Original Research

The Impact of Risk Factors on ECG Parameters and Quality of Life in Post-Myocardial Infarct Patients

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Abstract

Introduction: Many epidemiological studies have shown that there are numerous risk factors for acute coronary disease. The aim is to determine the effect of risk factors on the echocardiographic changes and quality of life in patients treated with different methods 1 year after myocardial infarction. **Methods:** The research was a prospective–retrospective, clinical, epidemiological study and was conducted at the Clinic of Cardiology, University Clinical Center Sarajevo. Patients were divided into four groups based on the therapy treatment they got. The patients were divided into four groups based on the therapy treatment they received. The first group consisted of 40 patients who had had myocardial infarction and were treated with medications. The patients in the groups II and III were treated with percutaneous coronary intervention (PCI) [who immediately after incident underwent primary PCI or delayed PCI], and each group consisted of 40 patients. The group IV consisted of 40 patients, who underwent surgical revascularization (coronary artery bypass surgery). After the treatments have finished, an echocardiogram was performed on every patient. The Short Form (SF)-36 health survey was used for testing the life quality. Echocardiogram and the quality of life (QoL) testing were repeated a year after the treatment. **Results:** The study included 160 patients with a history of myocardial infarction, of which 130 (81.3%) were men, and 30 (18.8%) were women. The average age in the total sample was 54.9 ± 8.8 years. The review of risk factors' presence showed that in the total sample, most present was hypertension with 134 (83.8%), smoking with 120 (75.0%), and hypercholesterolemia with 110 or 68.8% of patients. Hypertension showed a statistically significant negative effect on the SF-scales only in the group III according to the mental health ($P = 0.020$), social functioning ($P = 0.013$), and pain ($P = 0.011$). A statistically significant effect of smoking was observed in the group III according to left ventricular internal dimension in end-diastole ($P = 0.000$) and left ventricular internal dimension in end-systole ($P = 0.001$) in the sense that smokers have the higher values of these parameters, and negative to ejection fraction (EF) ($P = 0.001$) in the sense that smokers have lower EF. In the group IV, positive correlation was observed to EF ($P = 0.038$), and negative toward the mitral regurgitation ($P = 0.032$). **Conclusion:** High blood pressure negatively affected the QoL. Smoking is negatively associated with all observed echocardiographic parameters in all the groups except with the size of the left atrium.

Keywords: Coronary artery bypass surgery, myocardial infarction, percutaneous coronary intervention, quality of life, risk factors

Introduction

Many epidemiological studies have shown that there are numerous risk factors for acute coronary disease. All the risk factors for acute coronary disease are divided into traditional and nontraditional types.[1] Most important risk factors are gender, age, genetic factors, hypertension, diabetes mellitus, tobacco smoking, dyslipidemia, and obesity.[2] Women, before menopause, and women who were using estrogen therapy replacements are relatively protected from coronary artery disease and other clinical consequences of atherosclerosis. According to some studies, up to 50% risk for atherosclerosis can be attributed to genetic predisposition.[3-6]

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The first studies about the quality of life (QoL) were more related to the possibility of achieving individual goals and the choice of the ideal lifestyle.[7] The QoL can be defined as an individual's personal perception of own position in life in comparison with the goals and within the system of values that is accepted and incorporated into decision-marking.[7]Generally, the term "quality of life" implies the scope of external conditions and personal characteristics by which an individual experiences pleasure and displeasure, and plans to preserve or change the circumstances in which he/she lives.[7,8]

The aim is to determine the effect of risk factors on the echocardiographic changes and the life quality of patients treated with different methods 1 year after myocardial infarction.

Material and Methods

The research was a prospective-retrospective, clinical, epidemiological study and was conducted at the Clinic of Cardiology, University Clinical Center Sarajevo (UCCS). This study included 160 patients who had acute myocardial infarction (verified by electrocardiographic changes, laboratory findings, which included an increase in enzyme activity in serum and nonhematological changes caused by necrosis and inflammation and echocardiographic abnormalities in left ventricular wall segmental kinetics). The study was approved by the Ethics Committee of UCCS.

All the patients were randomly selected, based on inclusion criteria, as they got in the emergency unit of Clinic for Cardiology. The inclusion criteria were the patients of all age groups who have had only one myocardial infarction, patients who on the previous day of the survey were not hospitalized for other illnesses, did not have any other systemic disease, neurological disease, cardiac valvular defect, and polyvascular atherosclerotic disease, and did not have diagnosed mental illness. Patients with lethal outcome, patients who for any reason did not want to participate in the study, and patients who have had more than one myocardial infarction were excluded from the study. Patients included in the research signed informed consent to participate in the study.

Patients were divided into four groups based on the therapy treatment they received. The group I consisted of 40 patients who had had myocardial infarction and were treated with medications. In the groups II and III, the patients were treated with percutaneous coronary intervention (PCI) [who immediately after incident underwent primary PCI (pPCI) or delayed PCI], and each group consisted of 40 patients. The group IV consisted of 40 patients who underwent surgical revascularization (coronary artery bypass surgery).

All the patients were treated either surgically or with medicaments, pPCI, or delayed PCI. After the treatments were finished, an echocardiogram was performed on every patient. The measurements included interventricular septum thickness, the thickness of the back wall of the left ventricle (LV), diameter of the left ventricular internal dimension in end-diastole (LVIDd) and left ventricular internal dimension in end-systole (LVIDs), ejection fraction (EF), and an overview of the valvular apparatus of the heart. One year after the treatment, the echocardiogram was repeated to all the patients, and the same parameters were observed.

Echocardiographic examinations were performed using two ultrasonic devices, Philips iE33 and Toshiba Powervision 7000. These examinations were performed by two physicians (to reduce the interobserver and intraobserver errors if any) who were not familiar with the inclusion or exclusion criteria and did not know one another.

Laboratory results [blood count, cholesterol, high-density lipoprotein (HDL), low-density lipoprotein (LDL), triglycerides, and glucose] were recorded at the Institute for Clinical Chemistry and Biochemistry of UCCS using standard laboratory procedures. Body mass index (BMI) was calculated after the measurement of body weight and body height during regular controls in the cardiac counseling center. All the laboratory tests were repeated, and the BMI measurements were taken again 1 year after the treatment.

The study used the Short Form (SF)-36 questionnaire for the QoL testing, and clinical data were obtained from the patient's history.[9] Furthermore, the SF-36 has 8-scaled scores.

Sections are given as follows: vitality, physical functioning, bodily pain, general health perceptions, physical role functioning, emotional role functioning, social role functioning, and mental health.[9]

Statistical analysis

All the data obtained from the research were analyzed using the Statistical Package for the Social Sciences program (SPSS Inc., Chicago, IL, United States). Research results were analyzed using the descriptive statistics, which includes the determination of the mean, standard deviation, and standard error of mean, or the median and interquartile ranking.

The following methods of analytical statistics have been used: the methods of empirical distribution identification, methods for assessing the statistical significance (chi-square test, Student's *t*-test, one-way analysis of variance, Mann–Whitney test, and Kruskal–Wallis analysis of variance). Methods, which were used for assessing the significance of relations, were the Pearson's linear correlation coefficient and Spearman's rank correlation coefficient. To assess the impact of these factors on the QoL, we used the Cox model of univariate and multivariate analyses. The statistical significance was on the level of $P < 0.05$.

Results

The baseline characteristics of the sample

The study included 160 patients with a history of myocardial infarction, of which 130 (81.3%) were men, and 30 (18.8%)

were women. An analysis of gender distribution showed that men were more represented than women in all the groups as well as in the total sample. Thus, men were dominantly present in the group IV with 40 (100%) male respondents, than those in the group III with 34 (85%) male respondents, followed by the group II with 31 (80%) and the lowest in the group I with 24 (60%) male respondents. The average age in the total sample was 54.9 ± 8.8 years (range 37–76 years). The patients in the group II were the youngest with average age of 51.7 ± 7.8 years (range 37–66 years), whereas the patients in the group IV were the oldest with average age of 55.8 ± 8.4 years (range 38–66 years).

The respondents under the age of 45 years were represented with 20 (12.5%) patients in the total sample, those aged between 45 and 54 years with 54 (33.8%) patients, whereas the respondents aged between 55 and 65 years were represented with 72 (45.0%) patients. The respondents over 65 years were represented with 14 (8.8%) patients in the total sample. An analysis of age groups showed that the largest number of respondents of the groups I, III, and IV were in the age between 55 and 65 years, and the respondents of the group II in the age between 45 and 54 years ($\chi^2 = 21.13$; $P = 0.012$). The highest representation of respondents older than 65 years was in the group I (20%).

PCI was applied slightly more often among men (34 patients – 85%) in the group III compared to the group II (32 patients–80%), but without statistically significant differences in the application of PCI by gender in the observed groups. An analysis of the number of stents by groups and gender showed that in the group II, there were slightly more patients with two stents and in the group III with one stent. Analysis by gender within the groups as well as in the total sample showed that there was no statistically significant difference in the number of stents by gender.

Most respondents were married, that is, 130 (81.3%) respondents (group I: 85%, groups II–IV: 80%). Four (2.5%) patients were unmarried, same number of respondents were divorced, 14 (8.8%) were widowed, and 8 (5.0%) were living in a common law marriage.

The employed examinees were mostly in the group II (28, 70.0%), and the unemployed were in the group I (8, 20%; $\chi^2 = 24.93$; $P = 0.003$). Retirees were mostly in the group IV (18, 45.0%) [Table 1].

The review of risk factors showed that in the total sample, most common was hypertension with 134 (83.8%), smoking with 120 (75.0%), and hypercholesterolemia with 110 or 68.8% of patients. The presence of the risk factors was statistically and significantly different within the patients suffering from diabetes mellitus (DM) and patients with BMI higher than 30 between groups ($P < 0.05$) [Table 2].

Correlation of observed risk factors with quality of life parameters

The hypertension showed a statistically significant negative effect on the SF-scales only in the group III according to

Table 1: Distribution of respondents based on their occupation

Occupation	Group *N* (%)				Total
	Group I	Group II	Group III	Group IV	
Agricultural worker	2 (5%)	0	0	0	2 (1.3%)
Industrial worker	4 (10%)	10 (25%)	10 (25%)	6 (15%)	30 (18.8%)
Intellectual work	12 (30%)	18 (45%)	13 (32%)	14 (35%)	57 (35.6%)
Unemployed	8 (20%)	0	2 (5%)	0	10 (6.3%)
Housewife	2 (5%)	4 (10%)	2 (5%)	2 (5%)	10 (6.3%)
Retiree	12 (30%)	8 (20%)	13 (32%)	18 (45%)	51 (31.9%)
Total	40 (25%)	40 (25%)	40 (25%)	40 (25%)	160 (100%)

Data are presented as frequencies and percentages. $\chi^2 = 33.43$; $P = 0.004$.

Table 2: Distribution of risk factors in the observed groups

Risk factors	Group *N* (%)				Total	χ^2	*P*
	Group I	Group II	Group III	Group IV			
Diabetes mellitus	18 (45%)	4 (10%)	6 (15%)	17 (35%)	42 (26.3%)	16.91	0.001
hypercholesterolemia	28 (70%)	24 (60%)	28 (70%)	30 (75%)	110 (68.8%)	2.21	0.530
BMI >30	32 (80%)	16 (40%)	16 (40%)	28 (70%)	92 (57.5%)	20.87	0.0001
Smoking	34 (85%)	32 (80%)	26 (65%)	28 (70%)	120 (75.0%)	5.33	0.149
Hypertension	34 (85%)	34 (85%)	30 (75%)	36 (90%)	134 (83.8%)	3.49	0.322

BMI = body mass index. Data are presented as frequencies and percentages.

the mental health ($P = 0.020$), social functioning ($P = 0.013$), and pain ($P = 0.011$) [Table 3].

Within the examinees in the group I, a statistically significant effect of smoking on any particular scale was not recorded. In the group II, there has been a positive influence on the scale of emotional role ($P = 0.025$) and negative on the scale of general health ($P = 0.013$). In the case of the group III, negative impact is recorded on the scale of physical functioning ($P = 0.012$), physical role ($P = 0.013$), emotional role ($P = 0.026$), and social functioning ($P = 0.036$), and in the group IV, positive impact on the scale of physical functioning ($P = 0.002$), mental health ($P = 0.028$), and general health ($P = 0.031$). The comparison of correlation coefficients between the groups shows that there are significant differences in almost all scales except on the scale of vitality and pain [Table 4].

The negative impact of total cholesterol was observed only in the group II on the physical role scale ($P = 0.004$), and in the group III on the scale of pain ($P = 0.038$), a statistically significant difference between the groups was observed only on the scale of physical role in relation to the groups ($\chi^2 = 9.98$; $P = 0.841$). LDL cholesterol showed a statistically significant positive effect only to the

Table 3: The correlation between quality of life and hypertension in the examined groups

Hypertension (grade)							
		Group I	Group II	Group III	Group IV	χ^2	*P*
Physical functioning	*r*	0.009	–0.029	0.141	–0.119	1.30	0.727
	P	0.957	0.860	0.385	0.465		
Physical role	*r*	0.143	0.272	–0.175	–0.209	6.45	0.091
	P	0.379	0.090	0.279	0.196		
Emotional role	*r*	–0.165	0.203	–0.249	–0.083	4.42	0.219
	P	0.309	0.209	0.121	0.610		
Vitality	*r*	–0.020	0.185	–0.288	–0.102	4.45	0.217
	P	0.902	0.253	0.072	0.533		
Mental health	*r*	0.027	0.248	–0.365	–0.317	10.09	0.018
	P	0.869	0.123	0.020*	0.046		
Social functioning	*r*	–0.051	0.223	–0.391	–0.190	7.97	0.047
	P	0.756	0.166	0.013*	0.241		
Pain	*r*	–0.122	0.181	–0.400	–0.190	6.94	0.074
	P	0.452	0.262	0.011*	0.240		
General health	*r*	–0.126	–0.205	–0.577	0.113	11.539	0.009
	P	0.440	0.205	0.000**	0.489		

Data are presented as Spearman's correlation. *Correlation significant at the level $P < 0.05$. **Correlation significant at the level $P < 0.01$.

Table 4: The correlation between quality of life and smoking in the observed groups

Smoking							
		Group I	Group II	Group III	Group IV	χ^2	*P*
Physical functioning	*r*	–0.005	0.101	–0.395	0.465	15.916	0.001
	P	0.976	0.536	0.012*	0.002**		
Physical role	*r*	0.210	0.065	–0.389	0.093	8.984	0.039
	P	0.193	0.691	0.013*	0.569		
Emotional role	*r*	–0.008	0.355	–0.352	0.169	10.925	0.012
	P	0.962	0.025*	0.026*	0.297		
Vitality	*r*	–0.076	0.084	–0.174	0.273	4.406	0.221
	P	0.643	0.605	0.284	0.088		
Mental health	*r*	–0.210	0.221	–0.212	0.347	9.882	0.02
	P	0.192	0.171	0.189	0.028*		
Social functioning	*r*	–0.264	–0.209	–0.333	0.265	8.659	0.034
	P	0.100	0.196	0.036*	0.099		
Pain	*r*	–0.155	0.199	–0.091	0.288	5.386	0.146
	P	0.338	0.218	0.576	0.072		
General health	*r*	0.148	–0.388	–0.309	0.341	15.003	0.002
	P	0.361	0.013*	0.052	0.031*		

Data are presented as Spearman's correlation. *Correlation significant at the level $P < 0.05$. **Correlation significant at the level $P < 0.01$.

physical role ($P = 0.017$) in the group II. HDL showed a statistically significant positive effect on the scores of all scales ($P > 0.05$) in the group I and negative to the scale of social functioning ($P = 0.012$) in the group II. Positive correlation in the group III was found to the scale of vitality ($P = 0.002$), mental health ($P = 0.033$), and social functioning ($P = 0.021$). The comparison of correlation coefficients between the groups shows that there is a significant difference at all scales ($P < 0.05$).

The BMI higher than 30 showed a negative impact on the score of almost all scales. In the group I, such an impact was significant to the physical role ($P = 0.006$), emotional role ($P = 0.023$), vitality ($P = 0.000$), and social functioning ($P = 0.003$). In the case of the group II to physical functioning ($P = 0.035$), physical role ($P = 0.010$), and vitality ($P = 0.033$), and in the case of the group III to pain ($P = 0.034$) and general health ($P = 0.047$). The comparison between groups of correlation coefficients shows that there is a significant difference in physical role ($\chi^2 = 18.86$; $P < 0.01$).

A positive correlation was registered to LVIDs ($P = 0.000$) (hypertension = higher value) in the group I and a positive correlation to LVIDs ($P = 0.001$), to the size of the left atrium ($P = 0.043$), and the negative to the EF ($P = 0.002$) in the group II. In the group III, a negative correlation was registered to LVIDs ($P = 0.012$) and positive toward EF ($P = 0.040$), whereas in the group IV, a positive correlation was recorded toward the size of the left atrium ($P = 0.002$) [Table 5].

A statistically significant effect of smoking was observed in the group III according to LVIDd ($P = 0.000$) and LVIDs ($P = 0.001$) in the sense that smokers have higher values of these parameters, and negative to EF ($P = 0.001$) in the sense that smokers have lower EF. In the group IV, a positive correlation was observed to EF ($P = 0.038$), and negative toward the mitral regurgitation ($P = 0.032$). Statistically significant differences of the impact of smoking on the parameters observed between the groups were recorded for all ($P < 0.05$) except the size of the left atrium ($P = 0.647$) [Table 6].

BMI shows a negative correlation within the group I to EF ($P = 0.011$) and mitral regurgitation ($P = 0.021$), and in the group IV negative correlation to the EF ($P = 0.048$) and

Table 5: Treatment outcome observed with echocardiographic parameters in relation to hypertension in the studied groups

Hypertension

		Group I	Group II	Group III	Group IV	χ^2	*P*
LVIDd	*r*	0.113	0.246	−0.264	0.048	5.414	0.144
	P	0.488	0.127	0.099	0.767		
LVIDs	*r*	0.607	0.487	−0.393	−0.160	32.145	0.000
	P	0.000**	0.001**	0.012*	0.323		
EF	*r*	−0.063	−0.484	0.327	0.105	14.946	0.002
	P	0.699	0.002**	0.040*	0.518		
Left atrium size	*r*	0.067	0.322	0.209	0.474	4.001	0.261
	P	0.680	0.043*	0.196	0.002**		
Mitral regurgitation	*r*	0.037	0.061	−0.248	0.243	4.757	0.19
	P	0.822	0.708	0.122	0.131		

LVIDd = left ventricular internal dimension in end-diastole, LVIDs = left ventricular internal dimension in end-systole, EF = ejection fraction. Data are presented as Spearman's correlation. *Correlation significant at the level $P < 0.05$. **Correlation significant at the level $P < 0.01$.

Table 6: Treatment outcome observed with echocardiograms in relation to smoking status in the studied groups

Smoking

		Group I	Group II	Group III	Group IV	χ^2	*P*
LVIDd	*r*	−0.310	−0.052	0.564	−0.269	24.102	0.000
	P	0.052	0.752	0.000**	0.094		
LVIDs	*r*	−0.206	0.180	0.494	−0.226	14.892	0.002
	P	0.202	0.266	0.001**	0.161		
EF	*r*	0.121	0.012	−0.525	0.329	17.350	0.001
	P	0.458	0.944	0.001**	0.038*		
Left atrium size	*r*	−0.160	0.120	−0.106	−0.060	1.656	0.647
	P	0.325	0.459	0.517	0.712		
Mitral regurgitation	*r*	−0.062	−0.264	0.269	−0.339	8.719	0.033
	P	0.703	0.100	0.093	0.032*		

LVIDd = left ventricular internal dimension in end-diastole, LVIDs = left ventricular internal dimension in end-systole, EF = ejection fraction. Data are presented as Spearman's correlation. *Correlation significant at the level $P < 0.05$. **Correlation significant at the level $P < 0.01$.

positive toward the left atrium size ($P = 0.000$). Statistically significant differences in the influence of BMI on the parameters observed between the groups were registered only in the case of the size of the left atrium ($\chi^2 = 22.35$; $P = 0.000$).

There was no statistically significant correlation of total cholesterol to neither of the monitored parameters within any group. A significant positive impact of HDL cholesterol was recorded on the value of EF ($P = 0.000$) in the group I, and negative on the degree of mitral regurgitation ($P = 0.004$) in the group IV.

An analysis of the blood glucose level (BGL) impact indicates that in the group I, there is a negative impact of higher BGL on the scales of physical functioning ($r = -0.330$; $P = 0.038$), physical role ($r = -0.313$; $P = 0.049$), vitality ($r = -0.385$; $P = 0.014$), social functioning ($r = -0.489$; $P = 0.001$), and general health ($r = 0.234$; $P = 0.041$). In the group II, there was a positive impact on the vitality ($r = 0.373$; $P = 0.018$) and social functioning ($r = 0.414$; $P = 0.008$), whereas in the group III, a negative impact on the scale of pain score was recorded ($r = 0.312$; $P = 0.050$). The comparison of correlation coefficients between the groups shows that there is a significant difference between the scales of physical role ($P = 0.007$), vitality ($P = 0.005$), social functioning ($P = 0.000$), and pain ($P = 0.025$) [Table 7].

A statistically significant correlation was recorded neither in the case of total cholesterol nor to one of the monitored parameters within any group, as well as no significant difference of impact between the groups was noted ($P > 0.05$) [Table 8].

A significant positive impact of HDL cholesterol values was recorded on the value of EF in the group I ($r = 0.536$; $P = 0.000$), and negative on the degree of mitral

Table 7: The correlation between quality of life and blood glucose levels in the examined groups

Blood glucose levels

		Group I	Group II	Group III	Group IV	χ^2	*P*
Physical functioning	*r*	–0.330*	0.079	0.216	–0.038	6.353	0.096
	P	0.038	0.627	0.180	0.814		
Physical role	*r*	–0.313*	0.308	0.309	–0.167	12.262	0.007
	P	0.049	0.053	0.052	0.303		
Emotional role	*r*	–0.161	–0.112	–0.079	–0.220	0.4396	0.932
	P	0.320	0.491	0.627	0.173		
Vitality	*r*	–0.385*	0.373*	–0.155	–0.214	13.041	0.005
	P	0.014	0.018	0.339	0.184		
Mental health	*r*	–0.140	0.260	–0.250	–0.261	6.959	0.074
	P	0.390	0.106	0.119	0.104		
Social functioning	*r*	–0.489**	0.414**	–0.158	–0.107	17.918	0.000
	P	0.001	0.008	0.331	0.512		
Pain	*r*	–0.273	0.301	–0.312*	–0.160	9.387	0.025
	P	0.088	0.059	0.050	0.325		
General health	*r*	–0.324*	0.148	0.066	–0.287	6.787	0.079
	P	0.041	0.362	0.684	0.073		

*Correlation significant at the level $P < 0.05$. **Correlation significant at the level $P < 0.01$.

Table 8: Treatment outcome observed with echocardiograms in relation to total cholesterol levels in the studied groups

Total cholesterol

		Group I	Group II	Group III	Group IV	χ^2	*P*
LVIDd	*r*	0.111	0.158	–0.032	–0.116	1.801	0.615
	P	0.495	0.329	0.844	0.476		
LVIDs	*r*	0.134	–0.024	0.236	–0.117	2.839	0.417
	P	0.408	0.885	0.143	0.470		
EF	*r*	0.070	0.049	–0.293	–0.030	3.256	0.354
	P	0.670	0.763	0.067	0.853		
Left atrium size	*r*	–0.021	–0.014	–0.143	0.010	0.530	0.912
	P	0.897	0.932	0.380	0.953		
Mitral regurgitation	*r*	–0.143	0.093	–0.105	–0.264	2.522	0.471
	P	0.379	0.566	0.520	0.100		

*Correlation significant at the level $P < 0.05$. **Correlation significant at the level $P < 0.01$.

regurgitation in the group IV ($r = -0.443$; $P = 0.004$). There were no statistically significant differences in the influence of HDL cholesterol level on the parameters observed between the groups [Table 9].

Discussion

Coronary heart disease is constantly rising and takes the form of a pandemic, which increases the need for its reduction and control of risk factors.[10-12] In our study, smoking was very present in all investigated groups. The highest percentage of smokers was in the group I (85%) and the lowest in the group III (65%). The results of this study showed that smokers had more bypasses[3,4] compared to that of nonsmokers. An increased concentration of cholesterol and lipids and a decreased HDL cholesterol are very harmful risk factors for myocardial infarction. Many studies have shown that the cholesterol reduction can significantly inhibit the progression of cardiovascular disease.[13] In our research, hypercholesterolemia was present in 68.8% of the patients, of which the highest percentage was in the group III of patients.

According to the results of our study, significant differences were determined in relation to a patient's gender, namely women had higher scores on subscales of mental health, and men on the subscales of physical functioning, physical role, emotional role, vitality, and social functioning. Our study did not find a significant effect of age on the QoL in investigated patients, although higher scores were found in specific age groups showing that younger patients have higher scores.

The highest overall score of life quality comprised the patients of the group II and the worst patients of the group I. With the increase of hypertension degree, there was a reduction in the QoL scores only in the group III. Significant difference between groups was found in the subscale of mental health and social functioning. Associations between smoking and the QoL within the groups showed a significant difference in all subscales except vitality and pain. With the increase of BMI, there was a decrease in life quality scores, but significant only in the subscale of physical role. The level of total cholesterol in the blood indicates a negative impact on the subscale of physical role in the group II and pain in the group III. Higher BGLs were mainly associated with a reduced QoL in all the observed subscales. The correlation between BGLs and the scores of the QoL showed that there was a significant difference in the scales of physical role, vitality, social functioning, and pain.

The results of EUROASPIRE III study published in 2013, on a sample of 8734 patients from 22 European countries, and with a history of acute myocardial infarction, showed that PCI and coronary artery bypass graft were correlating with the QoL and lifestyle risk factors. It was noted that the lower QoL scores had women, older patients, and those with lower levels of education.[14] In addition, there was a significant connection among the QoL and smoking, the obesity of central type, and unregulated BGLs.[15]

A comparison of correlation between age and changes in echocardiographic parameters in the observed groups showed that there was a significant difference only in the case of EF. Analyzing the impact of hypertension on the echocardiographic changes, we found that there was a significant difference between groups according to LVIDs, EF, and the degree of mitral regurgitation. The impact of smoking on echocardiographic changes showed statistically significant differences between the groups in all the observed parameters except the size of the left atrium.

Total cholesterol, LDL, and HDL were not significantly associated with echocardiographic parameters except in the group I, wherein the increase of HDL was followed with a decrease in EF. The values of BMI in our study were negatively associated only with the LV size. Research, conducted in Norway during 2007 on a sample of 120 patients with an average age of 40 years and EF greater

Table 9: Treatment outcome observed with echocardiograms in relation to HDL cholesterol levels in the studied groups

HDL cholesterol							
		Group I	Group II	Group III	Group IV	χ^2	*P*
LVIDd	*r*		0.033	−0.285	−0.152	2.671	0.445
	P	0.903	0.838	0.075	0.350		
LVIDs	*r*	0.145	−0.169	−0.026	0.008	1.877	0.598
	P	0.373	0.297	0.872	0.959		
EF	*r*	0.536**	0.176	−0.009	0.152	7.457	0.059
	P	0.000	0.278	0.958	0.348		
Left atrium size	*r*	−0.233	0.088	0.160	−0.133	3.86	0.277
	P	0.149	0.591	0.325	0.412		
Mitral regurgitation	*r*	−0.380*	−0.149	0.103	−0.443**	7.656	0.054
	P	0.016	0.357	0.528	0.004		

*Correlation significant at the level $P < 0.05$. **Correlation significant at the level $P < 0.01$.

than 30%, tested the QoL before and after bypass surgery. They noted that testing of life quality could be a measure of procedure success.[16]

Conclusion

High blood pressure negatively affected the QoL, in such a way that in the group III, we found a negative impact on the subscales of mental health and social functioning. Analyzing the impact of hypertension on the echocardiographic changes, we found that there was a significant difference between groups regarding LVIDs, EF, and the degree of mitral regurgitation. The impact of tobacco smoking on echocardiographic changes showed statistically significant differences between the groups in all observed parameters except the size of the left atrium.

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Conflicts of interest

There are no conflicts of interest.

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