

## Original Article

# Changes in Health-Related Quality of Life of Patients with Myocardial Infraction after Percutaneous Angioplasty

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### Abstract

**Background:** Percutaneous coronary intervention (PCI) is often part of standard treatment in patients presenting with coronary artery disease.

**Aim:** To investigate changes in health-related quality of life in myocardial infarction patients one year after angioplasty intervention.

**Methods:** A prospective study was conducted in Greece. Patients diagnosed with acute myocardial infarction treated with percutaneous angioplasty were included in the study. Patients' quality of life was assessed immediately after the angioplasty, 6 and 12 months later. Quality of life was assessed with the questionnaire "MAC-NEW Heart Disease Health-Related Quality of Life".

**Results:** Quality of life increased significantly in all patients regardless of their characteristics. Quality of life differed significantly at 6 months according to gender (men had higher values), comorbidity (patients with comorbidities had lower values), smoking (patients who smoked had higher values) and exercising (patients who exercised had higher values). Quality of life differed significantly at 12 months by gender (men had higher values), comorbidity (patients with comorbidities had lower values), and exercising (exercising patients had higher values). A positive correlation was found between the quality-of-life scores at three measurements.

**Conclusions:** Patients after PCI showed better quality of life at 6- and 12-months follow-up. Assessing patients' quality of life after PCI is an important step for a holistic approach to patients whose physical and mental health are considered during the assessment.

**Keywords:** quality of life, percutaneous coronary intervention, myocardial infarction

### Introduction

In recent decades the World Health Organization (WHO), the World Heart Federation (WHF) and the World Stroke

Organization (WSO) have been trying to address the increased death rate from cardiovascular disease, often exceeding 60%. Specific diseases include coronary heart

disease (ischemic cardiomyopathy), stroke, peripheral vascular disease and diseases of the aorta and arteries such as arterial hypertension (Mendis et al., 2011). Every year approximately 2 million people die in the European Union due to coronary heart disease and at least 7 million people worldwide with a continuous increasing trend (OECD, 2017, WHO, 2021). In Greece in 2019 specifically there were 21124 deaths (30% rate) due to coronary heart disease (WHO, 2021b). In Greece, cardiovascular diseases are in the first place of causes of morbidity and mortality (43% in women and 36% in men) with the main risk factors being smoking (27% of the population) and obesity (24%) (OECD, 2017). Although the trend of these death rates for Greece is decreasing, they remain constantly higher compared to the corresponding average of the European Union (WHO, 2016).

The ever-increasing incidence rates of coronary heart disease affect the quality of life of patients and their families which increase public and private costs for medical care and decrease the productivity of people (European society of Cardiology, 2012). It is imperative to improve the modifiable factors (comorbidities) by the patients themselves, as well as the assessment of the non-modifiable ones (i.e., gender, age, heredity) by the State in order to implement similar health policies in order to improve the health-related quality of life and overall social and individual well-being (Rosiek et al., 2016).

The European Society of Cardiology emphasizes the fact that prevention and the improvement of lifestyle and habits are certainly more economical and profitable solutions, because medication and interventional operations lead to excessive private and public health costs. A healthy lifestyle will certainly reduce the occurrence of coronary heart diseases (Ettihad et al., 2016). A positive global event in recent years is the reduction of deaths specifically due to acute myocardial infarction and the necessary thrombolysis, thanks to the readiness of Emergency Departments, the expertise of interventional cardiologists with the immediate performance of coronary angiography and percutaneous rescue angioplasty (rescue PCI) in hemodynamic laboratories and due to optimization of

diagnostic and therapeutic tools (OECD, 2017). Percutaneous coronary intervention (PCI) is often part of standard treatment in patients presenting with coronary artery disease, usually consisting of balloon dilation and stenting. Over the past decades, technical, procedural and pharmacological aspects of the PCI procedure have been greatly developed, resulting in improvements in clinical outcome and reduction in mortality (Yeh et al., 2010).

Our aim was to investigate changes in health-related quality of life in myocardial infarction patients one year after angioplasty intervention.

### **Methodology**

**Study design:** The study was a prospective observational study that was conducted at two general public hospitals in Athens, Greece. For the collection of the data permission was requested from the hospitals' boards (13968/4-7-2016 and 14904/13-07-2017). The study was also approved by the Ethics Committee of the department of Nursing, of the National and Kapodistrian University of Athens. Regarding the treatment of the participants of the study the researchers applied the rules of the Declaration of Helsinki.

**Inclusion criteria:** All adult patients diagnosed with acute myocardial infarction treated with percutaneous angioplasty were included in the study.

**Exclusion criteria:** All patients with a history of psychiatric disease, those readmitted 6 months after discharge of hospital, those with cognitive impairment, and patients with coronary artery bypass grafting were excluded from the study. The data collection was done between January 2018 and June 2019. The patients' quality of life was assessed immediately after the angioplasty, 6 and 12 months later. The patients' quality of life was assessed with the questionnaire "MAC-NEW Heart Disease Health-Related Quality of Life", which was developed in 2004. This is an instrument specific for cardiovascular patients. It includes 27 questions divided into 3 dimensions of quality of life, physical functionality-physical dimension (13 items), psychological dimension (14 items) and social dimension (13 items) (Hofer et al., 2004).

**Statistical Analysis:** Means, standard deviations (SD) and medians were used to describe quantitative variables. Frequencies and percentages were used to describe qualitative variables. Repeated-measures analysis of variance (ANOVA) was used to test for differences in measurements across various characteristics and over time. Also, ANOVA analysis was used to assess the degree of change over time between different variables. Pearson's correlation coefficient ( $r$ ) was used to test the relationship between two quantitative variables. Linear regression analysis was used to find independent factors associated with quality of life at 6 and 12 months. We calculated coefficients beta and their standard errors (standard errors=SE). Significance levels were two-sided and statistical significance was set at 0.05. The statistical program SPSS 22.0 was used for the analysis.

## Results

Study population included 100 patients. Demographic and clinical data of patients are presented in table 1. Totally, 52% of the patients had arterial hypertension, 42% dyslipidemia and 27% diabetes mellitus, while 61% of the patients smoked.

Table 2 presents the scores of the patients in the dimensions of quality of life. Higher values indicate a better quality of life. Scores on all dimensions of quality of life as well as the total score increased significantly both

between consecutive measurements and from baseline to 12 months later.

Table 3 shows the changes in the quality-of-life score according to the various patient characteristics. The overall quality of life score increased significantly in all patients regardless of their characteristics. However, improvement in quality of life was greater in those with comorbidities ( $p=0.03$ ). Baseline score differed significantly by gender (men had higher values), comorbidity (patients with comorbidities had lower values), and whether they exercised (exercising patients had higher values). The score at 6 months differed significantly according to gender (men had higher values), comorbidity (patients with comorbidities had lower values), whether they smoked (patients who smoked had higher values) and whether they exercised (patients who exercised had higher values). The score at 12 months differed significantly by gender (men had higher values), comorbidity (patients with comorbidities had lower values), and whether they exercised (exercising patients had higher values).

Table 4 shows the results of the multivariable linear regression with total quality of life score at 6 and 12 months as the dependent variable. The better the patients' overall quality of life at baseline, the better it was at 6 and 12 months. Patients who were aged under 60 years had a 0.262-point higher score, which means better overall quality of life at 12 months, compared to patients who were over 70 years of age.

**Table 1. Demographic and clinical data of patients.**

		N	%
<b>Gender</b>	Males	81	81.0
	Females	19	19.0
<b>Age, years</b>	30-39	2	2.0
	40-49	8	8.0
	50-59	31	31.0
	60-69	29	29.0
	>70	30	30.0
<b>Education level</b>	Primary	37	37.0
	High school	28	28.0

	University/College	35	35.0
	Unmarried	6	6.0
<b>Family status</b>	Married	70	70.0
	Divorced	8	8.0
	Widows	16	16.0
<b>Job status</b>	Employees	36	36.0
	Unemployed	14	14.0
	Pensioners	44	44.0
<b>Comorbidity</b>	Household	6	6.0
	No	29	29.0
<b>Medical history</b>	Yes	71	71.0
	Hypertension	52	52.0
	Dyslipidaimia	42	42.0
<b>Habits</b>	Diabetes mellitus	27	27.0
	Smoking	61	61.0
	Alcohol consumption	36	36.0
	Exercise	29	29.0
	<b>Days of hospital stay after PCI<sup>a</sup></b>	4.2	1.9
	<b>Ejection fraction<sup>a</sup></b>	44.7	9.0

<sup>a</sup> mean, standard deviation

**Table 2. Patient scores on quality-of-life dimensions.**

	Baseline measurement	6 months	12 months	Change from baseline to 12 months	P-value baseline measurement vs 6 months	P-value baseline measurement vs 12 months	P-value 6 vs 12 months
	Mean± SD	Mean± SD	Mean± SD	Mean± SD			
<b>Emotional functioning</b>	4.64±0.87	5.18±0.63	5.58±0.6	0.94±0.64	<b>&lt;0.001</b>	<b>&lt;0.001</b>	<b>&lt;0.001</b>
<b>Physical functionality</b>	4.58±1.23	4.98±0.84	5.44±0.84	0.86±0.88	<b>&lt;0.001</b>	<b>&lt;0.001</b>	<b>&lt;0.001</b>
<b>Social functionality</b>	4.76±1.42	4.98±0.99	5.49±1.04	0.73±0.89	<b>0.050</b>	<b>&lt;0.001</b>	<b>&lt;0.001</b>
<b>Overall quality of life</b>	4.62±1	5.07±0.69	5.49±0.68	0.87±0.69	<b>&lt;0.001</b>	<b>&lt;0.001</b>	<b>&lt;0.001</b>

p-value after correction with Bonferroni

**Table 3. Changes in quality-of-life score**

		Baseline			Change from baseline to 12 months		
		measurement	6 months	12 months	Mean± SD	Mean± SD	
		Mean± SD	Mean± SD	Mean± SD	Mean± SD		
<b>Gender</b>	Males	4.73±1	5.15±0.68	5.59±0.64	0.86±0.72	<0.001	0.830
	Females	4.15±0.88	4.72±0.63	5.04±0.72	0.89±0.56	<0.001	
	<b>P1</b>	<b>0.021</b>	<b>0.013</b>	<b>0.001</b>			
<b>Comorbidities</b>	No	5.15±0.87	5.34±0.68	5.78±0.65	0.63±0.51	<0.001	<b>0.030</b>
	Yes	4.41±0.97	4.96±0.67	5.37±0.67	0.96±0.73	<0.001	
	<b>P1</b>	<b>0.001</b>	<b>0.012</b>	<b>0.006</b>			
<b>Smoking</b>	No	4.44±1.02	4.86±0.77	5.33±0.76	0.89±0.58	<0.001	0.834
	Yes	4.74±0.98	5.2±0.6	5.59±0.62	0.85±0.76	<0.001	
	<b>P1</b>	0.155	<b>0.014</b>	0.061			
<b>Exercise</b>	No	4.45±0.93	5±0.64	5.42±0.7	0.97±0.66	<0.001	0.061
	Yes	5.05±1.05	5.22±0.79	5.64±0.62	0.59±0.71	<0.001	
	<b>P1</b>	<0.001	<b>0.042</b>	<b>0.038</b>			

**Table 4. Multivariable linear regression with total quality of life score at 6 and 12 months as the dependent variable.**

		6 months			12 months		
		Coefficient beta	Standard error	P	Coefficient beta	Standard error	P
<b>Age</b>	>70 (reference)						
	<60	0.225	0.118	0.061	0.262	0.129	<b>0.045</b>
	60-69	0.070	0.106	0.511	0.045	0.114	0.696
<b>Overall quality of life (baseline measurement)</b>		0.438	0.047	<0.001	0.418	0.047	<0.001

**Discussion**

In the present study, an improvement in the overall quality of life of patients after PCI (18.83%) was observed over time. At 6 months, patients showed the least change in the dimension "social functioning" (4.62%), followed by "physical functioning" (8.7%) and finally by "emotional functioning" (11.64%). At 12 months, patients showed the least change in the dimension "social functioning" (15.33%), followed by "physical functioning" (18.77%) and finally by

"emotional functioning" (20.26%). Scores on all dimensions of quality of life as well as the total score increased significantly both between consecutive measurements and from baseline to 12 months later. Consequently, patients' quality of life improved significantly in all dimensions over time. PCI in patients who have suffered a myocardial infarction reduces mortality rates and generally improves patients' quality of life (Kwong et al.,2019, Blankeship et al.,2013, Park et al., 2013, Sipotz et al.,2013, Stefanini et al., 2013).

The results of our study are in line with the results of previous studies in which the specific Mac-New questionnaire (Sipotz et al., 2013, Benzer et al., 2003, Cuevas Fernandez et al., 2007) or other specific questionnaires that assessed the patients' quality of life were used (Blankenship et al., 2013, Yan et al., 2018, Chatriwalla et al., 2015, Weilu et al., 2011, Agarwal et al., 2009, De Quadros et al., 2011, Melberg et al., 2010, Moore et al., 2006, Gunal et al., 2008, Spertus et al., 2004). Most statistically significant results were reported at the 6- or 12-month QoL review of patients who underwent PCI.

In 2007, in Australia a cross-sectional study by Fernandez et al. (2007) with a sample size of 202 patients (18-80 years), using the Mac-New tool, found that after the implementation of PCI there was improvement in patients' quality of life (emotional, physical, social functioning) at 15-17 months ( $p < 0.001$ ) (Cuevas Fernandez et al., 2007).

A study found at 6 months a small improvement in the quality of life of patients who underwent PCI using special stents (drug-eluting stents) (Chatriwalla et al., 2015). Yan et al. found at the 6-month follow-up that the group of patients aged 65-74 years had the greatest improvement in their quality of life (Yan et al., 2018). Finally, a small improvement in the quality of life of patients who applied PCI and used a special stent (drug-eluting stent) was observed at the 6-month follow-up (Chatriwalla et al., 2015).

In the present study it was found that patients aged  $< 60$  years had better quality of life at the 12-month follow-up after PCI than older patients. Our results agree with a study according to which patients aged  $> 70$  years, 6 months after PCI, have worse quality of life, which means that younger patients had better quality of life than older patients (Jankowska-Polanska et al., 2014). The results of studies show that the factor "age" affects the quality of life of patients at a statistically significant level (Spertus et al., 2004, Li et al., 2012) and especially in 6 months after the implementation of PCI (Soo Hoo et al., 2016).

Another factor found in the present study to affect quality of life is the gender of the patients. Male patients showed a better quality of life than females. Women usually have a worse quality of life as they take on many

stressful responsibilities to care for their husbands who may be suffering from various cardiovascular health problems. At the same time women may be working and even having to carry out the entire burden of the household with all those responsibilities and obligations (Weilu et al., 2011, De Quadros et al., 2011).

In the present study, it was found that patients without comorbidities had better quality of life than women. In the literature, it appears that cardiovascular risk factors (diabetes, hypercholesterolemia, hypertension, obesity, stress, lack of exercise, smoking, alcohol consumption) may lead to decrease in patients' quality of life (De Smedt et al., 2013, Kahkonen et al., 2017). Patients who incorporate more healthy and balanced habits into their lives (physical exercise, healthy diet, no smoking and alcohol consumption), are more likely to have better physical, emotional and mental health and therefore better quality of life with fewer symptoms of psycho-emotional disorders. The results of our research are in agreement with other studies of literature (De Smedt et al., 2013, Kahkonen et al., 2017). Indeed, in a study by Yeh et al found that younger women with comorbidities showed higher levels of depression and worse health status than patients without depression (Yeh et al., 2019). Diabetes mellitus is reported as the most important comorbidity that reduces patients' quality of life (Van Dijk et al., 2016).

The study also has some limitations. Specifically, a convenience sample was applied, which reduces the validity of the study. The study sample consisted mainly of men, so the results should be explained with caution. The study was carried out in Attica, which limits the generality of the results. Also, the follow-up time was 6 months and 1 year, which probably does not reflect the long-term effect of PCI on all the patients who participated in the study. The sample size of our study was relatively small and further studies with bigger samples should be conducted.

## Conclusions

Patients after PCI showed better quality of life at 6- and 12-months follow-up. Male patients, those who were younger and those who did not have comorbidities had a better quality of life. Assessing patients' quality of life after

PCI is an important step for a holistic approach to patients whose physical and mental health are taken into account during the assessment. Without the combination of good physical, emotional and mental health, it is not possible to achieve the best possible recovery of patients and accordingly their quality of life both in the short and long term.

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