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ISSN No: 2319-5886

International Journal of Medical Research & Health Sciences, 2016, 5, 6:221-228

Trends in the Lipid Profile, Mean Age and Fatality of Patients with Myocardial Infarction in the South of Iran from 2008 to 2014

Sepideh Yadollahi[1], Hosein Hamadiyan[1], Fazilat Pour Ashouri[2], Soghra Fallahi[3], Afshin Parvizpanah[1] and Sepehr Rasekhi[1]*

[1]Student Research Committee, Hormozgan University of Medical Sciences, Bandar Abbas, Iran
[2]Hormozgan Fertility & Infertility Research Center, Hormozgan University of Medical Sciences, Bandar Abbas, Iran
[3]Molecular Medicine Research Center, Hormozgan University of Medical Sciences, Bandar Abbas, Iran
Corresponding Email: flosep538@gmail.com

ABSTRACT

Dyslipidemia is a determinant for the outcome of myocardial infarction (MI). The pattern of dyslipidemia mainly reflects the mean age and mortality rates of patients with hospitalized MI. This study was carried out to analyze the trends in the serum lipid levels, mean age and fatality in the south of Iran during the six years (2008-2014). This cross-sectional study was conducted in 2015 at the Shahid Mohammadi hospital of Bandar Abbas, Iran. All case records of patients (with 18 years old or more) admitted to the hospital between March 2008 and March 2014 (six complete Iranian calendar year) with a principal diagnosis of MI were included. Sample size of this study was calculated and 147 case records were selected by simple random sampling method. A two part checklist was used, part one for demographic characteristics and part two for special information including blood pressure at admission, HDL, LDL, TG and Cholesterol. The prevalences of abnormal values for HDL, LDL, TG, Cholesterol, blood pressure at admission and case fatality were 46.1%, 56.52%, 43.48%, 46.96%, 69.6% and 21.74%, respectively. There are two significant associations between fatality of MI and TG during 2008 to 2010 (P = 0.021) and also between the case fatality of MI and LDL during 2010 until 2014 (P = 0.043). Hypertension was independent from the other variables and also no oriented trends were observed in the mean ages of hospitalized patients with MI in this project. The managements and prevention strategies used to manage lipid profile, fatality and incidence of MI in patients, were not successful in recent years.

Keywords: *Myocardial Infarction; Trends; Dyslipidemias; Mortality*

INTRODUCTION

Dyslipidemia is a well-known determinant for the outcome of cardiovascular disease, including myocardial infarction (MI) [1]. Since the pattern of lipid abnormalities and their relative negative effects on MI risk might differ among various ethnic groups [2], assessing the current trends in the lipid profile of each population is essential to monitor the burden of coronary heart disease, the most common cause of death [3, 4].

In recent years, favorable alterations in the lipid profile have been reported in the most of industrialized countries [5]. In fact, the improvement in the concentrations of low density lipoprotein, high density lipoprotein, triglycerides and total cholesterol were observed and also consequently in parallel to the trends in the lipid profile, the mortality of coronary heart disease has also declined in those countries [6-8]. Indeed, the reduction is due to a decline in the

incidence of disease and also the improved survival, simultaneously [3, 6]. In addition, the mean age of patients with myocardial infarction was increased as the another coincident trend. The better management of risk factors, improving the awareness of healthy lifestyle, especially dietary habits and the other medical care implemented by health centers are greatly responsible for diminished incidence and mortality and the improved lipid profile and mean age of patients with cardiovascular disorders [9].

On the other hand, the continuing burden of cardiovascular disease should not be underestimated. In this issue, developing countries (especially Asians) have the largest burden of cardiovascular disease, mainly due to the environmental and nutritional factors such as high carbohydrate and high fat diets and reduced physical activity [10, 11]. Majority of investigations in various populations have indicated that the levels of serum lipids reflect the mean age and mortality rates of patients with hospitalized myocardial infarction [12]. These observations documented the high importance of considering the lipid profile in managing heart disease [13]. Although several studies are required to highlight the mentioned topic in developing countries, there is a lack of studies about the trends in lipid profile and consequently changes in the mean age and mortality of myocardial infarction in those populations [14]. Therefore, we decided to analyze the trends in the serum lipid levels, mean age and fatality in the south of Iran during the six years (2008-2014).

MATERIALS AND METHODS

Patients

This cross-sectional study was conducted in 2015 at the Shahid Mohammadi hospital of Bandar Abbas, Iran. All case records of patients (with age of 18 years old or more) admitted to the hospital between March 2008 and March 2014 (six complete Iranian calendar year) with a principal diagnosis of acute myocardial infarction were eligible for enrollment in present observation. In fact, we used the medical record system of the hospital in which the details of every encounter are included. Thus, the inclusion criteria were a principal diagnosis of acute myocardial infarction and the age of 18 years old or more. On the other hand, exclusion criteria were usage of lipid-lowering, diabetic and antihypertensive treatments. Therefore, the patients on lipid-lowering, diabetic and antihypertensive medications were ruled out from the survey.

Sample Size

Since processing the entire dataset is expensive and also not necessary, the number of case records in this dataset center in the mentioned period was assessed (N=5972) and then the statistical formula (n = [DEFF*Np(1-p)]/ [($d^2/Z^2_{1-\alpha/2}$*(N-1)+p*(1-p)], p=50%±8, d=8%, $DEFF$=1) was used to calculate the sample size with the confidence level of 95%. Based on the above formula, 147 case records were selected for data gathering by simple random sampling method. Thirty two case records were ruled out from the project during the research period according to the exclusion criteria and therefore 115 records were analyzed.

Study Protocol

The sampling strategy was performed by assigning a number to each case and a table of random numbers to identify which records were to be selected. All case records were extracted by a relevant expert, leading to the reduction in personal errors. The full medical record of each subject case was searched and the required data were recorded by a trained medical student to a two part checklist, part one was designed for demographic characteristics including age of patients and year of admission and part two for special information including blood pressure at admission, HDL, LDL, TG and Cholesterol. All personal information were kept confidential and those records which we were not allowed to review or participate in the study, were excluded. As shown in table 1, the normal ranges for each of the components of lipid profile were determined based on the WHO criteria. In fact, the values in the range of desirable were considered normal, while the others (borderline and high risk) were defined as abnormal values. In addition, the status of blood pressure for each participant was assessed by table 2.

Depending on the published reports [7], fatal myocardial infarction can be definitively considered if death occurred within four weeks of the onset. Thus, we have contacted to the discharged individuals via phone numbers existed in the records to determine the fatal or non-fatal myocardial infarction. If we could not access each individuals after three tries, we would remove them from the continue of the investigation.

Statistical Methods

All statistical analyses were conducted using SPSS version 19 for Windows. Baseline characteristics are presented as frequencies for categorical variables and mean ± SD for continuous variables. The obtained data were statistically analyzed using T-test for quantitative data and Chi-square for qualitative data. For all comparisons, a two sided $\alpha = 0.05$ was considered statistically significant.

RESULTS

Characteristics of Study Population

Thirty two case records were ruled out from the project during the research period depending on exclusion criteria and thus 115 records were analyzed. Among this population, 30 of whom (26.1 %) were female and 85 of them (73.9 %) were male and mean age of them was 60.27±15.67, ranging from 28 to 97 years. The prevalences of abnormal values for HDL, LDL, TG and Cholesterol were 46.1%, 56.52%, 43.48% and 46.96% among investigated subjects, respectively. Eighty (69.6%) of the patients had abnormal values of blood pressure at admission and 21.74% of all myocardial infarctions were fatal. The complete examined parameters of participants are indicated in table 3.

Table 1. The normal ranges of study variables

Variables	Desirable	Borderline	High risk
Cholesterol	<200 mg/dl	200-239 mg/dl	>239 mg/dl
Triglycerides	<150 mg/dl	150-199 mg/dl	>199 mg/dl
HDL Cholesterol	46-60 mg/dl	35-45 mg/dl	<35 mg/dl
LDL Cholesterol	60-130 mg/dl	130-159 mg/dl	>159 mg/dl

Table 2. Blood pressure chart by age

Age	Systolic BP	Diastolic BP
3-12 years	105-120	69-80
13-19 years	107-120	73-81
20-24 years	108-132	75-83
25-29 years	109-133	76-84
30-34 years	110-134	77-85
34-39 years	111-135	78-86
40-45 years	112-137	79-87
45-49 years	115-139	80-88
Ages 50 +	116-142	81-89

Table 3. Complete demographic and specific characteristics of participants

Variables	Years							Total
	2008	2009	2010	2011	2012	2013	2014	
Age	61.27±18.56	66.77±13.18	54.62±16.74	61.15±13.43	58.41±14.33	61±17.62	62.33±13.78	
HDL								
Normal	10(66.67%)	7(53.85%)	13(61.9%)	7(35%)	8(47.06%)	11(55%)	6(66.67%)	62(53.9%)
Abnormal	5(33.33%)	6(46.15%)	8(38.1%)	13(65%)	9(52.94%)	9(45%)	3(33.33%)	53(46.1%)
LDL								
Normal	5(33.33%)	4(30.77%)	11(52.38%)	13(65%)	6(35.3%)	9(45%)	2(22.22%)	50(43.48%)
Abnormal	10(66.67%)	9(69.23%)	10(47.62%)	7(35%)	11(64.7%)	11(55%)	7(77.78%)	65(56.52%)
TG								
Normal	11(73.33%)	10(76.92%)	13(61.9%)	8(40%)	8(47.06%)	11(55%)	4(44.44%)	65(56.52%)
Abnormal	4(26.67%)	3(23.08%)	8(38.1%)	12(60%)	9(52.94%)	9(45%)	5(55.56%)	50(43.48%)
Cholesterol								
Normal	6(40%)	6(46.15%)	11(52.38%)	13(65%)	9(52.94%)	10(50%)	6(66.67%)	61(53.04%)
Abnormal	9(60%)	7(53.85%)	10(47.62%)	7(35%)	8(47.06%)	10(50%)	3(33.33%)	54(46.96%)
Blood pressure								
Normal	4(26.67%)	5(38.5%)	7(33.33%)	6(30%)	4(23.53%)	4(20%)	5(55.56%)	35(30.4%)
Abnormal	11(73.33%)	8(61.5%)	14(66.67%)	14(70%)	13(76.47%)	16(80%)	4(44.44%)	80(69.6%)
Final								
Fatal	2(13.33%)	2(15.38%)	6(28.57%)	5(25%)	6(35.3%)	2(10%)	2(22.22%)	25(21.74%)
Non-fatal	13(86.67%)	11(84.62%)	15(71.43%)	15(75%)	11(64.7%)	18(90%)	7(77.78%)	90(78.26%)

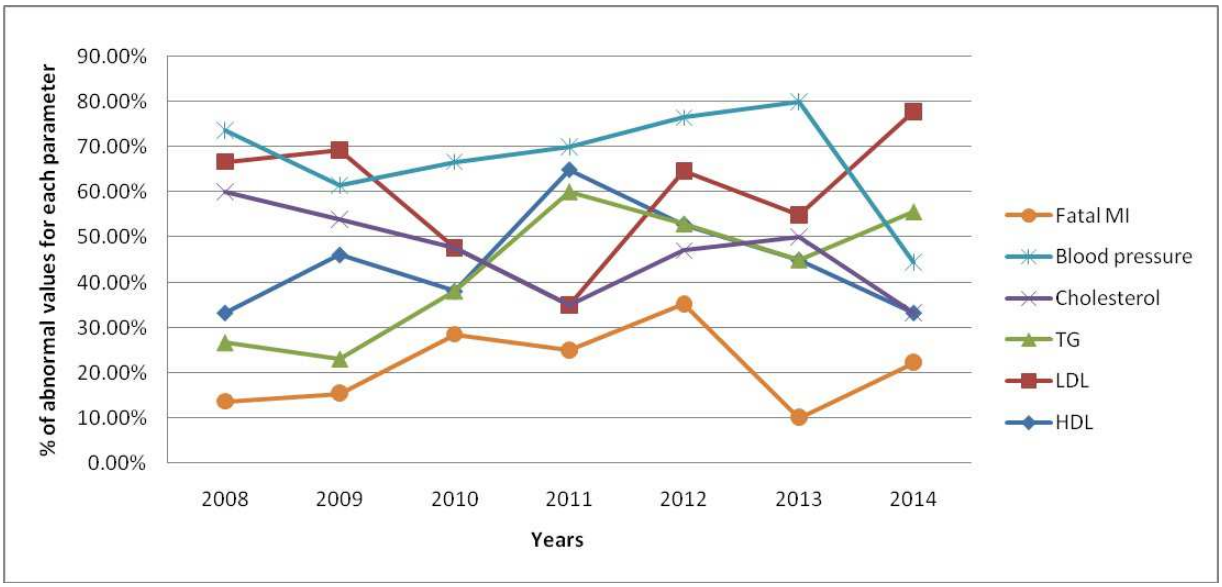

Figure 1. Trends in the abnormal levels of LDL cholesterol (LDL-c), HDL cholesterol (HDL-c), trigelyceride, cholesterol, blood pressure and also trends in the case fatality of MI are documented on a linear scale from each study year, 2008 to 2014.

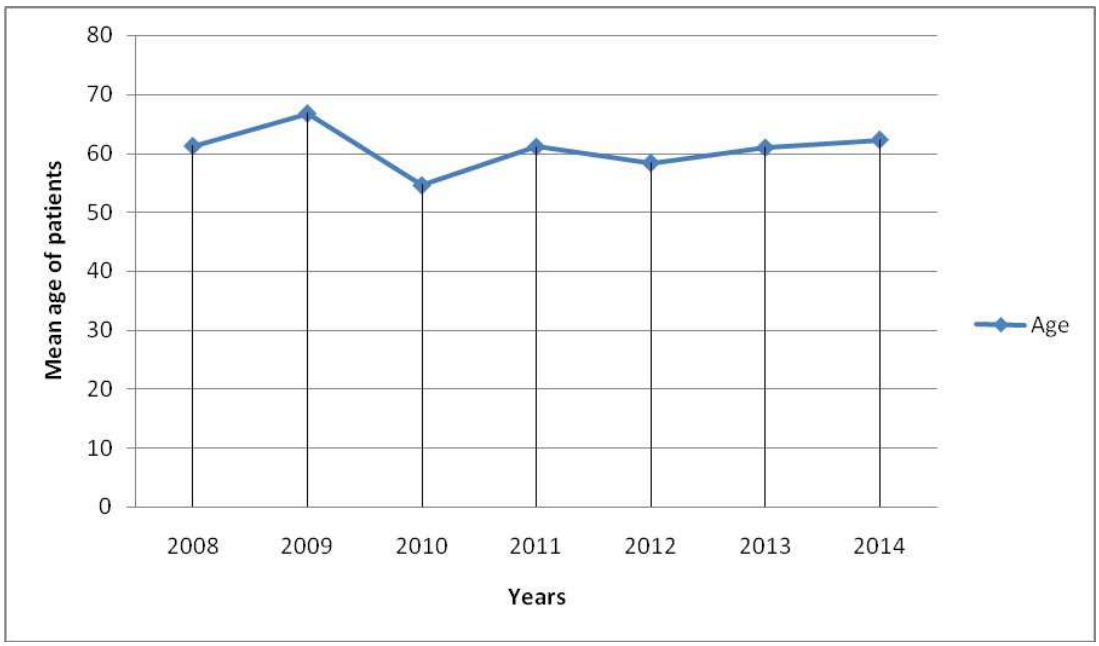

Figure 2. Trends in the mean age of MI incidence in each study year are illustrated on a linear scale.

Trends in the measured parameters

Figure 1 indicates the trends in the prevalences of abnormal levels of blood pressure, cholesterol, trigelyceride, LDL, HDL and fatal myocardial infarction from 2008 to 2014. As can be seen from the figure, similar additive trends in trigelyceride level and fatal MI were observed from 2008 to 2010 and based on the statistical analysis, there is significant association between the graphs of fatal MI and TG during 2008 to 2010 (P = 0.021). However, although the levels of TG increased in 2011, the values for fatality decreased, unexpectedly. On the other hand, statistically significant association was detected between the trends in fatality of MI and levels of LDL from years 2010 until 2014 (P = 0.043). In addition, there is another considerable relationship between graphs for LDL and

cholesterol during 2008 to 2013. Marked changes were also observed in HDL cholesterol levels, during the examined years, leading to relatively opposite trends in LDL and cholesterol. However, hypertension was independent from the others and no more correlations existed among the other graghs in figure 1. Unfortunately, no significant progress was observed in the situation of lipid profiles, case fatality and blood pressure in recent years.

Figure 2 also shows the age distribution of the entire study population in the same period of time. As expected, no clear trend or association with other trends were observed in the mean ages of hospitalized patients with MI in this project, since the major risk factors of MI (lipid profile and blood pressure) were not changed in the investigated years (figure 1).

Effects of gender on examined parameters

Further analysis demonstrated that there are no statistically significant relationship between sex of the patients and variables of present paper. However, the P values for blood pressure and type of myocardial infarction were close to the significant value (P = 0.05). In fact, fatality of acute myocardial infarction and hypertension are more obvious in females and males, respectively. Table 4 shows the differences between men and women in the evaluated parameters.

Table 4. Influences of gender on measured parameters

Variables	Gender		P value
	Male	Female	
Age	58.96±15.74	63.97±15.11	0.133
HDL			
Normal	46(40%)	16(13.91%)	0.554
Abnormal	39(33.91%)	14(12.18%)	
LDL			
Normal	35(30.44%)	15(13.04%)	0.266
Abnormal	50(43.48%)	15(13.04%)	
TG			
Normal	49(42.61%)	16(13.91%)	0.421
Abnormal	36(31.3%)	14(12.18%)	
Cholesterol			
Normal	45(39.13%)	16(13.91%)	0.570
Abnormal	40(34.78%)	14(12.18%)	
Blood pressure			
Normal	22(19.13%)	13(11.31%)	0.062
Abnormal	63(54.78%)	17(14.78%)	
Final			
Fatal	15(13.04%)	10(8.70%)	0.065
Non-fatal	70(60.87%)	20(17.39%)	

DISCUSSION

To our knowledge, this is the first local research documenting the trends in the mean age, lipid profile and mortality of patients with MI. This investigation describes the changes in the serum lipid profile and mean age among patients with myocardial infarction during the last six years in the South of Iran. Findings of current study revealed that the prevalences of abnormal values for HDL, LDL, TG, Cholesterol and blood pressure were 46.1%, 56.52%, 43.48%, 46.96% and 69.6% among investigated population, respectively. The values are noticeably higher than similar studies among healthy individuals in Iran. This differences document the role of dyslipidemia and hypertension in incidence of cardiovascular disease [15, 16]. Therefore, despite of recent improves in preventing strategies implemented by health centers, the incorrect lifestyles and inappropriate dietary habits are responsible for high incidence of coronary heart disease in Iran [17]. This conclusion is agree with lots of experiments performed in the other developing countries [18].

Data analysis suggests that fatality of MI is related with LDL and TG levels which is in accordance with the literature [19, 20]. As shown in figure 1, the prevalence of fatal MI and TG altered with a relatively similar slope till 2010, whereas fatality graph followed the trends in LDL cholesterol from 2011 to 2014. On the other hand, although the levels of TG increased in 2011, the values for fatality decreased, which is mainly due to the positive impacts of HDL peak. In fact, based on the previous published reports, hypertriglyceridemia and low-density lipoprotein

remnants are related with atherosclerosis, since they can penetrate the arterial intima and be trapped within the arterial wall [21]. After required surgeries and medical cares, high levels of mentioned factors may refill the arteries and make a complex condition, while obstruction of coronary arteries with other causes can be treated easier only by depletion of that factor. For this reason, high mortality of MI in patients with elevated values of TG and LDL is justifiable [20]. In addition, cardioprotective effects of HDL particles, including its influences on endothelial cells and its role in reverse cholesterol transport are the main causes of reduction in fatality of MI patients and the levels of LDL and total cholesterol in 2010 [22]. For these reasons, high mortality of MI in patients with elevated values of TG and LDL and protective effects of HDL seen in present project is justifiable.

Depending on recent researches, hypertension is mainly linked with dyslipidemia, several life associated and dietary factors. In this regard, Farlina et al conducted an experiment to determine association between blood pressure with lipid profile in obese adolescents in the city of Padang [23]. Choudhury et al carried out another similar study in Bangladesh that indicated a close correlation between dyslipidemia and blood pressure [24]. In contrast with these two recent observations, alters in admission blood pressure were independent from the other investigated variables. The findings of our trial, are coincident with Nguyen et al which mean that differences among similar studies are due to their populations [25]. In fact, the balance of dyslipidemia and other related factors in each society, can determine this correlation. For example, psychological or dietary factors including high salt consumption, in many communities are the major causes of hypertension and further cardiovascular disease [26, 27]. In this regard, there are several researches that approved the high levels of psychiatry pressures and wrong dietary habits in Iranian populations [28-30]. Therefore, these concepts, can explain the lack of association between lipid abnormalities and blood pressure in present paper.

Similar to the graph of blood pressure, no clear trend or association with other trends were observed in the mean ages of participants. As shown in figure 2, there is a constant trend in mean age of incidence of myocardial infarction in Bandar Abbas in recent years. It was expected, since the trends in lipid profile and blood pressure (as the major risk factors of MI) had also the similar constant situation without any improvements in recent years [31]. However, this trend is majorly additive in developed countries. In fact, this linear scale, reflects the rate of success in preventing techniques implemented by governmental organizations and the degree of people's perception in relation with myocardial infarction and it's common risk factors [32].

In general, mean age of female subjects were higher than males, though it was not statistically considerable. The difference between genders was identidied by previous studies and it is agree with literature [33]. However, this was not significant in this project mainly due to small size of our study population. According to table 2, no tangible differences were described by considering gender in any of evaluated parameters. Indeed, sex had no influence on blood pressure and lipid profile. This was consistent with a study performed by Akhtar et al. in Pakistan, which analyzed the relationship between obesity, blood pressure and lipid parameters in 200 individuals [34]. In this issue, Juliaty et al. also revealed that association between sex and blood pressure showed no significant difference [35].

It should be considered that the findings of this survey should be reported with caution, since present study was limited in various ways. First, the sample size of present work was relatively small due to the size of study population. Second, it was better to assess the effects of gender on lipid profile of patients after age-adjustment. Third, although no clear trend or association with other trends were observed in the mean ages of hospitalized patients with MI in these years, it was better to compute the trends in the components of lipid profile and blood pressure according to the age groups of subjects (age-specific trends). Therefore, these limitations are suggested to be considered in future studies. Consequently, we can conclude that the managements and prevention strategies used to manage lipid profile, fatality and incidence of MI in patients, were not successful in recent years and this trend was not associated with gender of participants.

Acknowledgements
The authors would like to thank the Student Research Committee of Hormozgan University of Medical Sciences for their help and support.

Conflicts of interest
The authors report no conflicts of interest.

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