Assessing the Risk Factors of Patients with Non-ST-Segment Elevation Myocardial Infarction

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Cardiovascular risk management decisions are based on the full profile of cardiovascular risk factors.It is important not only the number of cardiovascular risk factors accumulated by a patient but the magnitude of each factor, both being proportional to cardiovascular risk.

Keywords: acute coronary syndromes, non-ST-segment elevation myocardial infarction, risk factors.

The prevalence of cardiovascular disease is decreasing in developed countries, but increasing in developing countries due to increased longevity, urbanization and lifestyle changes.

Cardiovascular diseases are responsible for approximately 30% of worldwide deaths each year. 80% of these occur in low or middle income areas, which encapsulate for about 85% of the world's population [1-2].

Acute coronary syndromes along with stable angina are the major clinical manifestation of ischemic heart disease. Unstable angina and non-ST-segment elevation myocardial infarction are included in acute coronary syndrome without ST segment elevation, non-ST-segment elevation myocardial infarction being differentiated from unstable angina by the presence of cardiomyocyte necrosis as evidenced by increased serum levels of cardiac biomarkers.

Data from national registries show that the annual incidence of hospitalizations for acute coronary syndromes without ST segment elevation st is 3/1000 inhabitants. The incidence of the disease varies widely across European countries, with the highest rates of incidence and mortality being recorded in Central and Eastern Europe [3].

Although the in-hospital mortality of patients with ST-segment elevation infarction is higher than those with non-ST segment elevation infarction (7% vs. 5%), long-term it becomes similar (12% vs. 13%) [4-5].This is due to the patients profile with acute coronary syndromes without ST segment elevation who are older, have a higher prevalence of cardiovascular risk factors and comorbidities, or frequently history of myocardial infarction or myocardial revascularization compared to patients with ST segment elevation infarction [6].

Experimental part

The aim of the study

The study was aimed to determine the prevalence of non-ST-segment elevation myocardial infarction and to correlate with the presence of risk factors, depending on age.

In our study we included patients admitted to the County Hospital of Craiova, Cardiology Department, between January 2018 and January 2019.

The patients have fulfilled the criteria and wanted to participate in our study after obtaining informed consent.

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	FEMALE		MALE		Total	
Age	N	%	N	%	N	%
40-49	2	1.49%	9	5.26%	11	3.60%
50-59	14	10.45%	30	17.54%	44	14.40%
60-69	22	16.42%	58	33.92%	80	26.20%
70-79	60	44.78%	41	23.98%	101	33.10%
>79	36	26.87%	33	19.30%	69	22.60%
Total	134		171		305	

Table 1
DISTRIBUTION BY AGE GROUP

The inclusion criteria were:

-Patients with history compatible with myocardial infarction

-Positive cardiac markers (Trop T/Trop I,CK-MB)

The exclusion criteria were patients with stable and unstable angina.

Results and discussion

Our study included 305 patients with NSTEMI whose mean age was 70.62 ± 11.05 years CI 95% (69.28 - 71.77) confirming the presence of non-ST-segment elevation myocardial infarction at older age [7-11] being more than 5 years old for women (73.36 ± 10.05 years) than for males (68.3 ± 11.32 years).

Asubstudy of INTERHEART showed that women make the first acute myocardial infarction 9 years later than men.[12] The risk factors associated with the risk of similar acute myocardial infarction between men and women are dyslipidemia, current smoking, obesity, diet and psychosocial factors[13-15]. The younger age of acute myocardial infarction in men was explained by higher levels of plasma lipids and smoking before age 60, especially as smoking is more common in males all over the world [16-17].

The number of men with NSTEMI was higher (N = 171; 56.10%) than women (N = 134; 43.90%). This result is confirmed from literature data, in the middle-aged population the risk of ischemic heart disease is 2-5 times higher in males than in women [18,19].

A total of 171 men (56.1%) and 134 women (43.9%) were included in our study, the gender ratio being (M / W) of 1.28, the slight predominance of males being due to the higher frequency of non-ST-segment elevation infarction among them. The lot was balanced in terms of urban areas 52.13% (N=159) and in rural areas 47.87 % (N=146).

Distribution by age group revealed a higher frequency in the seventh decade of the patients (N = 101, 33.1%). Over 83% of the population affected by coronary artery disease is over 65 years of age. In both sexes, the risk of ischemic coronary artery disease increases with age, one explanation lies in the fact that most cardiovascular risk factors have a higher prevalence in the elderly [20-24] (table 1).

Non-ST-segment elevation myocardial infarction was 3.5 times more common in men aged 40-49 years (N = 29; 5.26%) than women of the same age (N = 2; 1.49%) and nearly 2 times higher in subjects aged 50-59 years (N = 30; 17.54% vs. N = 14; 10.45%). The risk of NSTEMI was double in men aged less than 65 years compared to women (RR = 2.33, 95% CI 1.52 to 3.57, p <0.001).

Smoking is a major risk factor for the myocardial infarction, including passive smoking being likely to increase cardiovascular risk. [25-29] Cardiovascular risk is even higher as the beginning of smoking occurs before the age of 15 [30].

A quarter of the subjects of the group (N = 80) were exposed to the effects of smoking, with the prevalence of smoking being 26.23%. Of these, 39 (12.8%) of patients were smokers and 41 (13.4%) were former smokers.

The prevalence of smoking was strongly influenced by age. The patients with40-49 years old 72.73% (N = 8) were exposed to active smoking, half of them 36.36% (N = 4) were smokers at the time of study. Almost 70% (N = 31) of patients in the 50-59 age group were exposed to smoking, of whom 40.91% (N = 18) were smokers and 29.55% (N = 13) were former smokers. In contrast to the younger patients, in the elderly patients with non-ST-segment elevation myocardial infarction the prevalence was much lower, 15% (N = 12) at 60-69 years old, 1.98% (N = 2) in those aged 70-79 years 4.35% (N = 3). The risk for smokers under the age of 65 was 4 times higher than those over 65 years of age (RR = 4.36; 95% CI = 2.53-7.50; P <0.0001).

The age-stratified risk reveals the impact of smoking in young patients with non-ST-segment elevation myocardial infarction, this risk is the highest in those patients of 40-49 years old (RR = 7.04; 95% CI = 4.08-12.15; P <0 , 0001) and those aged 50-59 years RR = 6.31; 95% CI = 3.96 to 10.03; P <0.0001). It was less or insignificant in those patients over this age group, and probably other risk factors such as biological and cardiovascular degeneration age-specific, as well as the cumulative effect of comorbidities may influence the risk (fig. 1).

Obesity is a major cardiovascular risk factor with prevalence in developed countries, especially due to environmental and social factors, diet and sedentary [31-34]. Obesity is also common in low socioeconomic populations associating and psychosocial risk factors [35].

Nearly half of patients with non-ST-segment elevation myocardial infarction had also obesity (N = 138), women (N = 69; 51.49%) being more frequently affected by obesity

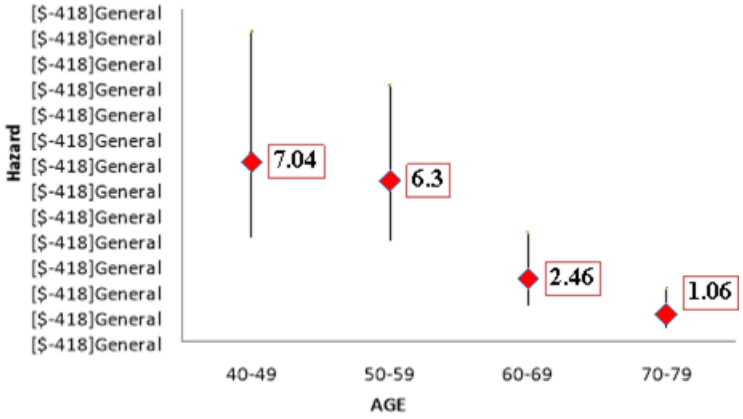
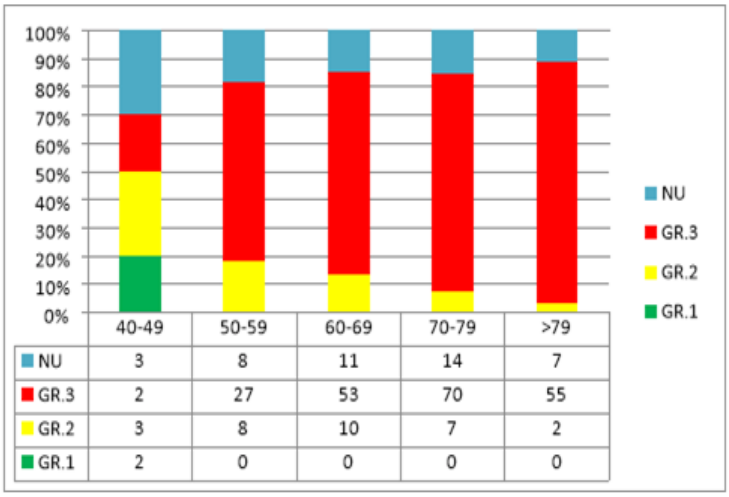


Fig. 1 . The age-stratified risk in patients with non-ST-segment elevation myocardial infarction



	40-49	50-59	60-69	70-79	>79
NU	3	8	11	14	7
GR.3	2	27	53	70	55
GR.2	3	8	10	7	2
GR.1	2	0	0	0	0

Fig. 2. Percentage distribution of cases by degree of hypertension

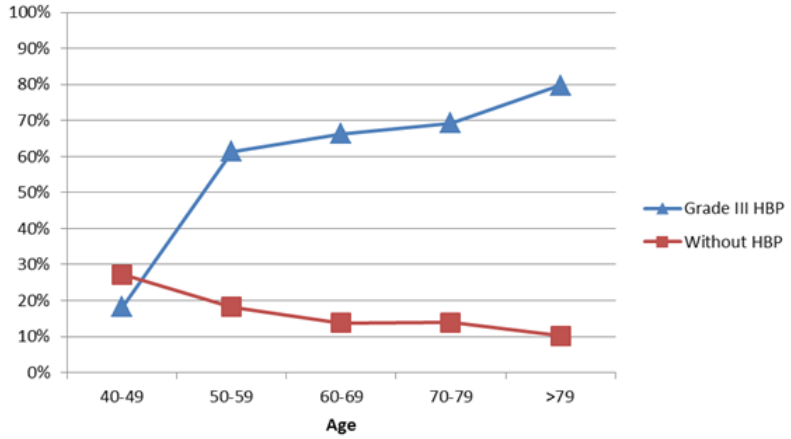


Fig. 3.

than men (N = 69; 40.35%), the risk being higher at the first category (RR = 1.28; 95% CI = 1.02-1.63; P = 0.0491).

Hypertension is one of the most important causes of cardiovascular death, contributing to about half of global cardiovascular mortality [36.]In the INTERHEART study, hypertension contributed to cardiovascular risk by 18% of the assignment population risk [12].

High blood pressure (HBP) is the most characteristic feature of non-ST-segment elevation myocardial infarction patients, 262 patients being hypertensive (85.9%), both sexes being similarly affected by 83.0% of men and 89.6% of women.

Age plays an important role as a modulator of the increase in hypertension prevalence. In patients aged 40-49 years, 72.73% were affected by hypertension, as compared to those over the age of 50 years whose high blood pressure prevalence increased to over 80%, and those over the age of 75 years had high blood pressure prevalence to nearly 90 %. Moreover, with age worsening high blood pressure occurs with the transition to higher degrees of hypertension (fig. 2, 3).

An analysis of the Copenhagen Heart Study, showed that diabetics have a high risk of acute myocardial infarction 2-3 times higher, independent of other cardiovascular risk factors [37] it is proven that the overall mortality of diabetes is comparable to those with a history of acute myocardial infarction, so that the NCEP ratio from 2002 included diabetes as the equivalent of high-risk ischemic heart disease[38-44].

The prevalence of diabetes in patients with non-ST-segment-elevationmyocardial infarction was 34.1% (N = 105), being similar in both sexes 35.07% (47/134) in women and 33.92% (58/171), with no significant differences (p = 0.3) with the exception of a lower prevalence in the 40-49 age group, at which diabetes was identified at 27.27% compared to the 50-59 age group (40.91%).

There was a higher prevalence of diabetes in non-ST-segment elevation myocardial infarction patients with high blood pressure, 37.8% (99/262) than those with NSTEMI without high blood pressure - diabetes prevalence was 14% (6/37). The risk of diabetes in hypertension cases is nearly 3 times higher than in cases without hypertension (RR = 2.71; 95% CI = 1.27-5.78; P = 0.01).

Epidemiological studies (Framingham study, Multiple Risk Factor Intervention Trial (MRFIT) , Atherosclerosis Risk in Communities (ARIC)) revealed a direct relationship between total cholesterol serum and cardiovascular morbidity and mortality [45]. Cardiovascular risk increases by 2-3% for every percentage increase in total cholesterol.

Dyslipidemia (N = 150) was associated with half of the patients with non-ST-segment elevation myocardial infarction, which was more common in females (53%) than in males (45.61). The younger patients were more frequently affected by dyslipidemia, the prevalence being higher (p = 0.01), confirming the tendency to decrease the prevalence of dyslipidemias in NSTEMI (r2 = 0.96). This highlights the effect of association of dyslipidemia in younger subjects probably related to its underdiagnosed and neglect (fig. 4).

The risk of dyslipidemia at younger age was 2.5 times higher than in the elderly (79 years), decreasing as the elderly progressed (table 2).

Stroke was identified in the medical history of 46 non-ST-segment elevation myocardial infarction cases, with its prevalence of 15.1%, higher in women (17.16) than in males (13.45%), difference without statistical significance (p = 0.54). The most affected age group was 60-69 years (N = 16; 20%), being more common (P <0.0001) in NSTEMI

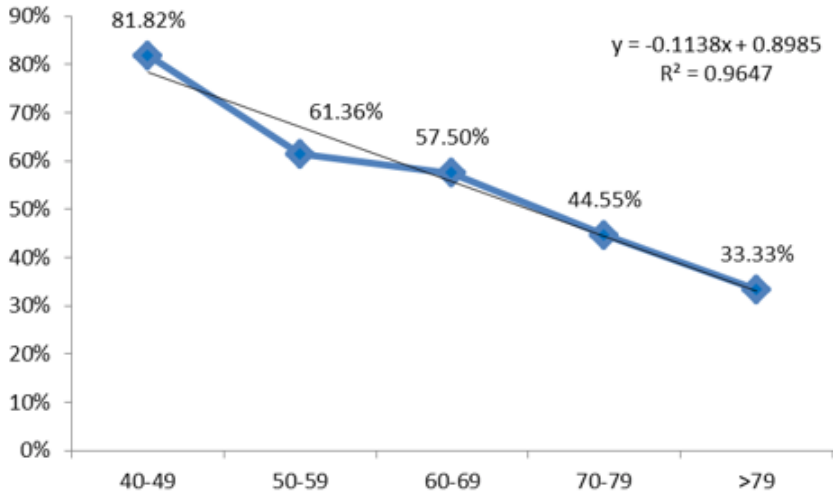


Fig. 4.

Table 2

RISK OF ASSOCIATION OF DYSLIPIDEMIA BY AGE GROUP.

	Risk	95%IC	P
40-49	2.45	1.59 to 3.79	P = 0.0001
50-59	1.84	1.22 to 2.77	P = 0.0034
60-69	1.72	1.18 to 2.53	P = 0.0053
70-79	1.37	0.89 to 1.99	P = 0.1534

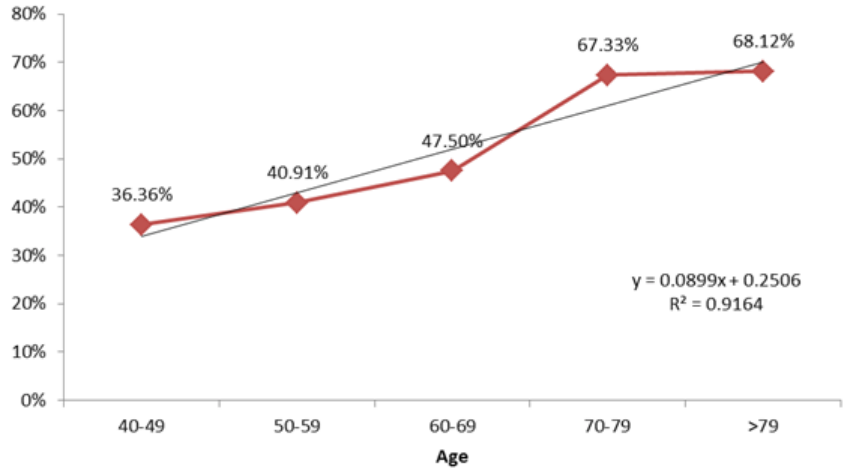


Fig. 5

Codes Y	**DA**	**NU**	**Total**		DA
40-49	4	7	11	**40-49**	36.36%
50-59	18	26	44	**50-59**	40.91%
60-69	38	42	80	**60-69**	47.50%
70-79	68	33	101	**70-79**	67.33%
>79	47	22	69	**>79**	68.12%
	176	129	305		
Chi-square	16.071				
DF	4				
Significance level	P = 0.0029				
Contingency coefficient	0.224				

Table 3

cases over 65 years of age (16.51%), comparative with those under 65 (11.49%).

More than half (57.7%) of the NSTEMI cases also associated the chronic heart failure, which was diagnosed in 176 cases. Chronic heart failure was more common in females (N = 86; 64.18%) than in males (N = 90; 52.63%), the risk of chronic heart failure association in NSTEMI women was 1.22 times higher than for men (RR = 1.22, 95% CI 1.01-1.475, P = 0.0411).

Chronic heart failure was more common in 70-79 year old (N = 33; 67.33%) and over 79 years (N = 22; 68.12%), age-increasing being an important factor in increasing chronic heart failure prevalence (r2 = 0.92). In NSTEMI patients over 65 years old (63.3%), the risk of chronic heart faiulure association was nearly 1.5 times higher (RR = 1.449; 95% CI 1.12-1 , 88; P = 0.005) than in cases under 65 years old (43.38%) (fig. 5).

Over 60% (N = 179) of non-ST-segment elevation myocardial infarction cases presented left ventricular ejection fraction with values below 50%. Men showed values below 50% more frequent (N = 105, 67.31%) than women (N = 74; 59.68%) and left ventricular ejection fraction deterioration was more pronounced in the elderly (73.03 % in the age group 70-79 years) compared to younger age groups (where left ventricular ejection fraction was found less than 50% in the 40-49 age group - N = 5;

Table 4

Codes X	LVEF-CLS	
<50	179	63,90%
>50	101	36,10%
Total	280	100.0%
Chi-square	21.175	
DF	1	
Significance level	P < 0.0001	

Codes X	LVEF-CLS				
Codes Y	SEX				
	Codes X				
Codes Y	<50	>50	Total	<50	>50
F	74	50	124	59.68%	46.91%
M	105	51	156	67.31%	31.66%
	179	101	280		
	-63.90%	-36.10%			
Chi-square	1.429				
DF	1				
Significance level	P = 0.2319				
Contingency coefficient	0.071				

Table 4

45.45%). Age over 65 increased by 1.3 times more the risk ofleft ventricular ejection fraction deterioration to below 50% (RR = 1.29, 95% CI = 1.03-1.61, P = 0.0281) (table 4).

Hospitalization days

Non-ST-segment elevation myocardial infarction cases required an average of 8.16 ± 4.39 hospitalization days (95% CI = 7.66 - 8.65). More than half of the NSTEMI were hospitalized for less than one week (N = 164, 54.5%) and only 23 cases (7.6%) required hospitalizations longer than two weeks.

Age has correlated with the number of days of hospitalization (Pearson correlation coefficient r = 0.22; 95% CI r = 0.11-0.32; P = 0.0002). Patients aged 40-49 had the shortest period of hospitalization at 6.91 ± 3.91 days, compared to elderly patients with median hospitalization days of 8.55 ± 4.57 in those aged 70 -79 years and over 9 days in those over 79 years (9.35 ± 4.3 days).

The high prevalence of high blood pressure in the general population and in specially in our study group (86.1%) makes it statistically difficult to correctly identify the role of high blood pressure inmodulation of the hospitalization period (p = 0.54). In high blood pressure cases the mean of hospitalization days was 8.22 ± 4.24 and in those without HBP was 7.76 ± 5.29 days. The impact on hospitalization is better validated by the calculation of mean of hospitalization days depending on the degree of HBP that was under 7 days for hypertension grade 1 and 2 and 8.35 ± 4.22 days for hypertension grade 3 (p <0.01). The association of chronic heart failure with non-ST-segment elevation myocardial infarction (p = 0.01) increases the number of hospitalization days to 8.713 ± 4,7 days compared to non-chronic heart failure patients (7.4 ± 3.82 days). The left ventricle ejection fraction deterioration less than 50% has the same effect, increasing by 1.5 days more (p = 0.01) the average number of hospitalization days (8.57 ± 4.4 days).

Conclusions

We considered that long-term follow-up must include lifestyle changing methods, risk factor correction and secondary prevention. It should be considered and implemented in all cases a cardiovascular recovery physical exercise program in stable patients, stopping smoking and diet changes. Hypertension, dyslipidemia and diabetes mellitus should be diagnosed and treated with care and promptness.

Abbreviations

NSTEMI: non-ST-segment elevation myocardial infarction
LVEF: left ventricle ejection fraction
HBP: high blood pressure

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