# EFFECT OF HYPERTENSION ON ACUTE MYOCARDIAL INFARCTION: A CROSS-CULTURAL COMPARISON

ABDULBARI BENER*, J. AL-SUWAIDI, A. EL-MENYAR AND HA AL-BINALI

DEPARTMENT OF MEDICAL STATISTICS AND EPIDEMIOLOGY (A.B.), DEPARTMENT OF CARDIOLOGY AND CARDIOVASCULAR SURGERY (J.A.S., E.M., H.A.B.), HAMAD GENERAL HOSPITAL, HAMAD MEDICAL CORPORATION, DOHA, STATE OF QATAR

**MHR**

**PRELIMINARY REPORT**

**MEDICAL HYPOTHESES AND RESEARCH ● THE JOURNAL FOR INNOVATIVE IDEAS IN BIOMEDICAL RESEARCH ●**

**ABSTRACT.** AIM: THE AIM OF this retrospective cohort study is to assess the effect of hypertension among the Qatari and non-Qatari patients admitted to hospital in Qatar with acute myocardial infarction (AMI). METHODS: A total of 22,440 Qatari and non-Qatari patients (40% males and 60% females) were admitted with AMI with or without hypertension in the Hamad General Hospital, State of Qatar from 1991 to 2002. The diagnostic classification of definite AMI was made in accordance with criteria based on the International Classification of Disease tenth revision (ICD-10). Data analysis was performed using stepwise logistic regression analysis. RESULTS: Of all patients, 8976 (40%) were Qataris and 13,464 (60%) were non-Qataris. 5390 (24%) patients admitted with AMI. Qataris with AMI were 1598 and 601 among them were hypertensive and non-Qataris with AMI were 3792 and 826 among them were hypertensive. Also, the incidence of hypertension was slightly higher in females than in males both among the Qataris 41.1% vs 20.5% ($P < 0.001$) and among the non-Qataris 13.0% vs 3.2%. Hypertension cases were rising sharply with increasing age ($P < 0.001$) among the Qataris. The results of stepwise logistics regression analysis showed that there was a statistically significant association between AMI and gender, diabetes, hypercholesterolemia, shortness of breath, and smoking. CONCLUSION: The present study revealed that there is a strong association between AMI, hypertension, DM, and other CVD risk factors, indicating the importance of the need for more effective prevention programs and control of hypertension and AMI.

*ADDRESS ALL CORRESPONDENCE TO: DR. ABDULBARI BENER, HAMAD GENERAL HOSPITAL AND HAMAD MEDICAL CORPORATION, P. O. BOX 3050, DOHA–QATAR. TELEPHONE: 974-439-3766. FAX: 974-439-3769. E-MAIL: abener@hmc.org.qa

## 1. INTRODUCTION

Cardiovascular disease (CVD) is the leading cause of mortality and morbidity [1] and the incidence of acute myocardial infarction (AMI) is rising rapidly in many of the affluent Arabian Gulf Countries especially in Qatar [2-3].

Hypertension is the most common risk factor for CVD [3-8] and other risk factors, such as obesity, diabetes mellitus (DM) and smoking, are also higher among hypertensive people than non-hypertensives [2-12]. More recently, Bener et al. [3] reported that hypertension was a predictor of congestive heart failure. Furthermore, some studies have indicated that pulse pressure may be a very important predictor of cardiovascular events [1-3, 8,11].

The aim of this study is to assess the effect of hypertension among the Qatari and non-Qatari patients admitted to hospital in Qatar with AMI.

## 2. SUBJECTS AND METHODS

The estimated population of the State of Qatar for the year 2003 was 724,125. Approximately 30% of the population were Qatari nationals and the rest were expatriates, mostly from the Middle East, South Asia and South East Asia [2].

The database of the Coronary Care Unit at the Hamad General Hospital, Hamad Medical Corporation was used for this study. This hospital provides comprehensive tertiary health care services for all patients with AMI, angina and congestive heart failure requiring hospitalization are treated at this hospital. With the described database, all inpatients diagnosed with AMI during the twelve-year period from January 1991 to December 2002 were identified. Overall 22,440 patients (40% were males vs 60% were females) admitted to the Coronary Care Unit and cardiology wards of Hamad General Hospital during a period of twelve years.  Of the total, 8976 (40%) were Qataris and 13,464 (60%) were non-Qataris. Out of total sample, 5390 (24%) patients admitted with AMI. The diagnostic classification of definite AMI cases was made according to the criteria recommended by Gillum et al. [11]

and other [12]. The age of presentation, gender, cardiovascular risk factor profiles (smoking status, hypercholesterolemia, diabetes, and pre-existing coronary heart disease), electrocardiography (ECG), and location of AMI were analyzed. Hypertension was defined according to WHO criteria [13] as SBP >140 mm Hg and/or DBP >90 mm Hg and or the use of antihypertensive medication. The presence of DM was determined by the documentation in the patient's previous or current medical record of a documented diagnosis of DM that had been treated with oral medications or insulin. The presence of hyperlipidemia was determined by the demonstration of a fasting cholesterol >200 mg/dL in the patient's medical record, or any history of treatment for hyperlipidemia by the patient's physician.

Data are expressed as mean ± standard deviation (SD) unless otherwise stated. Chi-square analysis was performed to test for differences in proportions of categorical variables between two or more groups. In $2 \times 2$ tables, the Fisher exact test (two-tailed) was used instead of Chi-Square, particularly, when sample size was small. Stepwise logistic regression analysis was used to predict risk factors (determinant) for the AMI. The level $P < 0.05$ was considered to be the cut-off value for significance.

## 3. RESULTS

Overall 22,440 patients (40% were males vs 60% were females) admitted to the Coronary Care Unit and cardiology wards of Hamad General Hospital during a period of twelve years. Of the total, 8976 (40%) were Qataris and 13,464 (60%) were non-Qataris. Out of total sample, 5390 (24%) patients admitted with AMI.

TABLE 1 shows the comparison between Qatari and non-Qatari patients with and without hypertension. Among the total Qatari patients (1,598) admitted with AMI and 37.6% of them were with hypertension. Also the prevalence of hypertension was higher in Qatari males $P < 0.001$ and among non-Qataris the females were more likely to be hypertensive 13.0% vs 3.2%, $P < 0.001$. Smoking habits among the Qatar were highly significant

TABLE 1. BASELINE CLINICAL CHARACTERISTICS AND BIOCHEMICAL PROFILE OF MI BY THE PRESENCE
AND ABSENCE OF HYPERTENSION AMONG QATARIS AND NON-QATARIS.

| VARIABLES | | QATARIS | | NON-QATARIS | |
|---|---|---|---|---|---|
| | | HYPERTENSION (N = 601) | NON-HYPERTENSION (N = 997) | HYPERTENSION (N = 826) | NON-HYPERTENSION (N = 2966) |
| GENDER | Male | 354 (58.9)* | 793 (79.5) | 719 (87.0)* | 2871 (96.8) |
| | Female | 247 (41.1) | 204 (20.5) | 107 (13.0) | 95 (3.2) |
| AGE GROUP | <60 | 211 (35.1) | 494 (49.5) | 645 (78.1) | 2621 (88.4) |
| | ≥60 | 390 (64.9) | 503 (50.5) | 181 (21.9) | 345 (11.6) |
| SMOKING HABITS | Yes | 178 (28.6)* | 423 (43.3) | 469 (18.4)* | 357 (28.8) |
| | No | 444 (71.4) | 553 (56.7) | 2085 (81.6) | 881 (71.2) |
| HISTORY | Angina | 307 (51.1) | 489 (49.0) | 499 (60.4) | 1712 (57.7) |
| | Dizziness | 8 (1.3) | 12 (1.2) | 7 (0.8) | 27 (0.9) |
| | Palpitation | 7 (1.2) | 14 (1.4) | 8 (1.0) | 19 (0.6) |
| | Atypical chest pain | 11 (1.8) | 15 (1.5) | 12 (1.5) | 44 (1.5) |
| | Shortness of breath | 157 (26.1)* | 128 (12.8) | 77 (9.3)* | 141 (4.8) |
| COMPLICATIONS | Diabetes mellitus | 391 (65.1)* | 472 (47.3) | 319 (38.6)* | 684 (23.1) |
| | Hypercholesterolemia | 172 (28.6) | 251 (25.2) | 233 (28.2)‡ | 711 (24.0) |
| | Angina | 38 (6.3)† | 35 (3.5) | 40 (4.8)† | 82 (2.8) |
| | CHF | 145 (24.1)* | 143 (14.3) | 65 (7.9)‡ | 168 (5.7) |
| | Old MI | 105 (17.5) | 147 (14.7) | 87 (10.5)‡ | 241 (8.1) |
| | Coronary artery bypass graft | 21 (3.5) | 41 (4.1) | 30 (3.6)‡ | 67 (2.3) |
| LABORATORY DATA | Total cholesterol | 5.35 ± 1.23 | 5.44 ± 1.29 | 5.49 ± 1.24 | 5.37 ± 1.24 |
| | HDL – cholesterol | 1.23 ± 0.52 | 1.12 ± 0.52 | 1.09 ± 0.45 | 1.16 ± 0.72 |
| | Triglyceride | 1.75 ± 0.96 | 1.96 ± 1.66 | 2.19 ± 1.79 | 2.14 ± 1.51 |
| | CPK | 719.4 ± 490.6 | 713.7 ± 492.6 | 746.9 ± 489.2 | 847.1 ± 531.6 |

$* P < 0.001$; $† P < 0.01$; $‡ P < 0.05$

among the Qatari as well as among the non-Qataris. Current smokers are higher among the non-hypertensive groups. History of angina, dizziness, palpitation and atypical chest pain did not show any significant difference among the hypertensive and non-hypertensive groups of Qataris and non-Qataris. However shortness of breath was significantly twice as high among hypertensive subjects among the Qataris as well as non-Qataris with $P < 0.001$ in each case. Complications like diabetes, angina, CHF were significantly higher among the hypertensive subjects and the prevalence of the disease was much higher among the Qataris than the non-Qataris. The prevalence of diabetes and CHF

was twice as much as in Qataris than non-Qataris.

TABLE 2 represents the mode of therapy and in-patient mortality of AMI subjects. The procedure thrombolysis was significantly higher among the non-hypertensive subjects both in Qataris and non-Qataris groups. Beta-blockers were significantly more likely to be given to non-hypertensive subjects during admission and ACE inhibitors on the other hand was more likely to be administered on hypertensive subjects in the Qatari and non-Qatari categories.

TABLE 3 presents the results of stepwise logistics regression analysis to identify factors inde-

TABLE 2. MODE OF THERAPY AND INPATIENT MORTALITY OF AMI PATIENTS IN THE PRESENCE
OF HYPERTENSION BY ETHNICITY.

| VARIABLES | QATARIS | | NON-QATARIS | |
|---|---|---|---|---|
| | HYPERTENSION | NON-HYPERTENSION | HYPERTENSION | NON-HYPERTENSION |
| THROMBOLYSIS | 100 (16.6)* | 314 (31.5) | 332 (40.2)* | 1616 (54.5) |
| DRUGS ADMINISTERED DURING ADMISSION | | | | |
| ASPIRIN | 436 (72.5) | 754 (75.6) | 694 (84.0) | 2565 (86.5) |
| BETA-BLOCKERS | 119 (19.8)* | 284 (28.5) | 305 (36.9)‡ | 1239 (41.8) |
| ACE INHIBITORS | 206 (34.3)* | 174 (17.5) | 171 (20.7)* | 347 (11.7) |
| CALCIUM CHANNEL BLOCKERS | 86 (14.3) | 120 (12.0) | 88 (10.7)* | 211 (7.1) |
| IN-HOSPITAL COMPLICATIONS | | | | |
| STROKE | 9 (1.5) | 16 (1.6) | 5 (0.6) | 16 (0.5) |
| HEART BLOCK | 18 (3.0) | 49 (4.9) | 26 (3.1) | 96 (3.2) |
| SHOCK | 38 (6.3) | 73 (7.3) | 25 (3.0) | 104 (3.5) |
| DEATH | 107 (17.8) | 162 (16.2) | 63 (7.6) | 198 (6.7) |
| * $P < 0.001$; † $P < 0.01$; ‡ $P < 0.05$ | | | | |

TABLE 3. STEPWISE LOGISTIC REGRESSION ANALYSIS TO IDENTIFY PREDICTORS OF
ACUTE MYOCARDIAL INFRACTION.

| INDEPENDENT VALUES | ODDS RATIO (OD) | 95% CONFIDENCE INTERVAL (95% CI) | P VALUE |
|---|---|---|---|
| HYPERCHOLESTEROLEMIA | 2.04 | 1.87–2.23 | <0.001 |
| SEX | 1.91 | 1.72–2.12 | <0.001 |
| SMOKER | 1.71 | 1.59–1.86 | <0.001 |
| SHORTNESS OF BREATH | 1.65 | 1.31–2.08 | <0.001 |
| DIABETES MELLITUS | 1.52 | 1.40–1.64 | <0.001 |

pendently associated with AMI in-hospital outcome. It is clear from the table that there was a significant association between AMI and sex, smokers, diabetes mellitus, shortness of breath and hypercholesterolemia after adjusting for age and other variables.

## 4. DISCUSSION

CVD is the leading cause of mortality and morbidity [1] and the incidence of AMI is rising rap-idly in many developed and developing countries [1-13]. It is worth noting that if we wish to achieve a significant reduction in the prevalence of CVD, it will be essential to adopt effective preventive strategies. In addition, knowledge of the epidemiology of hypertension and the effects of socio-demographic, economic and behavioral factors on the prevalence of hypertension and CVD risk factors is significantly important and equally necessary [2-6,8,9].

This study in an urban population in early epi-

demiological transition shows a high prevalence of hypertension in AMI patients particularly after the age of 50 years. The prevalence of hypertension is highly dependent on the definition used and the age distribution of the population studied. This is the first comprehensive cross-sectional hospital based survey for studying the effect of hypertension, DM and hypercholesterolemia among Qatari AMI patients. High rates of hypertension were found among Qatari population, which is consistent with the results of studies conducted in developed and other countries [1,4,7,8,10,13-16]. The effect of hypertension on AMI has been documented by several studies [1-10,13-16]. Their study findings are consistent with the present study outcome results.

Comparison of hypertension between males and females with respect to age has been reported in previous studies; these had shown that younger men have higher blood pressure than younger women and older men have lower blood pressure than older women in most populations [2-4,7,8,10]. This is consistent with the present study conducted in Qatar [2-7,8] and other surveys carried out in the United States [6] and in the French population [10].

The efficacy of lifestyle-modification for preventing hypertension is very essential [2,9] for reducing blood pressure and other risk factors under practical conditions. However, lifestyle modification programs can be implemented in Arabian Gulf countries and improve such cardiovascular risk factors such as hypertension and obesity.

STUDY LIMITATIONS. The major limitation of our study was its retrospective analysis of a prospective registry. Second, our study probably underestimated the true prevalence of hypertension and DM, since systematic screening is not routinely performed in our patients. Third, there were insufficient data on socio-economic and life-style habits associated with hypertension.

CONCLUSION. The present study revealed that there is a strong association between AMI, hypertension, DM, and other CVD risk factors, indicating the importance of the need for more effective prevention programmes and control of hypertension and AMI.

REFERENCES

[1]  TUNSTALL-PEDOE H, KUULASMAA K, MAHONEN M, TOLONEN H, RUOKOKOSKI E AND MOUYEL P [1999] Contribution of trends in survival and coronary-event rates to changes in coronary heart disease mortality: 10-year results from 37 WHO MONICA project populations. Monitoring trends and determinants in cardiovascular disease. Lancet 353: 1547-1557.

[2]  BENER A, AL-SUWAIDI J, AL-JABER K, AL-MARRI S, DAGASH MH AND ELBAGI IA [2004] The epidemiology of hypertension and its associated risk factors in the Qatari Population. J Human Hypertension 18: 529-530.

[3]  BENER A, AL-SUWAIDI J, EL-MENYAR A AND GEHANI A [2004] The effect of hypertension as a predictor of risk for congestive heart failure patients over a 10-year period in a newly developed country. Blood Pressure 13: 41-46.

[4]  GUSTAFSSON F, KOBER L, TORP-PEDERSON C, HILDEBRANDT P, OTTESEN MM, SONNE B AND CARLSEN J [1998] Long term prognosis after acute myocardial infarction in patients with a history of arterial hypertension. TRACE Study group. Eur Heart J 19: 588-594.

[5]  AL-SUWAIDI J, BENER A, BEHAIR S AND AL-BINALI H [2004] Mortality caused by acute myocardial infarction in Qatari Women. Heart 90: 693-694.

[6]  AL-SUWAIDI J, BENER A, AL-BINALI H AND NUMAN MT [2004] Does Hospitlisation for Congestive Heart Failure occur more frequently in Ramadan: a population based study (1991–2001). Int J Cardiol 96: 217-221.

[7]  FRANKLIN SS [2002] Definition and epidemiology of hypertensive cardiovascular disease in women: The size of the problem. J Hypertension 2: S3-S5.

[8]  BENER A, OBINECHE E, GILLETT M, PASHA M AND BISHAWI B [2001] Association between blood levels of lead blood pressure and risk of diabetes and heart diseases in workers. Int Arch Occup Environ 74: 375-378.

[9]  AL-SUWAIDI J, WRIGHT RS, GRILL JP, HENSRUD DD, MURPHY JG, SQUIRES RW AND KOPECKY SL [2001] Obesity is Associated with Premature Occurrence of Acute Myocardial Infarction. Clin Cardiol 24: 542-547.

[10]  BENETOS A, SAFAR M, RUDNICHI A, SMULYAN H, RICHARD JL, DUCIMETIEERE P AND GUIZE L [1997] Pulse pressure a predictor of long term cardiovascular mortality in French male population. Hypertension 30: 1410-1415.

[11]  GILLUM RF, FORTMANN SP, PRINEAS RJ AND KOTTKE TE

[1984] WHO criteria for diagnosis of acute myocardial infarction. Am Heart J 108: 150-158.

[12] Tunstall-Pedoe H, Kuulasmaa K, Amouyel P, Arveiler D, Rajakangas AM and Pajak A [1994] Myocardial infarction and coronary deaths in the World Health Organization MONICA Project. Registration procedures, event rates, and case-fatality rates in 38 populations from 21 countries in four continents. Circulation 90: 583-612.

[13] World Health Organization [1999] International Society of Hypertension Guidelines for the Management of Hypertension. J Hypertension 17: 151-182.

[14] Fox KM, Tomlinson IW, Portal RW and Aber CP [1975] Prognostic significance of acute systolic hypertension after myocardial infarction. Br Med J 3(5976): 128-130.

[15] Flack JM, Ferdinand KC and Nasser SA [2003] Epidemiology of hypertension and cardiovascular disease in African Americans. J Clin Hypertension 1: 5-11.

[16] Madhavan S, Ooi WL, Cohen H and Alderman MH [1994] Relation of pulse pressure and blood pressure reduction to the incidence of myocardial infraction. Hypertension 23: 395-401.