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FACTORS INFLUENCING THE RETURN TO THE PROFESSIONAL ACTIVITY IN PATIENTS HOSPITALIZED FOR MYOCARDIAL INFARCTION: A SINGLE CENTRE EXPERIENCE – PILOT STUDY

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Abstract

Background: Cardiovascular diseases, with myocardial infarction (MI) on the leading position, remain a serious health care issue and socio-economic burden. Nevertheless, factors influencing the return of patients to the professional activity are not fully understood. Cardiac rehabilitation may have a positive impact on the return to professional activity after MI. However, no study among participants in the comprehensive care after myocardial infarction (CCMI) model (in Polish: "KOS-zawał") evaluated this issue so far. The aim of the study was to evaluate factors influencing the return to work and duration of the sick leave after MI among patients who participated in the CCMI in a single reference cardiology centre in Poland. **Material and Methods:** In total, 144 patients were screened retrospectively. Out of them, 105 were included in the analysis. All patients were treated with direct percutaneous coronary intervention according to current European Society of Cardiology guidelines and participated in cardiac rehabilitation within the CCMI program, therefore had been provided optimal and modern therapeutic approach. Data was collected based on patients' medical records and information furnished by the insurer. **Results:** Out of 105 patients analysed, 93 (88,6%) returned to work. A positive predictor of returning to work was male sex. Predictors of a prolonged return to work were older age and female sex. Completing rehabilitation, anthropometric factors, biochemical factors or results of post-MI echocardiographic examination did not influence the return to professional activity. **Conclusions:** A relatively large percentage of patients after MI and in the CCMI program returns to professional activity. Main factors of prolonged sick leave are older age and female sex. Med Pr Work Health Saf. 2024;75(6):501–510

Key words: rehabilitation, professional activity, return to work, myocardial infarction, sick leave, cardiac rehabilitation

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INTRODUCTION

Cardiovascular diseases (CVD), particularly ischemic heart disease and myocardial infarction (MI) persist as a societal challenge and economic burden. In the European Union >1.8 million people die every year as a result of CVD, accounting for 36% of all deaths, many of them being premature (<65 years) [1]. Median (Me) age of MI is 63 years in men and 74 years in women [2]. With >70 000 new cases of MI in Poland every year, CVD accounts for one-fourth of all deaths in the working-age population [3]. Regarding this data, CVD occurs before reaching the retirement age for men in Poland and is one of the leading causes of sick leave, estimated by the Polish insurance system [4]. According to European Society of Cardiology (ESC) statistics 67–93% of post-acute myocardial infarction (AMI) patients return to work within 3 months [5,6]. This noticeably large discrepancy in data indicates the need for further investigation into this topic. The rate and timing of the return to work after ST elevation myocardial infarction (STEMI) are important, as there are consequences in terms of the qual-

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ity of life of the individual patient as well as economic consequences for both the individual and the society [7].

In the current ESC guidelines, cardiac rehabilitation was granted the highest class of recommendation and the highest level of credibility as a highly effective and preferable method of treatment in patients with acute coronary syndrome (ACS) [8]. Lately, it was also proved as one of the statistically significant predictors of a return to work among American cardiac patients [9] yet there is no study conducted among participants of the comprehensive care after myocardial infarction (CCMI) model concerning this matter. Comprehensive care model after MI was implemented in Poland in 2017 in order to optimise comprehensive patient care in the first 12 months after MI. The program aims to improve the prognosis of post-MI patients and enable quick return to the pre AMI quality of life; these goals are achieved by providing patients with systematic specialised medical care in the first year after MI such as being under the supervision of a cardiologist (3 visits), 6-weeks cardiac rehabilitation program, dietetic and psychologic advisory. Cardiac rehabilitation should be implemented as soon as possible, be continuous, and consist of many stages, typically early rehabilitation, in the second stage either inpatient or ambulatory rehabilitation, and finally constant follow-up and monitoring.

In most of the studies, the patient's return to occupational activities has been considered to be the measure of effectiveness of the medical therapy and cardiac rehabilitation. It was found that the individuals returning to work after MI not only had a longer lifetime span but were also less likely to develop recurrent cardiac incidents or cardiovascular abnormalities [10].

A successful return to work after MI depends on numerous variables. Factors leading to the early return to occupational activity are diverse, including the effectiveness of treatment in the first hours and days after MI, post-hospital care and rehabilitation, comorbidity as well as plenty of social agents. These social factors differ across populations and include such as gender, education, type of occupation, treatment methods and regional labour law. Numerous studies were conducted to ascertain these factors, yet none of them was performed on the population of post-AMI patients taking part in CCMI program [11–15].

This study is regarded as the first conducted in Poland among patients after MI who participated in the CCMI program, focused on the assessment of the midterm (12 months) results of this program, regarding returning to patients' professional activity. Considering that employment and professional activity among post-MI patients can benefit in improvement in patients' life quality and improvement of the socio-economic situation in Poland.

MATERIAL AND METHODS

Study population

Between August 2021 and July 2023, 144 consecutive patients following MI treatment in 1 cardiology department were screened retrospectively, following this inclusion and exclusion criteria.

Inclusion criteria:

- patients treated for MI (both STEMI and non-ST elevation myocardial infarction [NSTEMI]) diagnosed on the basis of ESC criteria and treated with percutaneous coronary angioplasty according to the standards for the treatment of MI, ≥12 months before the study,
- hospitalization in 1 cardiology centre,
- professional activity prior to the MI,
- enrolment and eligibility for the CCMI.

Exclusion criteria:

- being unemployed prior to the MI or lack of data from the insurer about the employment,
- treatment for ACS with methods other than percutaneous coronary intervention (PCI),
- another hospitalization during the CCMI program,
- other diseases during CCMI prolongating the sick leave, not related to cardiovascular disease.

All the participants included in this study were diagnosed with MI (according to ESC criteria [8]) and treated with percutaneous coronary angioplasty according to the standards for the treatment of MI. Of these, 39 patients were excluded from the study, as they were not professionally active before MI.

All the patients completed early in-hospital (first stage) rehabilitation program; 87% (N = 91) participated in the CCMI cardiac rehabilitation program, which included second stage of ambulatory cardiac rehabilitation. The qualification visit for further rehabilitation took place no later than 2 weeks after discharge from the hospital. During the visit, cardiologist performed a medical interview and physical examination, reviewed the hospital treatment information card, and performed a treadmill exercise test according to the Bruce protocol. Based on the physical capacity assessed during the exercise test and the risk of cardiac events, the patient was qualified for 1 of 3 rehabilitation models (A, B, or C) and an individual level of exercise intensity was determined (Karvonen method). Depending on the selected reha-

bilitation model, the patient underwent a rehabilitation cycle lasting 24 consecutive days (excluding weekends). Initially, interval training sessions monitored by ECG and blood pressure measurements on cycloergometers were performed for 10 or 14 consecutive days. The next 10 or 14 days were general fitness exercises in the gym and in the pool, including breathing, stretching, and relaxation exercises. During this time, resistance training was also conducted 2–3 times a week, engaging different muscle groups. In the middle of the rehabilitation cycle, a monitoring cardiology visit took place. During the visit the patient's health and exercise tolerance were assessed by cardiologist. An electrocardiogram and laboratory tests were performed. During the rehabilitation, the patient had a consultation with a psychologist, dietitian, and attended a lecture on health promotion. After the rehabilitation cycle was completed, the patient was subject to another medical assessment by cardiologist and had an exercise test on a mechanical treadmill performed.

Comprehensive care model after MI is a Poland's National Health Fund and Ministry of Health program of comprehensive care for patients after MI. The program has 4 core modules: I – hospitalization and acute intervention according to ESC guidelines, II – cardiac rehabilitation, III – implantation of implantable cardioverter defibrillator or chronic resynchronization therapy in eligible subjects, and IV – 12 months of scheduled outpatient cardiology care (≥4 visits over 12 months) [16].

In total, 105 patients met the inclusion and exclusion criteria. Among them, there was 90 males and 15 females. The age of MI in women is Me = 74 years, and according to the Polish legislation system, the retirement age for females is 60 years. Therefore, few of them met the inclusion criteria. Data on the date of MI, duration of hospitalization and sick leave, type of work, participation in the cardiac rehabilitation, comorbidity [diabetes mellitus (DM), hypertension and history of MI] as well as the MI treatment details were collected from the medical records and insurer. All patients returning to professional activity within 6 months since MI were considered successfully returned to work based on the average time of return to professional activity based on ESC guidelines [5,6].

Laboratory assessment

Troponin I was measured at the time of admission, the reference range was <34 ng/l. Creatinine, low-density lipoproteins (LDL), high-density lipoproteins (HDL), total cholesterol, triglyceride, glucose, haemoglobin A_{1c} (HbA_{1c}) and haemoglobin (Hb) were measured on the first day after admission. The reference ranges were as follows: creatine (0.5–1.0 mg/dl for women and 0.7–1.25 mg/dl for men), LDL (assessed accordingly to the ESC guidelines [17]), HDL (<40 mg/dl), total cholesterol (<180 mg/dl), triglyceride (<150 mg/dl), glucose (70–99 mg/dl), HbA_{1c} (<6.5%), Hb (11.2–15.7 g/dl for women and 13.7–17.5 g/dl for men). Plasma N-terminal prohormone of brain natriuretic peptide (NT-proBNP) concentration was measured from venous blood samples collected at the third day after MI, during hospitalization. The analytic measurement range for NT-proBNP was 39.2–5408.5 pg/ml.

Echocardiographic evaluation and exercise stress-testing

Echocardiographic was analysed based on the first echocardiography after MI performed at the second day after MI. All studies were performed by 1 echocardiographist. During the echocardiographic examination left ventricle ejection fraction (LVEF), left ventricular diastolic diameter (LVdD), left atrial area (LAA) and left atrial diameter (LAD) were assessed. Examination was performed based on standard procedures described in the *Recommendations for the Evaluation of Left Ventricular Diastolic Function by Echocardiography* authored by American Society of Echocardiography and European Association of Cardiovascular Imaging [18]. Metabolic equivalent of task (METs) was assessed before CCMI during the baseline hospitalization and after CCMI within 5–12 months after MI, as part of CCMI participation, based on exercise stress-testing.

Statistics

The variables were checked for data normality using the Shapiro-Wilk test. Descriptive analyses included the calculations of mean and standard deviation (SD) for normally distributed variables or median (Me) and interquartile range (IQR) for non-normally distributed continuous variables and frequencies (percentages) for categorical variables. The analysis of categorical variables was performed with the use of the χ^2 test or the Fisher exact test if the number of observations was <5. For continuous variables Student's test and Mann-Whitney U test were applied. Spearman's and Pearson's correlation coefficients were used to assess the association between patients' characteristics and the duration of sick leave. Statistical significance was defined as $p < 0.05$. The data was analysed with the SPSS v. 29.0.0.0 (IBM SPSS Statistics program; IBM Corporation, Armonk, USA).

Ethics

This study was conducted according to the guidelines laid down in the Declaration of Helsinki and all procedures involving patients were approved by the local Ethic Examining Committee of Human Research (Decision of Approval: AKBE/291/2022).

RESULTS

The study population subjected to the final analysis consisted of 105 patients aged M±SD 53.7±7 years, 90 males (86%). Among the study population, 91 patients (87%) completed CCMI. The mean duration of hospitalization was 4 days and the duration of sick leave was 83 days. Study group characteristics are shown in Table 1. Out of the 105 patients, 93 (88.6%) returned to work. Men more often returned to work than women (N = 82, 91% vs. N = 11, 73%, p = 0.045) (Table 2). Women presented longer duration of sick leave compared to men, 106 days (Q_1 = 82; Q_3 = 201) vs. 76 days (Q_1 = 76; Q_3 = 150), respectively, p = 0.026 (Table 3). In participants >53.7 years duration of sick leave Me = 102 days (Q_1 = 58.5; Q_3 = 169), in patients <53.7 years Me = 72 days (Q_1 = 54; Q_3 = 106), p = 0.008. There was observed a trend towards longer duration of sick leave among diabetic patients Me = 103 days (Q_1 = 64; Q_3 = 196) vs. 78 days (Q_1 = 54; Q_3 = 156), p = 0.09. Out of the clinical and laboratory data analysed, age and glycated haemoglobin (HbA_{1c}) concentration were associated with significantly longer duration of sick leave, R = 0.268, p = 0.008 and ρ = 0.253, p = 0.015, respectively (Table 4). No significant difference was observed in terms of completing CCMI, type of MI, history of MI, hypertension, exercise capacity (expressed as METs before or after CCMI), the type of work performed, body weight, BMI, LVEF, LVdD, LAD, LAA, as well as other laboratory data analyzed including NT-proBNP and high sensitivity troponin I.

In a subgroup analysis of 45 patients with data available on the type of work performed, there was found that there is no association between the type of work performed and the duration of the sick leave (p = 0.63); 20 (44%) of patients performed physical job and 25 (56%) desk job. Participants of this study represented various professions including transportation (N = 2, 4%), education (N = 1, 2%), commerce (N = 13, 29%), agriculture (N = 3, 6%), construction (N = 12, 27%), clerical work (N= 9, 20%) and production (N = 5, 11%).

In order to gain a deeper understanding of the relationship between the differences in the rate of return to work among men and women, a comprehensive analysis comparing these 2 subgroups (Table 5) was performed. The data analysis showed no statistically significant differences between patients male and female in terms of type of MI, history of MI, DM or hypertension, exercise tolerance before or after CCMI, the type of work performed, body weight, BMI, LVEF, LVdD, LAD, LAA, NT-proBNP and concentration of troponin I, creatinine and Hb in the venous blood samples.

DISCUSSION

This is considered the first study evaluating the influence of various factors on return to professional activity and duration of the sick leave among patients after MI, who completed the cardiac rehabilitation program.

In the study population, 88.6% of patients after MI participating in the CCMI returned to the professional activity. Patients' return to professional activity can be considered as a measure of effectiveness of medical therapy as well as a valuable tool for assessing the outcomes of patient's participation in the CCMI program. The ESC guidelines mention the average time of return to professional activity after MI is 3 months [19], which aligns with the data, where the duration of the sick leave in the study group was Me = 83 days.

According to ESC guidelines return to work after AMI is an important indicator of recovery [19]. It affects not only patients' psychophysical condition but also can become an important factor considering both individual and social aspects. Employment and professional activity among post-AMI patients can bring benefits to improvement in patients' life quality and of socioeconomic situation in Poland [10]. Halawa [20] reports that in the 1980's 83–87% of patients returned to professional activity, depending on the country. However, Malina [21] in study from 1996 describes that only 43% of patients started working again. In the study from 2009 Waszkowska [10] reports 63.2% of patients returning to occupational activity. Another study from France, conducted in 2009, also presents 76% of the study group getting back to work [7]. According to ESC statistics 67–93% post-AMI patients return to work within 3 months [5,6]. In the study group, a relatively high percentage of patients returning to work was observed, which may result from the relatively young age of the study group (M = 53.7 years old), given that the established retirement age in Poland is 65 years old.

The results should also be interpreted taking into account the socio-economic context. The decision to return

Table 1. Population characteristics of 105 consecutive patients following myocardial infarction (MI) treatment in 1 cardiology department were screened retrospectively, Department of Internal Medicine, Cardiology and Hypertension, Medical University of Warsaw, Mazowiecki Szpital Bródnowski, Warsaw, Poland, August 2021 – July 2023

Variable	Participants (N = 105) [n (%)]	M±SD	Me (Q_1; Q_3)
Socio-economic			
age [years]		53.7±7	
sex			
male	90 (86)		
female	15 (14)		
Medical			
BMI [kg/m^2]			28.8 (26.5; 31.9)
body weight [kg]			89.9 (81.5; 97.3)
myocardial infarction			
history (yes)	11 (10.5)		
type (STEMI)	56 (54)		
diabetes mellitus (yes)	21 (20)		
hypertension (yes)	75 (71)		
participation in CCMI (yes)	91 (87)		
duration of hospitalization [days]			4 (3; 4)
duration of sick leave [days]			83 (56; 158)
METs			
before CCMI			7 (7; 7.4)
after CCMI			10.2 (10; 13.3)
baseline echocardiographic parameters			
LVEF [%]		48.87±7.4	
LVdD [cm]		5±0.5	
LAD [cm]			4.1 (3.8; 4.4)
LAA [cm^2]		23.8±4.9	
baseline laboratory parameters			
troponin I [ng/l]			2704 (490; 13 397)
NT-proBNP [pg/ml]		416±311	
Hb [g/dl]		14.8±0.12	
creatinine [mg/dl]		0.85±0.2	
lipid panel [mg/dl]			
cholesterol			
total		184.9±4.5	
LDL		120.44±4.5	
HDL			37 (33; 46)
triglycerides			134.5 (72.25; 215.75)
glucose [mg/dl]			113 (98; 139)
HbA_{1c} [%]			5.4 (5.2; 5.7)

CCMI – comprehensive care after myocardial infarction, Hb – haemoglobin, HbA_{1c} – haemoglobin A_{1c}, HDL – high-density lipoproteins, LAA – left atrium area, LAD – left atrial diameter, LDL – low-density lipoproteins, LVdD – left ventricular diastolic diameter, LVEF – left ventricular ejection fraction, METs – metabolic equivalent of task, NT-proBNP – N-terminal prohormone of brain natriuretic peptide, STEMI – ST elevation myocardial infarction.

Table 2. Clinical characteristics by groups of patients who returned to work and those who did not return to work – the study on 105 consecutive patients following myocardial infarction (MI) treatment in 1 cardiology department were screened retrospectively, Department of Internal Medicine, Cardiology and Hypertension, Medical University of Warsaw, Mazowiecki Szpital Bródnowski, Warsaw, Poland, August 2021 – July 2023

Variable	Participants (N = 105)						p
	return to work (N = 93) [n (%)]	M±SD	Me (Q_1; Q_3)	no return to work (N = 12) [n (%)]	M±SD	Me (Q_1; Q_3)	
Socio-economic							
sex							0.045
male	82 (88)			8 (67)			
female	11 (12)			4 (23)			
age [years]		53.3±7.5			56.7±6.1		0.14
type of job							0.20
desk	24 (56)			1 (25)			
physical	17 (44)			3 (75)			
Medical							
body weight [kg]			90 (82; 97)			85 (75; 97.5)	0.26
BMI [kg/m^2]			28.8 (26; 31.9)			28.7 (27; 32.3)	0.96
participation in CCMI (yes)	81 (89)			12 (86)			0.71
myocardial infarction							
history	10 (11)			1 (8)			0.8
type							0.96
STEMI	50 (54)			6 (55)			
NSTEMI	43 (46)			5 (45)			
diabetes mellitus	18 (19)			3 (25)			0.65
hypertension	66 (71)			9 (75)			0.77
METs							
before CCMI			7 (7; 7.4)			7 (7; 7)	0.62
after CCMI			10.3 (10.1; 13.5)			10 (7; 12)	0.23
LVdD [cm]		5±0.5			4.8±0.6		0.17
LAD [cm]			4.1 (3.9; 4.4)			4.0 (3.8; 4.4)	0.36
LVEF							
%		48.5±7			50.3±10.1		0.41
<50%	50 (54)			4 (33)			0.17
LAA [cm^2]		23.9±5			23.6±4.2		0.86
NT-proBNP [pg/ml]		423±317			359±260		0.57

CCMI – comprehensive care model after myocardial infarction, LAA – left atrium area, LAD – left atrial diameter, LVdD – left ventricular diastolic diameter, LVEF – left ventricular ejection fraction, METs – metabolic equivalent of tasks, NSTEMI – non-ST elevation myocardial infarction, NT-proBNP – N-terminal prohormone of brain natriuretic peptide, STEMI – ST elevation myocardial infarction.

to work is often influenced not only by socio-economic factors such as age, gender, educational background and type of job but also by current law determining work conditions in the given country. A striking example of this correlation was described by Bednarzewski [11] when by the analysis of a group of Polish farmers who returned to work after AMI and concluded that 92% of self-employed farmers returned to work; at this time

Table 3. Associations between clinical characteristics and duration of sick leave-categorical variables – study on 96 consecutive patients following myocardial infarction (MI) treatment in 1 cardiology department were screened retrospectively, Department of Internal Medicine, Cardiology and Hypertension, Medical University of Warsaw, Mazowiecki Szpital Bródnowski, Warsaw, Poland, August 2021 – July 2023

Variable	Sick leave [days]	p
Sex (Me (Q_1; Q_3))		0.026
female	106 (82; 201)	
male	76 (76; 150)	
Diabetes mellitus (Me (Q_1; Q_3))		0.09
yes	103 (64; 196)	
no	78.5 (54; 156)	
Myocardial infarction		
history (Me (Q_1; Q_3))		0.28
yes	62 (49; 158)	
no	87 (58; 162)	
type (M±SD)		0.09
STEMI	122.3±13.3	
NSTEMI	94±8.9	
LVEF (Me (Q_1; Q_3))		0.36
<50%	93.5 (57; 158)	
≥50%	76 (54; 137)	

LVEF – left ventricular ejection fraction, NSTEMI – non-ST elevation myocardial infarction, STEMI – ST elevation myocardial infarction.

Table 4. Associations between clinical characteristics and duration of sick leave-quantitative variables – study on 96 consecutive patients following myocardial infarction (MI) treatment in 1 cardiology department were screened retrospectively, Department of Internal Medicine, Cardiology and Hypertension, Medical University of Warsaw, Mazowiecki Szpital Bródnowski, Warsaw, Poland, August 2021 – July 2023

Variable	Spearman's ρ	Pearson's R	p
Age	0.268		0.008
BMI		–0.05	0.62
Duration of hospitalization		0.18	0.07
LAD	0.13		0.19
LVEF	–0.11		0.26
NT-proBNP	0.10		0.41
Body weight		–0.06	0.53
LVdD	0.03		0.74
LAA	0.03		0.78
Troponin I		–0.15	0.15
Creatinine	–0.33		0.75
Hb	0.16		0.88
HbA_{1c}		0.235	0.015

Hb – haemoglobin, HbA_{1c} – haemoglobin A_{1c}, LAA – left atrium area, LAD – left atrial diameter, LVdD – left ventricular diastolic diameter, LVEF – left ventricular ejection fraction, NT-proBNP – N-terminal prohormone of brain natriuretic peptide.

this occupational group had no insurance. In the study, in a subgroup analysis of the type of work, 20 (44%) patients were physical workers and 25 (56%) desk workers. Among them, there were employees in industries such as construction and logistics, a lot of them were officials and customer service employees.

The trend observed in the study group regarding the relatively high percentage of patients returning to professional activity in the study population might result from an improvement in MI therapy, compared to previous studies. Additionally, it must be highlighted that this group of patients was particular, while being a part of CCMI, they participated in cardiac rehabilitation, which differentiates this group from other studies, and had a constant access to specialistic cardiological care and monitoring.

Based on the results, male sex can be defined as a non-modifiable predictor of return to professional activity after MI. Predictors of a prolonged return to work were older age and female sex. A trend towards prolonged duration of sick leave was observed for diabetic patients. Completing rehabilitation, body weight, cardiac remodelling or LV systolic function do not influence return to professional activity according to the results. Additionally, the study group was divided into subgroups, considering the performed type of job (physical/desk). However, statistical analysis proved that in the study population, this factor did not influence return to work.

According to the available evidence, many factors have influence on returning to professional activity. In his study, Szymański [22] mentions that around 25% of patients will never return to work, including elderly, physical workers, elementary or secondary educated or patients who did not participate in cardiac rehabilitation. The analysis showed that male sex correlates with getting back to professional activity. Halawa [20] also reports that males are getting back to work more often than females. Results suggest that in polish society there are still some gender divisions in the labour market, forcing men to return to work more often after MI than women. However, results from Halawa's study being similar to conclusion in this study, the group of females included in this investigation was relatively small. Women typically undergo MI being older, and these female patients are already retired so they were probably not included into this study. One of the inclusion criteria was be-

Table 5. Associations between clinical characteristics and gender of study participants – 105 consecutive patients following myocardial infarction (MI) treatment in 1 cardiology department were screened retrospectively, Department of Internal Medicine, Cardiology and Hypertension, Medical University of Warsaw, Mazowiecki Szpital Bródnowski, Warsaw, Poland, August 2021 – July 2023

Variable	Participants (N = 105)						p
	male (N = 90) [n (%)]	M±SD	Me (Q_1; Q_3)	female (N = 15) [n (%)]	M±SD	Me (Q_1; Q_3)	
Socio-economic							
age [years]		53.43±0.785			55.33±1.9		0.36
type of job							0.41
desk	22 (88)			19 (95)			
physical	3 (12)			1 (5)			
Medical							
body weight [kg]			90 (82.5; 100)			62 (57; 83.5)	0.001
BMI [kg/m^2]			29 (27.2; 32)			26.8 (22.3; 32.4)	0.16
participation in CCMI	78 (87)			13 (87)			1.0
myocardial infarction							
history	9 (10)			2 (13)			0.7
type							
STEMI	45 (51)			11 (73)			0.1
NSTEMI	44 (49)			4 (27)			
diabetes mellitus [n (%)]	18 (20)			3 (20)			1.0
hypertension [n (%)]	67 (74)			9 (60)			0.29
METs							
before CCMI			7 (7; 7.3)			7.2 (5.1; 9.3)	1.0
after CCMI			10.3 (10.15; 13.5)			10 (7.75; 10.83)	0.11
LVdD [cm]		5.1±0.05			4.6±0.09		0.001
LAD [cm]			4.2 (3.9; 4.45)			3.8 (3.6; 3.9)	0.034
LVEF							
%		49±0.8			46.4±2.07		0.2
<50%	44 (49)			10 (67)			0.21
LAA [cm^2]		24.1±0.47			22.06±2.5		0.18
NT-proBNP [pg/ml]		558.5±109.1			531±126		0.92

CCMI – comprehensive care after myocardial infarction, LAA – left atrium area, LAD – left atrial diameter, LVdD – left ventricular diastolic diameter, LVEF – left ventricular ejection fraction, METs – metabolic equivalent of task, NSTEMI – non-ST elevation myocardial infarction, NT-proBNP – N-terminal prohormone of brain natriuretic peptide, STEMI – ST elevation myocardial infarction.

ing employed prior to cardiac incident and in Poland the legally determined retirement age for women is 60 years and for men 65 years. Therefore, finding a group of female patients fitting these criteria might be challenging.

Participation in cardiac rehabilitation program has been proven as a factor influencing successful return to work in numerous studies conducted over the last years [23–25]. However, in the study from 2009, no significant difference was found between the 2 groups (participants and nonparticipants in cardiac rehabilitation) regarding the duration from hospital discharge to return to work [26]. There is also an example of a study conducted in France where participation in cardiac rehabilitation had no significant impact on return to professional activity [7]. The heterogeneity of the data indicates the need for further research among patients after MI.

Strengths and limitations

Some limitations of this study should be taken into consideration. The sample size was relatively small and included few women, although they are less frequently hospitalized for MI according to large epidemiological data. According to the ESC Euroheart Report 2023 female patients constituted 31.6% of patients admitted to hospital with ACS [27]. Still, this is the first study on Polish population concerning return to work after MI later than 2009. Also, age of MI in women is Me = 74 years, and according to the Polish legislation system, the retirement age for females is 60 years. Therefore, few of them met the inclusion criteria. This study focused only on the somatic factors influencing return to work and duration of sick leave. It has been demonstrated in some studies that psychological factors also have a big impact on getting back to professional activity [23].

CONCLUSIONS

According to the findings of this study, among patients after MI who participated in CCMI almost 90% of patients return to occupational activity within a year after MI and the results indicate that men are more likely to return to work. Predictors of a prolonged return to work include older age and female sex. The association between diabetes and prolonged sick leave warrants further investigation.

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