 mg/dl	54.9% (941)	40.4% (296)

MI=Myocardial infarction; DM=Diabetes mellitus; HTN=Hypertension; CHF=Congestive heart failure.

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Because BB therapy is commonly used in the treatment of AMI, its use was examined in greater detail. The use of BBs in diabetic patients is relatively contraindicated, and is significantly contraindicated in CHF (Herholz et al., 1996). As previously noted, MA females (20.4%) were more likely to develop CHF post-AMI compared to MA males (18.1%) and the prevalence of diabetes mellitus (DM) amongst MA was also higher for females (30.3%) than males (20.3%). As expected MA females with a history of DM or CHF received BB therapy less than those without DM or CHF. Therefore, in order to adjust for the effect these potential cofounders may have, multivariate logistic regression analysis was used. The use of BBs in CHF patients was significantly (p=0.000) associated with increased odds of mortality (odds ratio=4.69,95%CI=3.42-6.42). This finding indicates that MA CHF patients taking BB have a 4.69 times increased odds of mortality compared MA taking BB without CHF.

A multivariate logistic regression model was used to estimate mortality amongst MA BB users, adjusting for potential confounding variables. Potential confounding variables included in the model were, gender, age, tobacco use, history of hypertension, history of diabetes, history of CHF, and total serum cholesterol levels. Table 2 presents the results of these analyses. The individual effect of BB on mortality demonstrates a protective effect in MA post-AMI as demonstrated by univariate odds ratio=0.85 (95%CI=0.77-0.93, p=0.001) and multivariate logistic regression analysis odds ratio=0.71 (95%CI=0.58-1.86, p=0.012) (Table 2). Univariate odds ratio of 0.85 indicates that MA not taking BB post-AMI had a 15% increased odds of mortality compared to MA taking BB post-AMI. Multivariate analysis reveals an odds ratio of 0.71 further substantiating the benefit of BB therapy when controlling for potentially confounding variables

Gender related differences in post-AMI therapy, and response to therapy

The adjusted mortality odds ratio for MA males taking BB was 1.13 (95%CI=0.84-1.52) with a p-value=0.044 and univariate analysis odd ratio=1.09 (95%CI=1.02-1.12, p=0.005) (Table 2). Indicating that when potentially confounding variables are controlled for, MA males taking BB post-AMI are at a 13% increased odds of mortality compared to MA females taking BB post-AMI.

Other significant findings included age (<65 years) adjusted mortality for individuals taking BB revealed an odds ratio=0.32 (95%CI=0.26-0.38, p=0.000) and univariate odds ratio=0.36 (95%CI=0.29-0.44, p=0.000) (Table 2). Indicating that MA over 64 years of age, taking BB post-AMI had a 68% increased odds of mortality compared to MA under the age of 65 years taking BB post-AMI.

Multivariate analysis demonstrated that tobacco users had an odds ratio of 1.63 (95%CI=1.20-2.22, p=0.002), indicating that MA tobacco users taking BB post-AMI had a 63% odds of mortality compared to MA non-tobacco users taking BB post-AMI. Diabetics had an odds ratio of 1.89 (95%CI=1.34-2.57, p=0.000), indicating that MA diabetics taking BB post-AMI had a 89% increased odds of mortality compared to non-diabetic MA taking BB post-AMI. All multivariate odds ratio p-value were <0.05 accept for HTN and hyperlipidemia p>0.05.

Table 2. Effect of selected risk factors on mortality adjusted for age, gender, tobacco use, history of diabetes, history of hypertension, history of CHF, and serum cholesterol level.

	Univariate			Multivariate		
Characteristic	**Odds ratio**	**95% CI**	**P-value***	**Odds ratio**	**95% CI**	**P-value***
Beta blocker**						
Yes	0.845	0.770 – 0.927	0.001	0.706	0.580-1.860	0.012
GenderÑ						
Male	1.087	1.024 – 1.115	0.005	1.126	0.836-1.517	0.044
AgeÑÑ						
<65 years	0.317	0.264 – 0.381	0.000	0.358	0.292-0.439	0.000
Tobacco Use**						
Yes	1.067	0.935 - 1.219	0.332	1.632	1.200-2.221	0.002
History of DM**						
Yes	0.539	0.473 - 0.613	0.000	1.889	1.389-2.569	0.000
History of HTN**						
Yes	0.834	0.766 – 0.892	0.000	1.314	0.971-1.779	0.077
History of CHF**						
Yes	0.279	0.236-0.329	0.000	4.685	3.420-6.418	0.000
Serum Cholesterol***						
³200 mg/dl	1.211	1.091-1.346	0.000	0.076	0.590-1.027	0.076

MI=Myocardial infarction; DM=Diabetes mellitus; HTN=Hypertension; CHF=Congestive heart failure; CI=Confidence interval.

P-values are based on the Pearson chi-square test.

*** Coded as 0=no, 1=yes*** Coded as 0<200 mg/dl, 1³200 mg/dl*

Ñ Coded as 0=female, 1=male ÑÑ Coded as 0 ³ 65 years, 1 < 65 yea

CONCLUSION

Previous studies suggested that females had higher cardiovascular mortality post-AMI when compared to males. This study indicates that MA females experienced a higher mortality post-AMI compared to MA males. However, MA females taking BB therapy post-AMI had a reduced odds of mortality compared to MA males taking BB post-AMI. Interestingly, MA females were less likely to have received BB therapy post-AMI compared to MA males, despite its apparent benefit.

Interestingly, the use of BBs post-AMI appears to be a less desirable option for medical management despite its documented benefit (MIAMI, 1985). This finding is not unique to the CCHP, it may be the mainstream practice in the USA. The Stanford MONICA Project (1994) identified similar findings, only 21% of patient received BBs at discharge, and in the US centers in the Survival and Ventricular Enlargement (SAVE) study only 28% of the subjects were taking BBs 12 months following myocardial infarction. In contrast, the Perth and Newcastle, Australia MONICA Project centers found 57.6% and 39% of the subjects were prescribed BBs post-myocardial infarction. An explanation for this difference in practice could be related to the aggressive marketing techniques for calcium channel blockers in the USA, since calcium channel blockers were the second most

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commonly prescribed drug in the CCHP next to nitrates (Herholz, 1996).

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Received: 05/20/2003
Accepted: 07/25/2003