

Predicting return to work following myocardial infarction: A prospective longitudinal cohort study

Original Investigation

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Introduction

Return to work (RTW) is a significant psychosocial outcome in patients recovering from myocardial infarction (MI). It is important from the perspective of both health economy and quality of life (QOL) of the patients. Survival from MI has increased dramatically over the recent decades due to implementation of evidence-based approaches in diagnosis, treatment, and management of MI.¹ While a significant achievement, this may not necessarily translate to a better QOL for the patients, as the physical, psychological, financial, and social aspects of many patients' lives are adversely affected by MI diagnosis, treatment, associated complications, and the need for lifestyle changes.²

RTW is an important indicator of the patient's recovery and returning to normality.³ After MI, patients who resume their work report better financial status and health outcomes. In previous studies, patients out of work were more likely to experience financial hardship, affecting their ability to pay treatment costs and experience poorer physical and mental health. In addition, compared to employed patients, the risk of premature death, CHD events, depression, and anxiety was higher in those who did not work.^{3,4} RTW has been found to be associated with better QOL.⁴ Nevertheless, patients with MI may experience many barriers in returning to work. RTW rates are notably lower in developing countries. At one-year post-MI, only about 55% of participants had returned to work in a Chinese study,⁵ compared with more than 90% in Western countries.^{4,6} Cardiac rehabilitation programs help improve the recovery and QOL of patients with MI. The programs focus on developing the patients' skills to manage their physical and mental challenges and modify cardiovascular risk factors via effective education and counselling.⁷ Further, evaluating patients' capacity to work is essential for cardiac rehabilitation programs to ensure that RTW is safe and feasible for the patients and facilitate the RTW process.⁸

Literature from developed countries has explored factors associated with patients' RTW following MI. A systematic review demonstrated that multiple demographic, behavioral, clinical, and psychosocial factors affect work resumption after MI, including gender, age, educational level, work type, duration of hospitalization, comorbidities, complications, mental health, and self-evaluated general health.⁹ However, no study has focused on the Korean population regarding this topic.

METHODS

This is a secondary analysis of data from a larger prospective cohort study, which examined QOL in South Korean patients with MI.¹⁰ This article focused explicitly on RTW following MI. A research ethics committee approved the secondary analysis of the original data (ETH20-4734). The study setting was two tertiary hospitals with integrated cardiovascular centers located in the southern area of South Korea. Participants with a diagnosis of MI were recruited from the inpatient cardiovascular wards within a few days of admission to the hospitals. Patients were eligible for inclusion in the study if they 1) had a diagnosis of MI by a cardiologist; 2) had adequate Korean language skills to complete the study questionnaires; 3) resided in South Korea; 4) demonstrated ability to understand the study and provide written informed consent. Participants were excluded if they: 1) had cognitive impairment; 2) were participating in other interventional studies when the original study was being conducted. Two hundred fifteen patients were screened, 150 (69.8%) of whom were eligible to participate and recruited. Participants were invited to the study after they had received an explanation about the purpose and protocol of the study. They were provided an information statement and signed the study consent form. Baseline data were collected while participants were at the hospital between August 2015 to February 2016 (n=150). Follow-up data were obtained three months later via telephone or face-to-face when participants visited the

hospital for their usual follow-up care (n=136) (10). Fourteen participants (9.3%) were lost to follow-up; therefore, data analysis was completed on 136 participants.

Data were gathered on participants' demographic and clinical profiles (Table 1). A question was asked regarding their employment status. RTW in the current study was defined as returning to paid work irrespective of work type and work hours. The Depression, Anxiety, and Stress Scale (DASS-21) was used to assess participants' mental health status. A validated Korean version of the DASS-21 was available.^{11, 12} Participants' perceived social support was assessed using the Enhancing Recovery in Coronary Heart Disease (ENRICHD) Social Support Inventory (ESSI). This scale has displayed good internal consistency, including a Cronbach's alpha of 0.86 in patients with MI and 0.88 in patients post PCI.^{13, 14}

DATA ANALYSIS

Statistical analyses were completed using SPSS version 26.0. Descriptive statistics were used to summarise demographic and clinical data and the proportion of patients who returned to work by three months. Bivariate analyses assessed the relationships between potential independent variables and RTW as the dependent variable. These included using Chi-square/Fisher exact tests for categorical variables and Student *t*-tests for continuous variables. The associations between independent variables and RTW were assessed using binary logistic regression analysis, as RTW was considered as a binary outcome. Ten potential independent variables were selected on a theoretical basis using the systematic review findings conducted by Sun et al.⁹ Results of the logistic analyses were presented as *p*-values and odds ratios (ORs) with 95% confidence intervals (CIs). Statistical significance was defined as $p < 0.05$ (two-tailed).

RESULTS

The mean age of participants was 64.35 years (SD=11.61), with a range of 21 to 86 years, and the majority (n=100, 73.5%) were male. They were mostly married (n=119, 87.5%), and above half were educated to a high school level or above (n=79, 58.0%). Less than half the participants were employed at baseline (n=56, 41.2%), and they mostly rated their financial situation as “only fair” or “poor” (n=118, 86.8%). More patients were diagnosed with non-ST-elevation MI than ST-elevation MI (n=79, 58.1%), had experienced a previous MI (n=106, 77.9%), received angioplasty (n=112, 82.3%), and had a left ejection fraction \geq 40% at baseline (n=119, 87.5%) (Table 1).

Table 1. **Participants’ Characteristics at Baseline and Three Months Follow-Up (N=136)**

Baseline			The 3-month follow-up		
Variables	n	%	Variables	n	%
Demographic factors			Demographic factors		
<i>Age, yr</i>			<i>Self-rated financial status</i>		
\leq 59	45	33.0	Excellent	2	1.50
60-69	41	30.1	Good	13	9.6
70-79	40	29.4	Only fair	92	67.6
$80\leq$	10	7.5	Poor	29	21.3
Gender			Behavioural factors		
<i>Gender</i>			<i>Physical activity status</i>		
Male	10	73.5	Moderate physical activity,		
Female	36	26.5	at least 30 minutes most or	49	36.0
Marriage status			all days of the week		
Married	119	87.5		27	19.9
	17	12.5			

Never married/ Separated/ Divorced/ Widowed			Moderate physical activity, less than 30 minutes less than 5 days per week		
<i>Educational level</i>			Not physically active	60	44.1
Primary school	35	25.7	<i>Smoking status</i>		
Middle school	22	16.3	Yes	81	59.6
High school	49	36.0	No	26	19.1
Undergraduate study or more	30	22.0	Quit	29	21.3
<i>Employment status</i>			<i>Drinks alcohol</i>		
Regular employee	30	22.1	Yes	40	29.4
Casual employee	3	2.20	No	96	70.6
Self employed	23	16.9	Clinical factors		
Unpaid family worker	24	17.6	<i>Readmission to hospital</i>		
Retired/unemployed	56	41.2	Yes	18	13.2
<i>Self-rated financial status</i>			No	118	86.8
Excellent	3	2.2	<i>Frequency of visiting a doctor within three months</i>		
Good	15	11.0	Less or equal to 3 times	117	86.0
Only fair	82	60.3	More than 3 times	16	12.0
Poor	36	26.5	Unknown	3	2.0
Clinical factors			<i>Frequency of chest pain</i>		
<i>Type of MI</i>			No pain most days	117	86.0
NSTEMI	79	58.1	Mild pain most days	17	12.5
STEMI	57	41.9	Moderate pain most days	2	1.5
<i>Time from MI to intervention</i>					

Less than 2 hours	50	36.8	Psychosocial factors		
More than 2 hours	47	34.6	Depression		
Unknown	39	28.6	Not depressed	104	76.5
LVEF at admission			Mild/Moderate depression	26	19.1
≥55%	53	39.0	Severe/ extremely severe depression	6	4.4
40-54%	66	48.5	Anxiety		
35-39%	8	5.9	No anxiety	116	85.3
<35%	9	6.6	Mild/ moderate anxiety	15	11.0
Type of intervention			Severe/ extremely severe anxiety	5	3.7
Antithrombotic therapy			Stress		
Antithrombotic therapy	20	14.7	Not stressed	122	89.7
Angioplasty	112	82.3	Mild/ moderate stress	14	10.3
CABG	4	3.0	Severe/ extremely severe stress	0	0
Number of comorbidities					
Zero	44	32.4			
One	47	34.6			
Two	41	30.1			
Three	4	2.9			
Previous MI					
Yes	106	77.9			
No	30	22.1			
Hypertension					

Yes	66	48.5
No	70	51.5

Diabetes

Yes	41	30.1
No	95	69.9

Abbreviations: CABG: coronary artery bypass graft; LVEF: left ventricular ejection fraction; MI: myocardial infarction; NSTEMI: non-ST elevation myocardial infarction; STEMI: ST elevation myocardial infarction.

At the 3-month follow-up, the number of participants who rated their financial status as “only fair” or “poor” increased slightly by 2.1%. More than half of the participants were still smoking (n=81, 59.6%); 13.2% (n=18) had been readmitted to the hospital; 12% (n=16) had visited their doctor more than three times; 14% (n=19) experienced mild to severe chest pain most days. Regarding psychological outcomes, 23.5% (n=32) of participants experienced depression, ranging between mild and extremely severe, 14.7% (n=20) anxiety and 10.3% (n=14) stress. The mean of perceived social support scores based on the ESSI was 27.97 (SD=5.41), ranging between 11 and 34 (Table 1).

RETURN TO WORK AT THE 3-MONTH FOLLOW UP

At the time of MI, 56 (41.2%) participants were employed; of these, 49 (87.5%) participants returned to work at the 3-month follow-up.

ASSOCIATES OF RETURN TO WORK

In regression analysis, age, gender, smoking, anxiety, and depression remained statistically significant associates of RTW (Table 2). That is, older age, female gender, smoking, and greater depression and anxiety statistically significantly were associated with lower work

resumption at the 3-month follow-up. The Nagelkerke R Square was 0.558, indicating that the independent variables included in the model explained 55% of the variance of RTW.

Table 2. Results of the Binary Logistic Analysis

Variables	B coefficient	SE	Wald test	df	<i>p</i> value	Exp(B)	OR	95% CI
Smoking	1.5	.6	5.0	1	.025	4.5	4.5	1.2- 16.7
Age	-.0	.0	4.2	1	.040	.9	.9	.9- .9
Gender	1.9	.7	5.8	1	.015	6.6	6.6	1.4- 31.2
Educational level			4.3	3	.224			
Education group 1	-1.8	.9	3.4	1	.063	.16	.1	.0- 1.1
Education group 2	.2	.8	.0	1	.798	1.2	1.2	.2- 6.0
Education group 3	-.2	.6	.1	1	.684	.7	.7	.2- 2.5
Social support	.0	.0	.0	1	.935	1.0	1.0	.8- 1.1
Hypertension	.4	.5	.6	1	.438	1.5	1.5	.5- 4.1
Diabetes	-.6	.6	1.0	1	.300	.5	.5	.1- 1.7
LVEF	.0	.0	.2	1	.607	1.0	1.0	.9- 1.0
Anxiety	.3	.1	4.4	1	.035	1.4	1.4	1.0- 1.9
Depression	-.5	.1	10.8	1	.001	.6	.6	.4- .8
Constant	-2.5	3.0	.6	1	.416	.0	.0	

Abbreviations: CI: confidence intervals; df: degree of freedom; Exp(B): exponentiation of the B coefficient;

LVEF: left ventricular ejection fraction; OR: odds ratio; SE: standard error

DISCUSSION

In the current study, 87.5% of participants working at baseline returned to work at the 3-month follow-up. No previous study has reported RTW rates in patients with MI in South Korea; however, compared to studies from Iran (79.2%)¹⁵ and the Netherlands (46.2%),¹⁶ considerably more patients returned to work at 3-month follow up in the current study. Our study is more recent than the studies mentioned above; this may partially explain the higher rate of RTW in our study. Advances in MI treatment and management have helped patients recover with better functionality, increasing their capacity to resume work.^{4,6}

In the current study, patients who returned to work at the 3-month follow-up were more likely to be younger, and this finding is in line with previous research.^{5,16} Older age has been frequently reported to predict poorer cardiovascular outcomes. Increased age was found to be associated with a higher risk of developing a major adverse cardiovascular event (MACE): recurrent MI, stroke, or cardiovascular death within one-year post-MI.^{17,18} This may suggest that MI at older age is associated with more severe damage. Thus, older age may be considered a barrier for patients to resume work following MI, especially for those with a physically demanding job.¹⁶

Findings from this study were consistent with most other studies in demonstrating that women were less likely than men to RTW after MI.³⁻⁵ This finding may be explained by the fact that women with MI tend to be older at presentation and have poorer socio-economic status than males; for example, women are more likely to be single, work only part-time or be unemployed, and, where this is necessary to access healthcare, to lack health insurance.^{3,19-21} They also tend to have poorer cardiovascular risk profiles, such as higher rates of hypertension, diabetes, heart failure, and chronic kidney disease, and to be less likely to receive optimum treatment for their MI, such as PCI revascularization procedures and referrals to cardiac rehabilitation.^{3,19-21} Multiple studies have also shown that MI outcomes

are poorer in women than men. For example, women had a higher likelihood of having MACE, depression, and anxiety. They also reported worse general health and QOL after MI.^{3, 21}

In the current study, smokers were less likely to return to work after MI than non-smokers or those who had quit smoking. The results of previous studies examining cardiovascular and other health outcomes among smokers and non-smokers after MI are mixed. In some studies, smoking was a protective factor for patients who experienced MI. For example, adverse left ventricular remodelling was less likely to occur in smokers,²² and they had a lower risk of experiencing MACE post-MI than non-smokers.²³ This has been referred to in the literature as 'the smokers' paradox'.^{22, 23} Rakowski et al.²⁴ argued that such findings were mainly due to the favourable baseline characteristics among smokers, such as being younger and with less comorbidity. In Rakowski et al.'s study, although smokers had lower mortality rates than non-smokers post-MI in the univariate analyses, the difference between groups was not statistically significant after adjusting for age and gender. Other studies observed that smokers had a worse prognosis than non-smokers post-MI. Compared to non-smokers and quitters, persistent smokers experienced poorer physical and mental health, QOL, higher cardiovascular and all-cause mortality, and greater risk of developing heart failure and MACE post-infarction.²⁵⁻²⁷

In addition, patients who had depression and/or anxiety were less likely to have resumed work at the 3-month follow-up. This finding is consistent with previous research.^{6,16, 28} Depression and anxiety are common comorbidities in patients with MI, adversely affecting the disease prognosis. Patients with depression have higher risks of developing complications and MACE and have greater all-cause mortality post-MI.^{29, 30} Rates of recurrent MI were seen to be higher in those with anxiety.³¹ While depression and anxiety impede RTW post-MI, the symptoms of anxiety and depression improved in patients who RTW.⁴ However,

these mental disorders often remain underdiagnosed and under-treated in this population; hospitalization periods are short, and some patients may develop depression and/or anxiety after discharge from the hospital.^{6, 32}

This study largely confirmed prior knowledge about the associates of RTW post-MI and emphasized the need for patient-centred approaches to decision-making for RTW post-MI. Health care professionals should be aware of factors that are deterrent to work resumption in this patient population and work with the patients, family members, friends, and employers to facilitate the patients' return to work. In addition, cardiac rehabilitation programs should incorporate mental health care to facilitate patients' return to normality, including work resumption.

LIMITATIONS

The results of this study should be interpreted in the context of several limitations. Using an existing dataset, some data related to participants' employment were missing, including work type and salary, which can affect RTW decisions of patients with MI. Only paid work was considered RTW in this study to avoid confusion. In addition, patients with MI with deteriorating physical conditions were not willing to participate in the study,¹⁰ which could introduce selection bias.

CONCLUSIONS

Key findings from this study suggest that most patients who experience MI can achieve work resumption by three months. Younger age, male gender, not smoking, and not experiencing anxiety and depression were associated with RTW at the 3-month follow-up among Korean patients with MI.

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