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Comparison of Patients with Acute Myocardial Infarction According to Age

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ABSTRACT

Introduction: By development of the medicine, control of the risk factors for acute myocardial infarction (AMI), became the foundation of cardiology. **Aim:** To investigate the association of the age with presence of risk factors in patients with acute myocardial infarction. **Methods:** The study had a prospective, comparative and descriptive character, and it was done on a sample of 80 patients (n=80; 55 male and 25 female) Clinic for Heart, Blood Vessel and Rheumatic Diseases, Clinical Center University of Sarajevo from January 2016 to August 2018. All patients were hospitalized under the diagnosis of myocardial infarction and were divided into two main groups, which were divided into two subgroups according to age. Group A, group of patients under 45 years of age at the moment of diagnosis of AMI (n = 40; men = 29; women = 11) was divided into group A1 (n = 20; patients aged 25-35 years) and group A2 (n = 20; patients aged between 35-45 years). Group B, patients older than 45 years at the time of diagnosis of AMI (n = 40; men = 26, women = 14) was divided into group B1 (n = 20; patients aged between 45-55 years) and group B2 (n = 20; patients aged 55-65 years of age). **Results:** According to gender distribution, there is a significantly higher incidence of hypertension in male patients aged 25-35 years and between 35-45 years (p = 0.01; p = 0.01). Increased cholesterol values were significantly more common in men aged 25-35 years (p = 0.0121). Increased triglyceride values were significantly more common in men aged 25-35 years, in comparison to female respondents of the same age (86.67% vs. 13.33%, p = 0.0001). There was a significant significance between the two groups in the occurrence of anteroseptal (p = 0.04) and in the diaphragmatic myocardial infarction (p = 0.01), while in other infarction localities no significant significance was observed. **Conclusion:** Male sex is a predisposing risk factor for the development of a cardiovascular incident in the younger age. The post infarction ejection fraction of the left ventricle was significantly reduced in younger patients. The potential for prevention should be of paramount importance. The localization of the incident itself, and the involvement of a certain blood, represents, regardless of all the research, still a fact that is hard to stratify and directly correlated with a certain risk factor.

Keywords: Myocardial Infarction, Risk Factors, Prevention.

1. INTRODUCTION

By development of the medicine, control of the risk factors for acute myocardial infarction (AMI), became the foundation of cardiology. Some of the risk factors of coronary heart disease are uncontrollable (like senility, male gender and positive family anamnesis) (1). Many of them can be modified (hypertension, hyperlipidemia, diabetes mellitus (DM) and smoking) (1). Risk factors were first identified in Framingham Heart Study (2, 3). Risk factors are positively correlated with the onset of atherosclerosis, its further development and its later consequences (2). The assessment of an individual patient's risk factor determines the likelihood that a cardiovascular event will occur in a particular time period (2). By identification of risk factors there can be an opportunity for better planning of preventive action for the purpose of reducing cardiovascular diseases as well as acute myocardial infarction and potential lethal outcome can be prevented. The new cardiovascular risks include highly sensitive C reactive protein, fibrinogen, homocysteine, lipoprotein (Lp) (a), low density lipoprotein (LDL), lipoprotein phospholipase A2, obstructive sleep apnea, and heredity for high Lp a (familial hypercholesterolemia, familial hyperlipidemia and familial deficit of high density lipoprotein (HDL)) (4-6). AMI among young is relatively uncommon (4). Over 90% of young people who experience IM are male. Female sex (ischemic heart disease develops on average 7–10 years lat-

er in women compared with men) is protected at this time by the positive effect of hormones (estrogens), but due to the high prevalence of smoking in young women, this protection has lost its effect, so an increasing number of young women with IM can also be expected. (4) Acute coronary syndrome (ACS) occurs three to four times more often in men than in women below the age of 60 years, but after the age of 75, women represent the majority of patients (1, 2). Gender differences are not limited just to the effects of estrogens, but are also a consequence of the genetic basis (two genes that are more common in men (connexin 37 and p22 phox), and two in females (plasminogen activator 1 inhibitor and stromelysin-1 inhibitor). Hypertension in women is 2-3 times higher risk for unwanted coronary events compared to males. Women with diabetes mellitus have a 2.6 times higher risk of dying from coronary disease than diabetic women compared to men who have this risk 1.8 times Women who smoke have six to nine times more risk of acute myocardial infarction than women do not smoke. Early recognition of risk factors and stratification of patients should be the basis for the work of each clinician.

2. AIM

To investigate the association of the age with presence of risk factors in patients with acute myocardial infarction.

3. METHODS

The study had a prospective, comparative and descriptive character, and it was done on a sample of 80 patients (n=80; 55 male and 25 female) Clinic for Heart, Blood Vessel and Rheumatic Diseases, Clinical Center University of Sarajevo from January 2016 to August 2018. All patients were hospitalized under the diagnosis of AMI, which was confirmed by electrocardiogram (ECG), echocardiography, and a positive finding of cardiac enzymes. Patients were divided into two main groups, which were divided into two subgroups according to age:

Group A group of patients under 45 years of age at the moment of diagnosis of IM (n = 40, men = 29; women = 11): 1) Group A1 (n = 20) - patients aged 25-35 years; 2) Group A2 (n = 20) - patients aged between 35-45 years

Group B - patients older than 45 years at the time of diagnosis of IM (n = 40, men = 26, women = 14): 3) Group B1 (n = 20) - patients aged between 35-45 years: 4) Group B2 (n = 20) - patients aged 45-55 years of age,

The inclusion criteria were the first hospitalization under the diagnosis of myocardial infarction, confirmation of AMI diagnosis by objective findings (ECG, positive heart biomarkers, echocardiography, and coronarography). Exclusion criteria were: patients with recurrent AMI or some other vascular incident, patients with congenital heart disease, cardiomyopathy, arteritis, Prinzmetal's angina, and patients with a diagnosis of neoplasm, neurological problems or mental illness.

Student t test and chi-square test with Yates correction due to the counts of the individual cells less than five were used for statistical analysis. Statistical level of 95% ($p<0.05$) was taken as significant.

	Group A	Group B	p	Total
Cholesterol				
Normal range	13 (32.5%)	9 (22.5%)	0.3196	22 (27.5%)
High	27 (67.5%)	31 (77.5%)		58 (72.5%)
Hypertension				
Yes	27 (67.5%)	30 (75%)	0.4615	57 (71.3%)
No	13 (32.5%)	10 (25%)		23 (28.7%)
Diabetes Mellitus				
Yes	7 (17.5%)	21 (52.5%)	0.0011	28 (35%)
No	33 (82.5%)	19 (47.5%)		52 (65%)
Triglycerides				
Normal range	12 (30%)	17 (42.5%)	0.2479	29 (36.3%)
High	28 (70%)	23 (57.5%)		51 (63.7%)
LDL				
Normal range	13 (32.5%)	15 (37.5%)	0.6413	28 (35%)
High	27 (67.5%)	25 (62.5%)		52 (65%)
Family history				
Yes	25 (62.5%)	27 (67.5%)	0.6413	52 (65%)
No	15 (37.5%)	13 (22.5%)		28 (35%)
Smoking				
Yes	31 (77.5%)	24 (60%)	0.0934	55 (68.8%)
No	9 (22.5%)	16 (40%)		25 (31.3%)
Obesity				
Yes	13 (32.5%)	23 (57.5%)	0.0255	36 (45%)
No	27 (67.5%)	17 (42.5%)		44 (55%)

Table 1. Risk factors according to age of patients

			Gender		
			Male	Female	
Age	N (%)	Age subgroup			p
Group A (<45 years)	27 (67.5%)	A1	15 (55.6%)	11 (73.3%)	4 (26.7%)	0.0121
		A2	12 (44.4%)	9 (75%)	3 (25%)	0.0165
		p	0.4149	0.9217		
Group B (>45 years)	30 (75%)	B1	14 (46.7%)	9 (64.28%)	5 (35.72%)	0.1378
		B2	16 (53.3%)	10 (62.5%)	6 (37.5%)	0.1782
p	0.4615	p	0.6122	0.9210		

Table 2. Hypertension as risk factor according to age and gender

4. RESULTS

A significant difference was not found in the analysis of gender distribution in the main groups ($p = 0.879$). By analyzing the presence of risk factors, there was no significant difference in the presence of high cholesterol ($p = 0.3196$), hypertension ($p = 0.4615$), high triglyceride levels ($p = 0.2479$) and high LDL cholesterol ($p= 0.6413$), as well as in a positive family history ($p = 0.6413$) (Table 1). Consumption of cigarettes was more common in the population <45 years, but without significant difference ($p = 0.0934$). The incidence of Diabetes Mellitus is higher

	Normal range	Reduced ejection fraction	p
Group A (n=40, <45 years)	19 (47.5%)	21 (52.5%)	0.656
Group B (n=40, >45 years)	15 (37.5%)	25 (62.5%)	0.026
p	0.3687		

Table 3. Post infarction ejection fraction of left ventricle in relation to the age of patients

in older patients (> 45 years) with a significant difference (p = 0.0011), as well as obesity (p = 0.0255) (Table 1). Hypertension as a risk factor was present in 27 (67.5%) subjects in group A and in 30 (75%) subjects in group B, but without significant statistical difference (p = 0.4615). By analyzing the presence of hypertension in subgroups, it was found that there was no significant difference between groups. Based on gender distribution, there is a significantly higher incidence of hypertension in males in subgroup A1 and A2 (p = 0.01; p = 0.01) (Table 2).

Diabetes mellitus (DM) as a chronic disease was more frequent in group B (52.5% vs 17.5%; p = 0. 0011). By analyzing the frequency of DM between subgroups, no significant difference was found. In the group of subjects who were between 55 and 65 years old, a significantly higher incidence of DM in male respondents was found (80% versus 20% -p = 0.0089). Increased cholesterol values were significantly more common in men aged 25-35 years, in relation to female respondents of the same age; 11 (73.3%) versus 4 (26.7%), p = 0.0121. Comparing the incidence of elevated triglyceride values between the two groups, a significant difference was noted (p = 0.2479). By analyzing the relations between subgroups A1 and A2 and B1 and B2, there were also no significant differences (p> 0.05). Increased triglyceride values were significantly more common in men aged 25-35 years, in comparison to female respondents of the same age (86.67% vs. 13.33%, p = 0.0001). Increased LDL cholesterol values were significantly more common in men aged 25-35 years, compared to female respondents of the same age (84.6% versus 15.4%), p = 0.0005. Also, elevated values were significantly more common in male respondents aged 45 to 55, than female respondents of the same age (71.4% vs 28.6%, p = 0.0262). Comparing the presence of a positive family history between the two main groups, there was no significant difference (p = 0.6413). Positive family history is more common in male respondents in groups 25-35 and 35-45 years compared to female respondents (73.3% vs. 26.7; p = 0.0327; 75% vs. 25%; p = 0.0094). Based on sex distribution, cigarette consumption was found to be more frequent among male respondents in all subgroups, ranging from 68.75% to 81.81% (p <0.005). Comparing the incidence of obesity in the sample between the two groups, a significantly higher incidence in the population over 45 years was observed - 13 (32.5%) versus 23 (57.5%); p = 0.0255. In patients who were younger than 45 years, the anteroseptal myocardial infarction was present in 50% of patients, followed by diaphragmatic in 22.5%, posterior in 20%, while the lowest incidence was lateral myocardial infarction in 7.5% of subjects. The most frequent localization of the infarction in the group of patients that are older than 45 years, was diaphragmatic infarction in 47.5%, then anteroseptal in 27.5%, lateral in 15%, and the lowest incidence of posterior infarction in 10% of subjects. There was a significant significance between the two groups in the occurrence of anteroseptal myocardial infarction (p = 0.04) and in the diaphragmatic myocardial infarction (p = 0.01), while in other infarction localities no significant significance was observed. In Group A, 52.5% of patients had reduced ejection fraction (p> 0.05). In the group B 62.5% of patients had reduced ejection fraction (p = 0.026) (Table 3).

5. DISCUSSION

When we talk about AMI in young people we are mainly thinking on males, but due to the increasing prevalence of cigarette consumption in the female population, the number of women who experience AMI in the younger age is progressively increasing (nicotine decreases the protective effect of estrogen on the blood vessels) (7). The lifestyle of young people, which includes high level of stress, business problems, small amount of breaks and relaxation, smoking, bad diet and alcohol consumption, lead to disorders of the organism as a whole, and thus to coronary artery disease (CAD) with its most severe manifestation - acute myocardial infarction (8). The importance of defining the present risk factors in patients experiencing AMI is reflected in the possibility of secondary prevention planning, which will be directly targeted at reducing the harmful effects of this risk factor and reducing the possibility of recurrence of cardiovascular events (5). This is confirmed by the WHO conducted MONICA research, which undoubtedly demonstrated that secondary prevention is a powerful weapon in the fight against AMI recidivism (9). It is a defeating fact from this study that secondary prevention is carried out in less than 50% of patients, even in highly developed countries, while this percentage is significantly lower in countries with less developed health systems (9). Since 1990, the MINOC (Myocardial Ischemia National Audit Project) documented a reduced mortality rate in the post infarction period in patients with adequate secondary prevention (10). Analysis of the sex and age distribution of patients who were enrolled in the study, showed that there is a higher number of male patients. Study conducted by Das and associates, had enrolled 183 patients under the age of 40 years with AMI diagnosis. There were 157 (85.5%) males and 26 (14.2%) females so the ratio of men and women was 6:1 (11). Weinberger and associates reported that in their study of 30 patients under the age of 30, there were 26 male patients and only 4 females (the ratio of men and women was 6.2 : 1) (12). From the above, it was concluded that the male sex is more exposed to AMI occurrence. As part of the research, an analysis of the prevalence of 8 risk factors for the occurrence of AMI (HTA, DM, total cholesterol level, triglycerides level, LDL, genetics, smoking and obesity) was performed, and an analysis was done in relation to the sex and age of the respondents. The analysis of the

results showed that there were differences in representation, dominance of risk factors in different age groups. Our results were consistent with the results of Wang et al. They found in 151 patients that smoking in patients under the age of 44 years was present in 82% of cases, and a positive family history was found in 54% of patients (8). In a study of 120 patients diagnosed with AMI younger than 35 years, Glover et al. had 89% of smokers, 48% had a positive history of cardiovascular disease, 21% with HTA and 20% with dyslipidemia (13). Hypertension was more common in older patients, elevated triglycerides and LDL slightly more common in younger patients, and a positive family history of early cardiovascular events as a risk factor with a slightly higher incidence of older patients. Hypertension is a high-prevalence disease whose incidence is increasing with age (14). High cholesterol level is a risk factor for coronary heart disease in middle-aged and young elderly patients (15, 16). Some observational studies have proved that low total cholesterol levels in elderly patients are increased with risk for coronary heart disease and with higher mortality (17). Current smokers had their first AMI more than 10 years earlier than non-smokers, and the younger smokers had a higher mortality rate. (18) Among young adults who consume cigarettes, there is a need for improved screening for risk factors. Earlier detection and treatment of dyslipidemia and hypertension could prevent acute cardiac events among subjects aged <40 years with multiple risk factors (19). In the group of older respondents (Group B), 62.5% had a reduced left ventricular ejection fraction (EFLV), and 37.5% of patients had normal EFLV. There was a significant difference within this group ($p = 0.026$). By analyzing the findings of the ECG and coronarography, data on the localization of AMI were found in each patient individually. Their analysis showed relationship between age and percentage of AMI occurrence in a particular location. These results correspond to result of Rumboldt et al. who confirmed that diaphragmatic location is nearly two times more frequent in younger patients, and the hospital mortality rate of these patients is almost four times lower than that of older patients (20). Acute coronary syndrome in people younger than 40 years is associated with diabetes and risk factors existence (21, 22). Patients with cardiovascular diseases have low serum testosterone (23). Also, protective role of androgens for cardiovascular system was also reported (24-26). It is important to note the role of nurses and pharmacists. Their main task is to educate patients and the general population about the importance of regular drug taking and adherence to life-changing habits. They can also contribute to tracking the healing by proper blood pressure measurements and co-operation with doctors. Prevention of cardiovascular incidents should be the foundation of work of medical doctors in primary health care (27). Assessment of risk should not be done only on laboratory parameters values and require multidisciplinary approach. Castelli Risk index I and II, Atherogenic Index of Plasma, atherogenic coefficient and CHOLIndex should be a part of practice in each laboratory.

6. CONCLUSION

An analysis of risk factors indicates that male gender, higher level of triglycerides, higher LDL level in age < 45 are risk factors for acute myocardial infarction. The post infarction ejection fraction of the left ventricle was significantly reduced in younger patients. The potential for prevention should be of paramount importance. The localization of the incident itself, and the involvement of a certain blood, represents, regardless of all the research, still a fact that is hard to stratify and directly correlated with a certain risk factor.

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