HEALTH-RELATED QUALITY OF LIFE INCREASES AFTER FIRST-TIME ACUTE MYOCARDIAL INFARCTION: A POPULATION-BASED STUDY
IZBOLJŠANJE Z ZDRAVJEM POVEZANE KAKOVOSTI ŽIVLJENJA PO PRVEM AKUTNEM MIOKARDNEM INFARKTU: POPULACIJSKA ŠTUDIJA

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ABSTRACT

Keywords:
acute myocardial infarction, quality of life, SF-36, WHOQOL BREF; MacNew, emotional health, mental health

Introduction: Acute myocardial infarction (AMI) affects patients' health-related quality of life (HRQOL). AMI may decrease HRQOL, thus negatively affecting QOL. However, the improvements in interventional treatment and early rehabilitation after AMI may have a positive effect on HRQOL.

Aim: We evaluated HRQOL in patients after the first AMI treated in a reference cardiology centre in Poland and assessed which clinical variables affect HRQOL after AMI.

Material and methods: We prospectively evaluated HRQOL in 60 consecutive patients suffering after their first AMI during the index hospitalisation and again after 6 months, using: (i) MacNew, (ii) World Health Organization Quality of Life (WHOQOL) BREF, and (iii) Short Form (SF) 36.

Results: As measured by the MacNew questionnaire, global, social, and physical functioning did not change (p≥0.063), whereas emotional functioning improved 6 months after AMI, compared to index hospitalisation (p=0.002). As measured by WHOQOL BREF, physical health, psychological health, and environmental functioning did not change (p≥0.321), whereas social relationships improved 6 months after AMI (p=0.042). As assessed by SF-36, the global HRQOL improved after AMI (p=0.044). Patients with improved HRQOL in SF-36 often had a higher baseline body mass index (p=0.046), dyslipidaemia (p=0.046), and lower left ventricle ejection fraction (LVEF; p=0.013). LVEF<50% was the only variable associated with improved HRQOL in multivariate analysis (OR 4.463, 95% CI 1.045 - 19.059, p=0.043).

Conclusions: HRQOL increased 6 months after the first AMI, especially in terms of emotional functioning and social relationships. Patients with LVEF<50% were likely to have improved HRQOL.

IZVLEČEK

Ključne besede:
akutni miokardni infarkt, kakovost življenja, SF-36, WHOQOL BREF; MacNew, čustveno zdravje, duševno zdravje

Uvod: Akutni miokardni infarkt (AMI) vpliva na z zdravjem povezano kakovost življenja pacientov. AMI lahko zmanjša z zdravjem povezano kakovost življenja pacientov in funkcionalno sposobnost ter s tem negativno vpliva na kakovost življenja. Vendar pa lahko izboljšave intervencijskega zdravljenja in zgodnja rehabilitacija po AMI pozitivno vplivajo na z zdravjem povezano kakovost življenja.

Cilj: Ocenili smo z zdravjem povezano kakovost življenja pri pacientih po prvem zdravljenju AMI v referenčnem kardiološkem centru na Poljskem in ovrednotili, katere klinične spremenljivke vplivajo na z zdravjem povezano kakovost življenja po AMI.

Gradiva in metode: Prospektivno smo ocenili z zdravjem povezano kakovost življenja pri 60 zaporednih pacientih s prvim AMI med indeksno hospitalizacijo in po 6 mesecih z uporabo: (i) vprašalnika MacNew, (ii) skrajšane različice vprašalnika kakovosti življenja Svetovne zdravstvene organizacije (WHOQOL-BREF) in (iii) vprašalnika SF-36.

Rezultati: Kot je bilo izmerjeno z vprašalnikom MacNew, se globalno, socialno in fizično delovanje ni spremenilo (p ≥ 0,063), čustveno delovanje pa se je 6 mesecev po AMI izboljšalo v primerjavi z indeksno hospitalizacijo (p = 0,002). Kot je bilo izmerjeno z vprašalnikom WHOQOL-BREF, se telesno zdravje, psihično zdravje in okoljsko delovanje niso spremenili (p ≥ 0,321), socialni odnosi pa so se v 6 mesecih po AMI izboljšali (p = 0,042). Kot je bilo ocenjeno z vprašalnikom SF-36, se je globalna z zdravjem povezana kakovost življenja po AMI izboljšala (p = 0,044). Pacienti z izboljšano z zdravjem povezano kakovostjo življenja so pri vprašalniku SF-36 imeli izhodiščni indeks telesne mase (p = 0,046), pogostejšo dislipidemijo (p = 0,046) in nižji iztisni delež levega prekata (LVEF; p = 0,013). LVEF < 50 % je bila edina spremenljivka, povezana z izboljšano z zdravjem povezano kakovostjo življenja, pri multivariatni analizi (OR 4,463, 95 % CI 1,045 – 19,059, p = 0,043).

Zaključki: Z zdravjem povezana kakovost življenja se je 6 mesecev po prvi AMI povečala, zlasti na področju čustvenega delovanja in socialnih odnosov. Pri pacientih z LVEF < 50 % je bila večja verjetnost, da se je z zdravjem povezana kakovost življenja izboljšala.

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1 INTRODUCTION

Globally, an estimated 17.5 million people die annually from cardiovascular disease (CVD), of which 7.5 million deaths are attributable to coronary artery disease and its complications, including acute myocardial infarction (AMI) (1). AMI not only is one of the leading causes of death worldwide, but also may lead to markedly impaired health-related quality of life (HRQOL) (2).

In developed countries, including Poland, wide access to new pharmacological therapies and percutaneous coronary intervention (PCI) has substantially reduced mortality after AMI (3, 4). However, the long-term consequences for the HRQOL may include decreased exercise tolerance, dyspnoea, new arrhythmias, or other symptoms of heart failure (HF) present within weeks to months following AMI (5). Moreover, AMI might impact many other aspects of life quality, for example sexual activity, as we showed one or two decades ago (6, 7). On the other hand, recent improvements in AMI interventional treatment and new cardiological rehabilitation programs after AMI may have a positive effect on post-AMI QOL (8). Finally, post-AMI QOL may differ per country due to differences in medical, psychological, and social support (9).

Since the general prognosis of patients with AMI in Poland substantially improved in recent years, mostly due to the implementation of a 24-hour interventional cardiology service and routine cardiac rehabilitation, evaluation of post-AMI in Poland QOL is of particular interest (10). Whereas the hard clinical endpoints such as major adverse cardiac events and cardiovascular mortality have been thoroughly evaluated in clinical trials, QOL remains less investigated. Evaluation of QOL is crucial for healthcare professionals to tailor support systems to meet patients' needs by offering the best treatment, as well as for public health specialists to offer new epidemiological solutions to improve HRQOL after AMI.

To further improve the quality of post-AMI care in Poland, we aimed to (i) evaluate the changes in HRQOL after AMI using three different standardized questionnaires, validated in the Polish population (11–13), and (ii) determine the clinical variables which affect HRQOL after AMI.

2 MATERIALS AND METHODS

2.1 Study design

We prospectively evaluated HRQOL in 60 patients admitted to the hospital (academic, regional referral centre with a 24-hour interventional cardiology service) due to the first AMI and participating in the AFFECT EV Quality of Life Substudy (14). The study protocol, designed in compliance with the Declaration of Helsinki, was approved by the Ethics Committee of Medical University of Warsaw (approval number: KB/112/2016) and published previously (15).

2.2 Target populations and sampling

All participants provided written informed consent. Study inclusion and exclusion criteria are listed in Table 1. Patients were eligible for enrolment if they (i) were admitted to the hospital due to the first ST-segment elevation of acute myocardial infarction (STEMI) or non-STEMI (NSTEMI) qualified for early invasive revascularisation, and (ii) underwent percutaneous coronary intervention (PCI) with stent implantation. STEMI was diagnosed based on persistent ST-segment elevation of at least 0.1 mV in at least two contiguous electrocardiography leads or a new left bundle-branch block (16). NSTEMI was diagnosed as ST-segment changes on ECG including ST depression, transient ST elevation and T-wave changes, along with a positive cardiac troponin test indicating myocardial necrosis in patients with the typical anginal chest pain (17).

2.3 Study population

Between January 2017 and June 2018, 60 patients were enrolled, and 56 patients were included in the final analysis (mean age 64.3±9.7 years, 75% male). The study flow chart is showed in Figure 1. Four patients did not attend the follow-up visit after 6 months and were excluded from the study.

Table 1. Eligibility criteria for the study evaluating the health-related quality of life after first-time acute myocardial infarction in Poland.

Inclusion criteria	Exclusion criteria
• Age ≥ 18 years • Informed consent to participate in the study • First ST-elevation myocardial infarction (STEMI) or non-STEMI • PCI with stent implantation • Capability to fill-in the quality-of-life questionnaires alone or under supervision	• Cardiogenic shock • Severe chronic renal failure (eGFR<30 mL/min) • Severe liver insufficiency (Child-Pugh C) • Autoimmune disease • Active neoplasm • Known pregnancy, breast-feeding, or intention to become pregnant during the study period

Legend: AMI – acute myocardial infarction; eGFR – estimated glomerular filtration rate; PCI – percutaneous coronary intervention
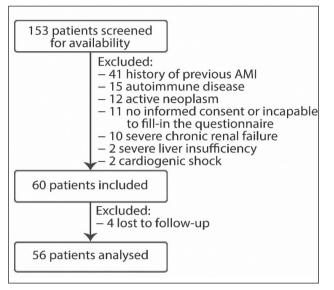
Figure 1. Study inclusion and exclusion chart. AMI – acute myocardial infarction.

2.4 Data collection procedure

Patients' baseline and clinical data were extracted from medical records. Before discharge, patients underwent echocardiography. All patients received standard treatment after AMI according to the guidelines, depending on the individual clinical characteristics and comorbidities. All patients who qualified for a cardiac rehabilitation were involved in the rehabilitation program. HRQOL was assessed during the index hospitalization and after 6 months using the following standardised questionnaires: (i) MacNew Heart Disease, (ii) World Health Organization Quality of Life (WHOQOL) BREF and (iii) Short Form (SF) 36 Health Survey. All questionnaires have been validated in the Polish population (11-13). The same two investigators (K.P. and A.Ć.) obtained questionnaire data during the index hospitalisation and follow-up.

The MacNew Heart Disease survey was designed to evaluate symptoms and well-being levels in patients with symptomatic coronary artery disease and with HF (18) after AMI. It consists of 27 questions grouped into 3 domains: physical, mental, and social. In addition, the global HRQOL is calculated as the sum of points from the 3 domains. The license was obtained from MacNewTM (Innsbruck, Austria).

The WHOQOL BREF evaluates general QOL and covers 4 domains: physical health, psychological health, social relationships, and environmental stability (19). It consists of 26 items referring to energy and fatigue, mobility, self-esteem, social support, and financial resources. The questionnaire was obtained as a courtesy of the Prof. Krystyna Jaracz (Department of Neurological and Psychiatric Nursing, Poznan University of Medical Sciences, Poznan, Poland).

The SF-36 Health Survey consists of 36 questions grouped into 8 domains, including general health, physical functioning, limitations due to physical health problems, limitations due to emotional problems, bodily pain, vitality, social functioning, and mental health (20). The questionnaire was interpreted according to the Polish version developed by Prof. Jan Tylka (21). The license was obtained as a courtesy of Dr. Krzysztof Gąsecki (Chair of Social Pedagogy and Educational Research Methodology, Faculty of Social Sciences, University of Warmia and Mazury, Olsztyn, Poland).

2.5 Observed outcomes

The primary outcome was the change in the HRQOL between the index hospitalization and 6-month follow-up using the MacNew questionnaire, which was specifically designed to evaluate QOL in patients after AMI. The secondary outcomes were the changes in HRQOL from the index hospitalization to 6 months using the WHOQOL BREF and SF-36 questionnaires. Based on the literature, we defined an improvement in the HRQOL as an improvement between the index hospitalisation and follow-up of at least 1 unit in the MacNew questionnaire and at least 10 units in the WHOQOL BREF and SF-36 questionnaires (22-24).

2.6 Explanatory factors

To determine the clinical variables which potentially affect HRQOL after AMI, we collected data regarding the following explanatory factors: demographics (age, gender), BMI, diagnosis at admission, cardiovascular risk factors (smoking, hypertension, dyslipidaemia, diabetes), laboratory parameters at admission (creatinine, haemoglobin level, low-density lipoprotein-cholesterol concentration, platelet count, troponin I concentration), left ventricle ejection fraction (LVEF) at admission, pharmacotherapy at discharge and attendance to cardiac rehabilitation.

2.7 Methods of analysis

The sample size was calculated by a two-sided t-test at a significance level of 0.05 using the following assumptions: (i) mean difference between the timepoints=1, (ii) standard deviation (SD) at the index hospitalisation and follow-up±1.5, and (iii) nominal test power=0.9. Based on this sample size estimation, a total of 49 patients should be enrolled in the study to observe a significant difference in the HRQOL between the index hospitalization and 6-month follow-up. Taking into account that up to 20% of patients could be potentially lost during follow-up, 60 patients were included in the study.

We conducted statistical analysis using IBM SPSS Statistics, version 27.0. Categorical variables were presented as numbers and percents. The Shapiro–Wilk test was used

to test for normal distribution of continuous variables. Continuous variables were presented as a mean and standard deviation, or as a median with inter-quartile range. Differences in quality of life between the two time points were assessed using the Wilcoxon signed rank test. Characteristics of patients with and without altered HRQOL after AMI in each of the three questionnaires were compared using the Mann-Whitney U test (continuous variables) and Chi-square test (categorical variables). The logistic regression model was performed manually (step-by-step), where HRQOL was used as a dependent variable and variables, which significantly differed between patients with and without altered HRQOL at 6 months and which were predictors of improved HRQOL in univariate analysis were used as independent variables. The area under receiver operating characteristic (AUC under ROC) curve was used to determine the cut-off of continuous variables associated with altered HRQOL. Mortality and other adverse events were reported descriptively. For univariate analysis,

a p-value below 0.1 was considered significant. For all other analyses, a p-value below 0.05 was considered significant.

3 RESULTS

3.1 Description of the study group

Patient characteristics are presented in Table 2. Of 56 patients included in the analysis, 61% had arterial hypertension, 23% suffered from diabetes mellitus, 64% had dyslipidaemia and 52% were smokers. At admission, 79% of patients were presented with STEMI. All patients had a successful PCI with at least 1 stent implantation. The median LVEF post-PCI was 52% (27-68%). All patients received dual antiplatelet therapy and statin and more than 90% of patients received a ß-blocker and an angiotensin-converting enzyme inhibitor or an angiotensin receptor blocker. Until the 6-month follow-up, there were no deaths and no recurrent thrombotic events during the study, neither in STEMI nor in NSTEMI patients.

Table 2. Comparison of baseline characteristics between patients with improved and without improved health-related quality of life, as assessed by Short Form-36 Health Survey. P-value<0.05 is considered significant.

Inclusion criteria	All patients (n=56)		QoL improved (n=26)		QoL not improved (n=30)		p
Characteristic							
Age, years – mean (SD)	64.3	9.7	63.2	8.6	65.2	10.7	0.593
Male gender – n (%)	42	75%	21	80%	21	70%	0.353
BMI – n (range)	**28.5**	**20.3-30.2**	**29.0**	**20.0-34.7**	**27.1**	**20.3-30.2**	**0.046**
STEMI at admission – n (%)	44	79%	22	84%	22	73%	0.305
LVEF, % – median (range)	**52**	**27-68**	**50**	**27-58**	**55**	**35-68**	**0.013**
CV risk factors – n (%)							
Arterial hypertension	34	61%	16	0.62%	18	60%	0.906
Diabetes mellitus	13	23%	7	27%	6	20%	0.541
Dyslipidaemia	**36**	**64%**	**20**	**76%**	**16**	**53%**	**0.046**
Smoking	29	52%	13	50%	16	53%	0.803
Laboratory parameters							
Creatinine, mg/dl – median (range)	0.95	0.33-1.65	0.94	0.55-1.51	0.95	0.33-1.65	0.966
Hb, g/dl – median (range)	13.8	10.2-17.5	13.9	11.3-17.5	13.9	10.2-16.0	0.698
LDL-C – median (range)	122	53-218	124	69-197	122	65-218	0.928
NT-proBNP – median (range)	764	127-12708	962	146-4942	386	127-12708	0.153
Plt count, 10^3/µl – median (range)	230	111-453	236	131-352	230	172-281	0.533
TnI, ng/ml – median (range)	13.0	0.4-685	20.3	0.5-685	11.4	0.4-236	0.457
Pharmacotherapy at discharge – number (%)							
Aspirin	56	100%	26	100%	30	100%	1.000
P2Y12 inhibitor	56	100%	26	100%	30	100%	1.000
Statin	56	100%	26	100%	30	100%	1.000
ß-blocker	51	91%	25	96%	26	87%	0.214
ACE-inhibitor or ARB	54	96%	25	96%	29	97%	0.918
Diuretics	13	23%	7	27%	6	20%	0.541
Aldosterone antagonists	14	25%	6	23%	8	27%	0.757
Cardiac rehabilitation – number (%)	44	79%	22	84%	22	73%	0.305

Legend: ACE: angiotensin-converting enzyme; ARB: angiotensin-receptor blockers; BMI: body mass index, weight in kilograms divided by square of the height in meters; CRP: C-reactive protein; Hb: haemoglobin; IQR: interquartile range; LDL-C: low-density lipoprotein-cholesterol; LVEF: left ventricle ejection fraction; NSTEMI: non-ST-segment elevation myocardial infarction; NT-proBNP: N-terminal pro-b-type natriuretic peptide; Plt: platelets; SD: standard deviation; STEMI: ST-segment elevation myocardial infarction.

3.2 Observed outcomes

Figure 2 shows the changes in HRQOL between the index hospitalization and follow-up visit at 6 months. Whereas global, social, and physical functioning did not change (p≥0.063), whereas emotional functioning improved after AMI (p=0.002), as measured by the MacNew questionnaire. Physical health, psychological health, and environmental functioning did not change (p≥0.321), whereas social relationships improved after AMI (p=0.042), as measured by WHOQOL BREF. The global HRQOL improved after AMI (p=0.044), as assessed by SF-36.

Patients with improved HRQOL in SF-36 had a higher baseline BMI (p=0.046), often with dyslipidaemia (p=0.046) and lower LVEF at discharge (p=0.013), compared to patients without improved HRQOL in SF-36. There were no significant differences between the characteristics of patients with and without improved HRQOL after AMI when administering the MacNew (emotional functioning) and WHOQOL BREF (social relationships) surveys.

3.3 Results of univariate analysis

Table 3 shows the results of univariate analysis for prediction of improved HRQOL in SF-36 using explanatory factors. BMI, left ventricle EF<50% and dyslipidaemia predicted improved HRQOL at p<0.1 (odds ratio [OR] 5.094, 95% confidence interval [CI] 0.987-1.269, p=0.080 for BMI; OR 5.863, 95% CI 1.441-23.851, p=0.013 for LVEF<50%; OR 2.917, 95% CI 0.914-9.309, p=0.071 for dyslipidaemia, respectively)

3.4 Results of multivariate analysis

Table 4 shows the results of multivariate logistic regression including clinical variables which differed between patients with and without improved QOL in SF-36 and which were predictors of improved QOL in univariate analysis. EF was the only variable independently associated with improved QOL in multivariate analysis (OR 4.463, 95% CI 1.045 - 19.059, p=0.043). The cut-off for EF associated with improved HRQOL determined based on the ROC curve was 50% (AUC 0.70, CI 0.56-0.84, p=0.013).

4 DISCUSSION

The main finding of this study is that HRQOL increased 6 months after the first AMI, especially in terms of emotional functioning and social relationships. We also found that patients with improved HRQOL in SF-36 had a higher baseline BMI, more often had dyslipidaemia, and more often had LVEF<50% compared to patients without improved HRQOL, indicating that patients with more comorbidities before AMI have a large chance for improved QOL after AMI. Finally, we showed that LVEF<50% was the only variable independently associated with improved HRQOL in multivariate analysis, increasing the odds of improved HRQOL 4.5-fold.

The MacNew Heart Disease (Panel A), WHO Quality of Life-BREF (Panel B), and Short Form (SF) 36 Health Survey (panel C). Data are expressed as median and interquartile range and compared using Mann-Whitney U test. P-value<0.05 is considered significant.
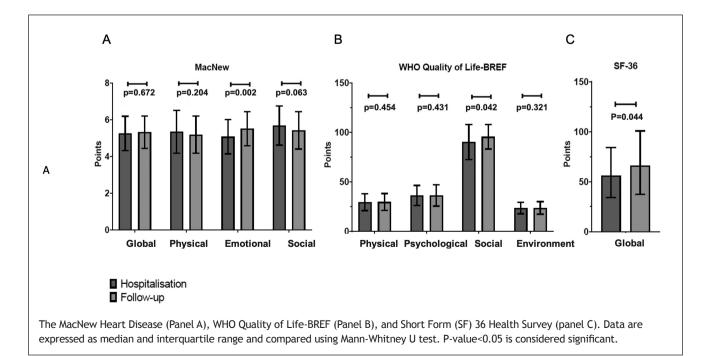
Figure 2. Changes in health-related quality of life from the index hospitalisation due to acute myocardial infarction up to a 6-month follow-up assessed with three questionnaires in 56 patients.

Table 3. Results of univariable logistic regression analysis for prediction of improved quality of life, as assessed by Short Form-36 Health Survey. P-value<0.1 is considered significant.

Variable	OR	95% CI		p-value
		Lower	Upper	
Baseline characteristics				
Age, years	0.978	0.925	1.033	0.424
Gender	0.556	0.159	1.938	0.356
BMI	**1.119**	**0.987**	**1.269**	**0.080**
STEMI at admission	0.500	0.131	1.905	0.310
LVEF<50%	**5.863**	**1.441**	**23.851**	**0.013**
CV risk factors				
Arterial hypertension	1.067	0.364	3.128	0.906
Diabetes mellitus	1.474	0.424	5.121	0.542
Dyslipidaemia	**2.917**	**0.914**	**9.309**	**0.071**
Smoking	0.875	0.306	2.504	0.803
Laboratory parameters				
Creatinine	1.328	0.150	11.771	0.799
Hb	1.221	0.799	1.865	0.356
LDL-C	0.999	0.984	1.013	0.873
NT-proBNP	1.000	1.000	1.000	0.976
Plt count	0.996	0.988	1.005	0.389
TnI	1.003	0.996	1.010	0.425
Pharmacotherapy at discharge				
Aspirin	0.959	0.867	1.014	0.593
P2Y12 inhibitor	1.320	0.833	2.093	0.238
Statin	0.998	0.990	1.006	0.551
ß-blocker	3.846	0.402	36.822	0.243
ACE-inhibitor or ARB	0.862	0.051	14.506	0.918
Diuretics	1.474	0.424	5.121	0.542
Aldosterone antagonists	0.825	0.244	2.793	0.757
Cardiac rehabilitation – number (%)	1.010	0.986	1.034	0.432

Table 4. Results of multivariable logistic regression analysis for prediction of improved quality of life (QOL) 6 months after AMI, as assessed by Short Form-36 Health Survey, including explanatory factors which significantly differed between patients with and without improved QOL and which were predictors of improved QOL in univariate analysis.

Variable	OR	95% CI		p-value
		Lower	Upper	
BMI	1.096	0.958	1.255	0.180
Dyslipidaemia	1.921	0.544	6.786	0.310
EF<50%	**4.463**	**1.045**	**19.059**	**0.043**

Legend: BMI: body mass index, CI: confidence interval; EF: ejection fraction, OR: odds ratio.

Improved quality of life 6 months after an AMI is contradictory to the common view that AMI might decrease the quality of life, which has been found in previous studies (25-28). In line with our results, other authors also found that HRQOL improves one year after the first AMI in 587 patients, as assessed by SF-36 and Euro Quality of Life questionnaires (22). Similarly, a study comprising 534 patients showed gradual improvement in HRQOL up to 4 years after AMI, as assessed by Quality of Life after Myocardial Infarction questionnaire (23). Finally, a recent meta-analysis of 29 studies demonstrated a significant improvement of QOL in acute coronary syndrome patients regardless of the medical therapy administered (PCI, coronary artery bypass grafting and pharmacotherapy) (24). Altogether, QOL seems to improve in Polish patients after AMI, similar to patients from other European countries and the US.

Whereas in our study the HRQOL increased, especially in terms of emotional functioning and social relationships, most previous studies found an increase in the overall QOL (22-24). This discrepancy might be due to our study's smaller sample sizes compared to previous studies, or the differences in sensitivity among the MacNew and WHOQOL BREF fields. It was postulated that the MacNew questionnaire is more likely to identify changes in the emotional field than in other domains (29). In addition, previous data showed that anxiety tends to decrease in the months following AMI, which might be due to the fact that patients start to cope with their diagnosis and adjust to the new situation (30). Although we had no specific questionnaire targeting anxiety, decreased anxiety likely contributes to the improved emotional and social aspects of QOL after AMI.

In our study, patients with improved HRQOL had a higher baseline BMI, often with dyslipidaemia and often with LVEF<50%. These findings might be explained by the fact that initially more morbid patients might undergo more intense ambulatory care for secondary prevention of CVD. However, in absence of reliable data to confirm this explanation, it remains a hypothesis. Also, data regarding the association between BMI/ dyslipidaemia and HRQOL are conflicting. Whereas some authors found a gradual decrease of QOL with increasing BMI (31), especially in women (32), others showed that the relationship between BMI and HRQOL is affected by gender and age (33). Noteworthy, in a study including 21,218 patients, it was found that class I obesity was associated with better HRQL scores, as assessed by SF-36, compared to underweight, normal weight, overweight, and class II obese patients, which has been termed the "obesity paradox" (34). Similarly, in some studies patients with dyslipidaemia tended to have a higher overall HRQOL, as assessed by SF-36 (26), whereas other studies demonstrated lower QOL in dyslipidaemic patients due to increased rates of pain, discomfort, and depression (35).

Finally, in our study LVEF<50% was the only independent predictor of improved HRQOL after AMI. Since LVEF<50% is a diagnostic criterion for HF with mid-range EF (40-49%) or HR with reduced (<40%) EF (36), it is likely that patients with LVEF<50% received more intensive medical therapy to improve their prognosis and reduce HF symptoms (37), which translated into better HRQOL (38, 39). In the absence of confirmatory data, this explanation remains a hypothesis.

4.1 Limitations

The main limitation of our study is its single-centre design, which might limit the generalizability of the results. Since our hospital is an academic, regional referral centre, our results might not be applicable to smaller centres without 24-hour interventional cardiology services. Secondly, the small sample size might increase the risk of potential enrolment bias. Thirdly, the observational study design does not allow any conclusions to be drawn regarding causality when identifying the possible improvement or decline of HRQOL predictors over time. Moreover, the present study was a substudy of the AFFECT EV study (14), wherefore the inclusion and/or exclusion criteria may have influenced the results. Thus, the applicability of the results to a general post-AMI population remains limited. Although we sought to collect thorough clinical data, the information on accompanying psychiatric disorders was limited. In addition, the data regarding the changes in LVEF over time was not collected, which could have influenced the QOL. Also, the patients' social networks, which were not taken into consideration, may have had an impact. Finally, our logistic regression model is based on only 56 patients and included 3 variables, which makes it hypothesis-generating. Altogether, the results should be interpreted with caution and re-evaluated in future studies.

4.2 Importance of the study and suggestions for future research

The results showing improvement of QOL in Poland after AMI enable the cautious conclusion to be drawn that Poland's interventional treatment and early implementation of cardiac rehabilitation results in similar effects among Polish patients after AMI, as observed in other European countries and the US (22-24). Our results exhibit a need for well-designed studies concerning the association between different clinical variables and QOL after MMI, as extant published studies provide inconsistent results.

The optimistic observations regarding the increase in QOL are most probably attributable to the availability of 24-hour interventional cardiology service. However, one should not forget the importance of providing first aid in a timely manner, which greatly influences the prognosis of the patient undergoing AMI, and consequently QOL post-AMI (40). Therefore, even in presence of well-developed

infrastructure and well-established algorithms in patients after AMI, large-scale education programmes are indispensable for further improving QOL after AMI (41).

5 CONCLUSIONS

Patients admitted to the reference cardiology centre in Poland due to their first AMI experienced an increase in HRQOL 6 months after AMI, especially in terms of emotional functioning and social relationships, confirming the recent trends demonstrated in other developed countries.

CONFLICT OF INTEREST

The authors declare that no conflicts of interest exist.

FUNDING

ETHICAL APPROVAL

The study was approved by the Ethics Committee of Medical University of Warsaw (approval number: KB/112/2016).

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