Original Article

Changing Patterns of Cardiovascular Risk Factors in Hospitalized Patients with Acute Myocardial Infarction in Babol, Iran

Karim O Hajian-Tilaki[1], Farzad Jalali[2]
[1]Department of Social Medicine and Health, Babol Faculty of Medicine, Babol University of Medical Sciences, Babol, Iran
[2]Department of Cardiology, Shahid Beheshti Hospital, Babol Faculty of Medicine, Babol University of Medical Sciences, Babol, Iran

Kuwait Medical Journal 2007, 39 (3): 243-247

ABSTRACT

Objective: To investigate a 10-year trend of major cardiovascular risk factors in patients with acute myocardial infarction (AMI)
Design: A retrospective study
Setting: Babol Shahid Beheshti Hospital, Babol, Iran
Subjects: A total of 1236 consecutive patients with diagnosis of AMI.
Main Outcome Measures: Major cardiovascular risk factors including history of hypertension, diabetes mellitus, mean of diastolic blood pressure measurements, cholesterol and triglyceride level on the third day of hospitalization, age and gender were extracted from hospital records.
Results: The mean age (± SD) of patients was 60.6 (± 11.2) years and its trend was not significant during the 10-year period. Overall, 62% patients were male and 32% had history of hypertension and their trends were not statistically significant. Roughly, 24% of patients had diabetes mellitus and 32% had a history of smoking; the trend of these two risk factors tended to decrease over 10 years. There was a significant trend toward increasing diastolic blood pressure level at hospitalization ($p < 0.0001$). The mean (± SD) of cholesterol was 217 (64) mg/dl and the mean (± SD) of triglyceride was 147 (97) mg/dl. Their trend was not statistically significant.
Conclusion: A multidimensional intervention program is necessary for prevention of cardiovascular risk factors. There is a need to promote health-related educational programs and to control the nutritional behavior and hypertension in order to cope with changing life styles.

KEYWORDS: cardiovascular risk factors, myocardial Infarction, trend

INTRODUCTION

Acute myocardial infarction (AMI) has a high rate of morbidity and cost of hospitalization, long term disability and mortality. In the United States, AMI causes a million deaths annually that account for over 50% of annual death[1,2]. Published data from United States showed that the mortality rate due of myocardial infarction (MI) decreased in the decade of 1960's. The decreasing rate was 54% during 1963-90 and it reached 31% during 1982 to 1990. This decreasing rate was mainly due to prevention of major risk factors by community based intervention programs[2].

In epidemiologic studies, the major classical risk factors were documented very well and it was clearly known that hypertension, hypercholesterolemia, diabetes mellitus, smoking and familial history increase the risk of MI[3-5]. Basic and clinical studies have clearly shown the biological relation between these risk factors and atherosclerosis. Published studies showed different results on changing pattern of cardiovascular risk factors in different societies[6,7]. An observational study in Australia, during 1985-1993 reported that the smoking rate, diastolic hypertension and total cholesterol on an average decreased 3.3% for men and 4.1% for women annually in patients with coronary heart diseases but the prescription of cardiovascular drugs increased[6]. In contrast, a hospital based study in Tehran, Masinia (1996) reported[8] that the smoking rate, the prevalence of diabetes mellitus, hypertension and cholesterol in patients with AMI increased during 1986-1996. In another report from Iran, it was concluded that the mean age of MI patients increased roughly 1.9 years in recent decade[9].

In developing countries, due to changing life styles and development of civilization, an increase in the incidence of MI was observed. Published data from Ministry of Health, Iran showed that the percentage of death due to cardiovascular diseases, in particular MI, increased significantly in the recent decade and roughly it accounted for 40% of

Address correspondence to:
Dr Hajian-Tilaki KO, Department of Social Medicine and Health, Babol Faculty of Medicine, Babol, University of Medical Sciences, Babol, Iran. Fax N0: 0098-111-2229936, E-mail:drhajian@yahoo.com

Table 1: The changes in mean (± SD) of triglyceride, cholesterol and diastolic blood pressure in patients with AMI over calendar years

Calendar year	Triglyceride level Mean ± SD (mg/dl)	Cholesterol level Mean ± SD (mg/dl)	Diastolic Blood Pressure Mean ± SD (mm/Hg)
1992	145.8 ± 95.9	217.5 ± 58.9	76.1 ± 12.0
1993	164.1 ± 115.0	211.9 ± 47.8	78.9 ± 14.0
1994	158.7 ± 114.7	235.1 ± 60.7	78.4 ± 14.7
1995	139.7 ± 74.1	202.4 ± 42.4	72.9 ± 11.7
1995	140.1 ± 93.8	210.8 ± 53.7	76.5 ± 15.2
1997	128.3 ± 80.4	208.3 ± 58.0	76.5 ± 15.2
1998	135.8 ± 87.9	225.4 ± 89.4	81.5 ± 13.8
1999	153.2 ± 100.7	219.4 ± 60.9	81.9 ± 16.2
2000	145.6 ± 92.9	235.7 ± 73.0	80.6 ± 12.8
2001	147.5 ± 94.1	200.5 ± 58.5	82.1 ± 14.1
Overall mean	147.0 ± 97.1	217 ± 63.9	79.5 ± 14.2

all deaths[10]. In this regard, the question is how the pattern of cardiovascular risk factors varies in MI patients. This study was conducted to assess the changing profile of cardiovascular risk factors in hospitalized patients with AMI over a decade in Babol, north of Iran.

SUBJECTS AND METHODS

A retrospective study was conducted over a 10-year period from 1992 to 2001, based on existing data on medical records of patients with AMI (both ST and non-ST elevation) who were admitted to the Shahid Beheshti hospital in Babol, Iran. Overall, 1236 patients with AMI were examined during the study period. The diagnosis criteria of AMI were the presence of at least two from three WHO criteria (presence of typical chest pain, ECG changes and serum cardiac enzyme (CKMB) rising). The data of age, sex, history of hypertension, the mean of several measurement of diastolic blood pressure (DBP) at hospitalization, cholesterol (Chol) and triglyceride level (TRG) at third day of hospitalization, history of diabetes mellitus (DM-type II) and smoking status and calendar year were extracted from hospital charts. A DBP > 90 mmHg was defined as hypertension; total Chol > 220 mg / dl and TRG > 250 mg / dl were considered as abnormal and were labeled as hypercholesterolemia and hypertriglyceridemia respectively. Also, a fasting blood sugar > 140 mg / dl at pre-hospitalization was defined as diabetes mellitus. Statistical analysis was done using SPSS software. The F-test for linear trend with ANOVA model was used to assess the changes on mean of risk factors on continuous scales over a 10-year period and Chi-square test was used to assess the changes on the prevalence of major risk factors over two 5-year periods; a p-value < 0.05 was considered significant.

Table 2: The frequency and percentage of major cardiovascular risk factors in male MI patients within two 5-year study periods and p-value

Risk factors	1st 5-year period (1992-1996) n (%)	2nd 5-year period (1997-2001) n (%)	Total n (%)	p-value
History of Hypertension				0.58
Yes	73 (22.6)	88 (20.9)	161 (21.6)	
No	250 (77.4)	333 (79.1)	583 (78.4)	
Total	323 (100)	421 (100)	744 (100)	
Hypertension at Hospitalization				
Yes	28 (8.6)	68 (15.9)	96 (12.7)	0.002
No	299 (91.4)	359(84.1)	658 (87.3)	
Total	327 (100)	427 (100)	754 (100)	
Diabetes Mellitus				0.74
Yes	53 (16.4)	65 (15.5)	118 (15.9)	
No	271 (83.6)	355 (84.5)	355 (84.1)	
Total	324 (100)	420 (100)	744 (100)	
Hypercholesterolemia				0.37
Yes	108 (34.2)	149 (37.4)	257 (36.0)	
No	208 (65.8)	249 (62.6)	457 (64.0)	
Total	316 (100)	398 (100)	714 (100)	
Hypertriglyceridemia				0.64
Yes	27 (8.5)	30 (7.6)	57 (8.0)	
No	288 (91.4)	364 (92.4)	652 (92.0)	
Total	315 (100)	394 (100)	709 (100)	
Smoking				0.007
Yes	168 (51.9)	173 (41.9)	341 (46.3)	
No	156 (48.1)	240 (58.1)	396 (53.7)	
Total	324 (100)	413 (100)	737 (100)	
Age				0.03
Under 50 Years	58 (17.5)	84 (19.6)	142 (18.7)	
50-64 Years	153 (46.2)	158 (36.8)	311 (40.9)	
≥ 65 Years	120 (36.3)	187 (43.6)	307 (404)	
Total	331 (100)	429 (100)	760 (100)	

RESULTS

Out of 1236 cases under study, 61.8% were male and 38.2% were female. The overall mean age (± SD) of MI patients was 60.6 ± 11.2 years; the age mean for men and women was 60.1 ± 11.8 and 61.5 ± 11.0 years respectively and the difference appeared to be significant statistically (p = 0.03). Table 1 shows that the overall mean DBP was 79.5 ± 14.2 mmHg and the F-test in ANOVA model shows a significant linear trend toward increasing DBP over the 10-year study period (p < 0.0001). The mean cholesterol level was 217 ± 63.5 mg / dl and its trend was not statistically significant (p = 0.38). Also, the mean (± SD) of TRG was 147.0 ± 97 mg / dl and changes in its trend were not significant (p = 0.39).

On the whole, considering both genders together, (pooling data of Tables 1 and 2), the proportions of major risk factors such as history of hypertension, diabetes mellitus, hypercholesterolemia, triglyceridemia, smoking and age less than 50 years were 32.2%, 24%, 43.6%, 11%, 30.7% and 15.7% respectively. In comparison to two 5-year study periods, proportion of hypertension at

Table 3: The frequency and proportion (percentage) of major cardiovascular risk factors in female MI patients within two 5-year study periods and p-value

Risk factors	1st 5-year period 1992-1996 n (%)	2nd 5-year period 1997-2001 n (%)	Total n (%)	p-value
History of Hypertension				0.53
Yes	91 (47.4)	138 (50.4)	229 (49.1)	
No	101 (52.6)	136 (39.6)	237 (50.9)	
Total	192 (100)	274 (100)	466 (100)	
Hypertension At Hospitalization				0.22
Yes	24 (12.6)	46 (16.8)	70 (15.1)	
No	166 (87.4)	228(83.2)	394 (84.9)	
Total	190 (100)	190(100)	464 (100)	
Diabetes Mellitus				0.69
Yes	73 (38.0)	100 (36.2)	173 (37.0)	
No	119 (62.0)	176 (63.8)	295 (63.0)	
Total	192 (100)	276 (100)	468 (100)	
Hypercholesterolemia				0.60
Yes	103 (53.8)	136 (53.8)	239 (54.8)	
No	85 (43.7)	117 (46.2)	197 (44.2)	
Subtotal	183 (100)	253 (100)	436 (100)	
Hypertriglyceridemia				
Yes	25 (13.7)	44 (17.5)	69 (15.9)	0.28
No	158 (86.3)	208 (82.5)	366 (84.1)	
Total	183 (100)	252 (100)	435 (100)	
Smoking				0.62
Yes	12 (6.3)	14 (5.2)	26 (5.7)	
No	179 (93.7)	255 (94.8)	434 (94.3)	
Total	191 (100)	269 (100)	460 (100)	
Age				0.004
Under 50 Years	13 (6.8)	38 (13.6)	51 (10.8)	
50-64 Years	108 (56.3)	118 (42.3)	226 (48.0)	
Δ65 Years	71 (37.0)	123 (44.1)	194 (41.2)	
Total	192(100)	471 (100)	471 (100)	

hospitalization significantly increased in the second 5-year study period (16.3 Vs 10.0%, p = 0.001) while the proportion of smoking was seen to decrease significantly in comparison with the first 5-year study period (27.4 Vs 35.1, p = 0.0004). With regard to occurrence of MI under the age of 50 years, the rate increased in the second study period (7.2% Vs 13.7%).

Tables 2 and 3 compare the proportion of risk factors between two 5-year study periods, 1992-1996 and 1997-2001 in men and women respectively.

When comparing men and women, the three major risk factors including hypertension at hospitalization (12.7% for men Vs 15.1% for women), hypercholesterolemia (36% for men Vs 54.8% for women) and diabetes mellitus (15.9% for men Vs 37% for women) were significantly more common among women than men (p < 0.0001). However, smoking rate was significantly greater among men than women (46.3% Vs 5.7%). As regards the temporal changing on cardiovascular risk factors, the amount of increasing rate of hypertension at hospitalization for 5-year period was greater in men than women (7.3% Vs 4.2%). Although the value of decreasing rate of smoking for women was 1% and for men 10% and the percentage of MI under 50 years in comparison for the two 5-year study period, the value of increasing rate was greater in women as compared to men (6.8% Vs 2.1%).

DISCUSSION

The findings of this study showed a significant increasing trend of the mean DBP at hospitalization in patients with MI during a 10-year study period but the smoking rate decreased over the same time. The mean of total cholesterol level and triglyceride however, did not change significantly over the times.

Based on the finding of this study, the rate of female patients with MI increased over a decade. Overall, 38.2% of patients were female and 61.8 were male. But the percentage of female patients increased from 36.8 at the first 5-year period (1992-1996) to 39.3 in the second five years study period (1997-2002). In particular, the proportion of female MI patients under the age of 50 years increased from 6.8% to 13.6% between the two 5-year periods. This increasing rate might be due to the higher prevalence of three major risk factors, namely, hypercholesterolemia, hypertension and hypertriglyceridemia among women seen in our study.

In general, the proportion of female MI patients was 38.9%. Other studies like al-Adsani *et al* (2000) in Kuwait[11], Zubaid *et al* (2004) in Kuwait[12] and Sawaya *et al* (1999) in Lebanon[13] reported that 15.1%, 13% and 22.9% of MI patients respectively were females. The increasing proportion of female MI patients in our study may be explained by the differences of ecologic, genetic and life style factors. It might also be due to the tendency of women to be more conscious about their health and to visit a physician earlier. Overall, as regards the age-sex distribution of MI patients, the age mean of our patients was similar to that reported from other Middle Eastern countries[14] while the proportion of MI patients aged ≥ 65 years was tending to be greater in women than men. On an average, the age of occurrence of MI was roughly one year higher in women compared with men. These findings are also consistent with those reported in published data[11,13,15]. In addition, we found that the proportion of female patients was increasing over time.

Regarding history of hypertension and presence of hypertension at hospitalization, we found a significantly increasing rate of about 10% between the two 5-year study periods. Although, the prevalence of hypertension in our study was lower compared with published data from a Chilean

hospital[16] (49%) and a Kuwait study among hospitalized Arab (28.5%) and south Asian (20.6%) MI patients living in Kuwait[17], we must still worry of its significant increasing trend over these 10 years. In comparison with the Tehran study in hospitalized patients with MI[7], the proportion of hypertension increased by 11.5% over a 5-year period and this is greater than our findings.

In terms of smoking behavior of MI patients, we observed a significant decreasing rate in the proportion of smokers within the two 5- year periods. The proportion of smokers decreased from 51.9% to 40.9% (the decreasing rate was roughly 10%) for men while among women the prevalence of smokers was low (5%) and the changes in the decreasing rate was not clearly obvious (roughly 1%). In comparison to other published study in Tehran[7], the proportion of smokers in our MI patients was much lower (30.6% Vs 52.3%). This might be due to temporal effect of decreasing smoking rate in our general population during the two different periods. Other published studies, Prieto *et al* (1999)[16], Thomas *et al* (2000)[18] and Zubaid *et al* (2004)[19] reported that the proportion of smokers was 40, 30 and 51.7% respectively. Because of cultural issues, in the general population of our study area, the prevalence of smokers was low among women. Thus, the overall proportion of smoker was lower in our study. On the other hand, a decreasing rate in the 10 years under study might be due to the increased awareness of our general population on the risks of smoking and promotion of health education for cessation of smoking during the last decade.

In this study, the overall proportion of diabetes mellitus was 24%; this proportion increased to 37% in women. We did not find any changes in its proportion over the study period. In Tehran study, Masinia (1997) reported the prevalence of diabetes mellitus as 20.4% during 1989-1996 that is roughly close to our findings[7]. However, in some published studies, it was also reported that up to 53% of MI patients were diabetic[18,19]. The prevalence of diabetes in our study was about 25% and corresponded with that reported by the classic reference[3].

Our findings also revealed that the prevalence of diabetes mellitus and history of hypertension among women is more than two times higher than men (37% Vs 15.9% for diabetes and 49.1% Vs 21.6% for hypertension). These results also correspond with findings from other studies that these two risk factors are more prevalent among women patients with MI[11,13]. These differences may be explained by the fact that women may have a greater tendency of visiting a physician leading to early diagnosis of diabetes and hypertension. Because of unbalanced diet, improper nutritional behavior and lack of physical activity, the women population might have a higher rate of these two risk factors. This may explain the increasing proportion of female patients in our study period. A similar result was also found in another study[20]. In fact, some reports have shown that the prevalence of obesity in adult women is greater than men[21, 22].

In our study, the most common risk factors in MI patients were hypercholesterolemia, hypertension, history of smoking and diabetes respectively while Thomas *et al* (2000) reported that the order of most common risk factors was diabetes mellitus, hypertension, hypercholesterolemia and smoking[18]. The differences in the order of these four major risk factors might be due to differences in nutritional behavior and life style in the general population.

A major limitation of this study is that the study did not include those subjects who died before getting to the hospital, since roughly 15% of MI patients die during their first heart attack before arriving at the hospital[2]. This may eliminate real severe cases with major classic risk factors from our study sample. In addition, the setting of our study was limited to a single educational and therapeutic hospital. Thus, conducting a multicenter prospective study with a larger sample size will help us judge the temporal changes in cardiovascular risk factors better.

CONCLUSION

As our study found an increasing trend of hypertension, increasing proportion of MI occurrence under the age of 50 years and an especially, high prevalence of hypercholesterolemia in women and high rate of smoking in men, there is a need to promote health educational programs for increasing awareness of the general population on cardiovascular risk factors. We recommend a systematic health education program using multi media and the health system to increase knowledge and to change the attitude and behavior of subjects regarding major risk factors in population. In particular, a multidimensional community based intervention program is needed to cope with changing lifestyle and nutritional behavior.

REFERENCES

1. Braunwald E, Faucy AS, Kaper DL, *et al*. Harrison's principle of internal medicine. 15th edition, Mc Graw Hill, Medical Publication Division, 2001; 1383.
2. Antman EM, Braunwald E. Acute myocardial infarction. In: Braunwald E, Zioes DP, Libby P, editors. Heart Disease: a textbook of cardiovascular medicine, 6th ed. WB Saunders Co.; 2001. p 1114, 1126, 1197-1205.
3. Mardon DJ, Rodker PM, Pearson TA. Risk factors and the prevention of coronary heart disease. In: Alexander R, Robetrte S, Valentin F, editors. Hurst's The Heart. 9th ed.

New York: Health Profession Division; 1998. p 1175, 1180.
4. Rao SV, Donahua M, Pi-Sunyer FX, *et al*. Obesity as a risk factor in coronary artery disease. Am Heart J 2001; 142:1102-1107.
5. Belmin J. Prevention of cardiovascular disease in elderly. Press Med 2000; 24:1234-1239.
6. Dobson AJ, McElduff P, Heller R, Alexander H, Colley P. D'Este K. Changing patterns of coronary heart disease in the hunter region of New south Wales, Australia. J Clin Epidemiol 1999; 52:761-771.
7. Masinia F. Changing risk factors of myocardial infarction in relation to passed time. Pajouhandeh Journal, Sahid Beheshti Medical Science University, Iran, 1997; 7:77-82.
8. Brown N, Young T, Gray D, Skene AM, Hamton JR. In: Patient deaths from acute myocardial infarction, 1982-92: analysis of data in the Nothingham heart attack register. BMJ 1997; 315:159-164.
9. Shamkani K, Hosiani-Akbar M, Samadi E, Habibi G. A comparing of mean age of AMI occurrence in 1989 and 1999. Journal of Gilan University of Medical Sciences, Iran 2001; 10:36-41.
10. Ministry of Health and Medical Education of Iran. A report of survey of Iranian health, Tehran; 1997. p 234.
11. al- Adsani A, Memon A, Peneva A, Baidas G. Clinical epidemiology of acute myocardial infarction in Kuwait. Acta Cardiol 2000; 55:17-23.
12. Zubaid M, Rashed WA, Husain M, *et al*. A registry of acute myocardial infarction in Kuwait: Patient characteristics and practice patterns. Can J Cardiol 2004; 20:783-787.
13. Sawaya JI, Jazra C, Eid EV, Sabra RF. Gender differences in the diagnosis and treatment of acute myocardial infarction in Lebanon. J Med Liban 1999; 47:2-6.
14. Dakik HA, Koubeissi Z, Kleiman NS, *et al*. Acute myocardial infarction:clinical characteristics, measurement and outcome in a university medical centre in developing Middle Eastern country. Can J Cardiol 2004; 20:789-793.
15. Gottlieb S, Harpaz D, Shoton A, *et al*. Sex differences in management and outcome after acute myocardial infarction in the 1990s: a prospective observational community based study. Israeli Thrombolytic Survey Group. Circulation2000; 102:2458-2459.
16. Preito JC, Corbalan R, Chavez E. Lanas F, Cumsille F, Nazzal C. Acute myocardial infarction in Chilean hospitals. Final results of the GENI study. Rev Med Chil 1999; 127:795-762.
17. Suresh CG, Zubaid M, Thalib L, Rashed W, David T. Racial Variation in risk factors and occurrence of acute myocardial infarction: complication between Arab and South Asian men in Kuwait. Indian Heart J 2002; 54:266-270.
18. Thomas CN, Titus G, Williams D, Simeon D, Pitt-Miller P. Two year mortality and its determinants following acute myocardial infarction in Trinidad and Tobago. West Indian Med J 2000; 49:112-114.
19. Zubaid M, Suresh CG, Thalib L, Rashed W. Differential distribution of risk factors and outcome of acute coronary syndrome in Kuwait: three years' experience. Med Prin Pract 2004; 13:63-68.
20. Widdershoven JW, Gorgels AP, Vermeer F, *et al*. Changing characteristics and in-hospital outcome in patients admitted with acute myocardial infarction. Observations from 1982 to 1994. Edu Heart J 1997; 18:1073-1080.
21. Azadbakht L, Mirmiran P, Azizi F. Prevalence and associates of obesity in Tehran adults: Tehran Lipid and Glucose Study. Int J Endcorinol Metab 2004; 5- Abstract.
22. James PT, Leach R, Kalamrs E, Shayeghi M. The worldwide obesity epidemic. Obes Res 2001; 9:228S-233S.