Acute Myocardial Infarction in a Region of Saudi Arabia—The Gизan Experience


One hundred patients admitted with acute myocardial infarction were analysed. The mean age was 54.5 ± 13 years (mean ± SD) for males, and 58 ± 9 years for females. The peak occurrence of acute myocardial infarction in males was at 60–69 years and for females at 50–69 years. The male to female ratio for the 77 Saudi patients was 6:1. The commonest risk factor was smoking, followed by hypertension and diabetes. Thirty-six of 50 Saudi patients had total serum cholesterol levels within the desirable range. Clinical characteristics for our patients were similar to those observed elsewhere. The commonest complications were arrhythmias. Five of the nine deaths were due to cardiogenic shock. Only 15% of the patients presented to hospital within 4 hours of the onset of acute myocardial infarction. The benefits of thrombolytic treatment may not, therefore, be fully realized. This study shows that acute myocardial infarction is significant among the indigenous Saudi population of the Gизan Region. The collection and dissemination of data relating to coronary artery disease and its sequelae is encouraged, since this will help improve management.

Coronary artery disease (CAD) and its sequelae remain a major cause of death in Western countries in spite of a declining mortality associated with it in some of these countries.1,2 There are marked international differences in the rate of occurrence of CAD, even within the technically developed countries.2 Atherosclerosis is the basis of CAD and a number of predictive variables (risk factors), have been reasonably well correlated with the incidence of clinically manifest disease. Acute myocardial infarction (AMI), is one of the most serious manifestations of CAD.

While patient and disease characteristics have been well described for communities where CAD is prevalent, little such information is available for the Gизan Region of Saudi Arabia. The population of Gизan Region is 700,000, served by 10 hospitals including the 500-bed King Fahd Central Hospital (KFCH). A modern coronary care unit (CCU) with telemetry monitoring facility was established in KFCH in 1986. Although KFCH is the regional referral centre, during the period of the study many patients with AMI were cared for in their local hospitals. This study was designed to analyse
patients with AMI who were admitted to KFCH. For these patients we analysed demographic data, distribution of risk factors, clinical and laboratory findings, complications and outcome of hospitalization.

Materials and Methods
One hundred consecutive patients admitted to KFCH with a diagnosis of AMI were studied. The following criteria were used for the diagnosis of AMI (1) a clinical history of typical chest pain; (2) evolutionary changes consistent with AMI in serial electrocardiograms (ECG); (3)

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characteristic serum cardiac enzyme changes (creatine phosphokinase aspartate aminotransferase and lactic dehydrogenase). At least two of the above criteria were necessary for the diagnosis of AMI. For patients who suffered more than one episode of AMI, only the first admission was analysed.

Upon discharge from hospital, the following information was abstracted from the case notes — (a) age, sex, nationality; (b) presence and duration of chest pain prior to admission, history of angina pectoris and physical signs; (c) risk factors i.e. diabetes (fasting blood sugar greater than 7 mmol/l or treatment with hypoglycaemic agents), hypertension (diastolic blood pressure greater than 90 mmHg on three different occasions, treatment with antihypertensive agents or evidence of target organ involvement e.g. left ventricular hypertrophy, retinopathy and renal dysfunction), CAD in the family and smoking. Total serum cholesterol was measured in 50 Saudi patients 1 month or later following AMI; (d) analysis of ECGs, chest X-rays and cardiac enzyme profile; (e) complications during hospital stay; and (f) outcome of hospitalization (discharged, left hospital against medical advice or died).

Results
Of the 100 patients studied 89 were males and 11 females. All females were Saudis. The male to female ratio among the 77 Saudi patients was 6:1 (Table 1). The mean age for the males was 54.5 ± 13 years (mean ± SD) and 58 ± 9
Table 1
Saudi and non-Saudi distribution of 100 patients with acute myocardial infarction

<table>
<thead>
<tr>
<th>Nationality</th>
<th>Male</th>
<th>Female</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Saudi</td>
<td>66</td>
<td>11</td>
<td>77</td>
</tr>
<tr>
<td>Non-Saudi</td>
<td>23</td>
<td>0</td>
<td>23</td>
</tr>
</tbody>
</table>

Table 2
Distribution of risk factors among patients with acute myocardial infarction

<table>
<thead>
<tr>
<th>Risk factor</th>
<th>No.</th>
<th>9 (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Smoking (males)</td>
<td>89</td>
<td>65 (73)</td>
</tr>
<tr>
<td>Hypertension</td>
<td>100</td>
<td>16 (16)</td>
</tr>
<tr>
<td>Diabetes mellitus</td>
<td>100</td>
<td>15 (15)</td>
</tr>
<tr>
<td>Family history of coronary artery disease</td>
<td>64</td>
<td>7 (11)</td>
</tr>
</tbody>
</table>

*Number of patients who provided the relevant information.
Number of patients found to possess the relevant risk factor.

years for females. The peak occurrence of AMI for males was at 60–69 years of age and for females at 50–59 years (Fig. 1).

Risk factors

Thirty-six of 50 Saudi patients had total serum cholesterol levels below 5.2 mmol/l and 14 had levels from 5.2 to 6.2 mmol/l. The distribution of other risk factors is shown in Table 2.

Clinical characteristics

Acute chest pain was the presenting complaint in 93 of the 100 patients. The others presented with dizziness (one patient), syncope (one), acute onset of dyspnoea (one), and non-specific symptoms (four). The rest of the clinical features are shown in Table 3. Only 15 patients presented to hospital within 4 h of the onset of their acute symptoms; 52 presented between 4 and 24 h; 26 presented more than 24 h later and seven could not accurately indicate the time of onset of their acute symptoms.

Laboratory investigations

All 100 patients had abnormal ECGs. Fifty-five had anterior, 35 inferior, eight subendocardial and two combined anterior and inferior wall AMIs. Of all the patients, 98 showed typical evolutionary changes of cardiac enzymes, and 43 had abnormal chest X-rays showing cardiomegaly and/or pulmonary congestion.

| Clinical characteristics of 100 patients admitted with acute myocardial infarction |
|------------------------------------------|------|
| Clinical features                        | No.  |
| Acute chest pain                         | 93   |
| Left ventricular failure                  | 66   |
| Arrhythmia at presentation               | 35   |
| History of angina                         | 20   |

Table 4
Complications during hospital stay among 91 patients who were discharged alive following acute myocardial infarction

<table>
<thead>
<tr>
<th>Complication</th>
<th>No. (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Arrhythmias</td>
<td>33 (30)</td>
</tr>
<tr>
<td>Left ventricular failure</td>
<td>32 (29)</td>
</tr>
<tr>
<td>Postinfarction angina</td>
<td>19 (7)</td>
</tr>
<tr>
<td>Pericarditis</td>
<td>6 (5)</td>
</tr>
<tr>
<td>Arterial embolism</td>
<td>3 (3)</td>
</tr>
</tbody>
</table>

Complications

The complications observed during hospitalization are shown in Table 4. The commonest complication was a variety of arrhythmias, comprising; premature ventricular complexes (11 patients), various grades of heart block (nine), sinus bradycardia (six), atrial fibrillation (four), persistent sinus tachycardia (three), paroxysmal supraventricular tachycardia (three), ventricular tachycardia (two), ventricular fibrillation (two) and atrial flutter (one).

Discharge and mortality

Eighty-two of the 100 study patients were discharged home; nine left against medical advice and nine died in hospital. Of the 82 patients discharged 18 (22%) stayed in hospital for 10 days or less, 37 (45%) stayed for 11–14 days, 17 (21%) for 15–21 days and 10 (12%) stayed longer. Six males and three females died in hospital from complications of AMI. Five had inferior, three anterior and one subendocardial infarctions. The commonest mode of death was cardiacogenic shock, which occurred in five patients. Three patients died of late onset arrhythmias and one died because of multiple arterial emboli.

Discussion

This study shows that AMI in our population occurs mainly in middle-aged and elderly males; however, postmenopausal females and young males are also afflicted. The majority of our patients were Saudis (77%), which refutes earlier undocumented impressions that AMI in the Giza Region occurred mainly in non-Saudis expatriates. Figures to indicate the proportion of foreign residents to Saudis in the region are not available.

Important risk factors that have been associated with the development of atherosclerotic CAD include hyperlipidaemia, hypertension, smoking, male gender and diabetes mellitus. Of the 50 Saudi patients who had estimation of total serum cholesterol after AMI, 70% did not require specific treatment, while 28% would benefit from dietary advice and follow-up cholesterol estimations. Comparison of the remaining risk factors observed in our patients was made with those reported in a series from the USA—a group of 778 randomized patients in the MILIS study. The commonest risk factor in both studies was smoking, being found in 73% of our patients and 82% of the MILIS group.
Hypertension was diagnosed in 16% of our patients compared with 54% in the American series. In our group 15% of our patients were diabetic and in the MILIS group, 18%. Female patients made up 11% of our patients while in the MILIS group 27% were females. All our female patients were Saudis and none was a smoker.

The clinical presentation and laboratory diagnosis of AMI in our patients was similar to that described elsewhere.  

Although opinions differ, many studies show that the in-hospital mortality of patients with AMI has declined because of the use of coronary care units (CCU). Arrhythmias and conduction disturbances were the commonest complications in this study. Only 15% of the patients presented to hospital within 4 h of the onset of AMI. Since fatal arrhythmias are most frequent within the first 2 h of the onset of AMI, one can speculate that many deaths must occur in the population before hospital attendance.

Patients with AMI die as a result of arrhythmias (sudden death), cardiogenic shock, thromboembolism, pulmonary oedema and the sequelae of mechanical complications. These sequelae include acute mitral regurgitation and ventricular septal rupture. Severe failure of the ventricles leading to cardiogenic shock in association with massive AMI continues to be a serious therapeutic challenge.

In our study most of the deaths were due to cardiogenic shock—five of nine deaths. Three of the deaths occurred after the patients had been discharged from the CCU. It is known that 31–34% of in-hospital deaths following AMI occur after discharge from the CCU, and half of these are sudden and unexpected.  

This points to a subgroup of AMI patients who are at high risk of catastrophic arrhythmias even after CCU discharge. This subgroup includes patients with various warning arrhythmias, anterior myocardial infarction, acute interventricular conduction disturbances and circulatory failure. Such high-risk patients need to be shifted to an intermediate care facility following discharge from the CCU, where they continue to be monitored, e.g. by telemetry.

Hospital attendance within the first 4–6 h of AMI is essential if patients are to derive maximum benefit from thrombolytic treatment as shown in many studies. None of the patients in this study received thrombolytic agents, however, this procedure has now been instituted as standard therapy in this hospital. The GISSI trial has had a very great impact in demonstrating the therapeutic benefit of intravenous thrombolytic treatment in reducing in-hospital mortality following AMI. This simple route of administering thrombolytic agents as opposed to intracoronary administration has brought this beneficial treatment within the reach of hospitals without cardiac catheterization facilities. Every effort should, therefore, be made to inform doctors and other health personnel of the benefit of this effective form of treatment in patients with AMI. It should be emphasized that the highest chance of coronary reperfusion is in the first 4–6 h following the onset of AMI.

There is also need to educate the general public with the intention of making them report to health institutions as soon as they suspect a heart attack.

This study has shown that there is significant CAD manifested as AMI among the indigenous population of the Gizar Region of Saudi Arabia. We must gather data about risk factors of atherosclerotic CAD and the characteristics of the disease in this region and indeed in the rest of Saudi Arabia. This will assist in formulating strategies for the prevention and management of CAD and its sequelae.

Acknowledgements

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References


