Mahdi Chinichian[1], Ramin Mehrdad[2], Mahboobeh Moradi[3], Gholamreza Pouryaghoub[2], Tahereh Davarpasand[4], Negin Kassiri[1]

[1] Iran University of Medical Sciences, Department of Occupational Medicine, Tehran, Iran

[2] Tehran University of Medical Sciences, Center for Research on Occupational Disease, Tehran, Iran

[3] Tehran University of Medical Sciences, Department of occupational medicine, Tehran, Iran

[4] Tehran University of Medical Sciences, Tehran Heart Centre, Tehran, Iran

Factors That Predict Early Return to Work After Myocardial Infarction: Importance of Coworker Support

Aim	Myocardial infarction (MI) affects the working-age group and cause many absences and lost days of work. Some occupational factors effect in the prognosis of MI patients. The objective of this study was to determine predictors of early, late and no return to work (RTW) after MI.
Material and methods	In this cohort study, 240 pre-employed, male patients with MI from April 2020 through February 2022 provided data about their demographic, occupational, psychosocial, and medical information. Data was also collected about the treatment they received as patients, their feelings about socioeconomic support, and RTW time. RTW within two weeks after MI was defined as early RTW. The relationships of these variables and with early RTW and with late or no RTW were analyzed.
Results	Ninety-four patients (39.6%) returned to work within two weeks after MI, whereas 207 patients (87.3%) returned to work by the end of six months. Many variables, including coworker support, were associated with early RTW in a univariate analysis. Regression analysis revealed that age, coworker support, marital status, the patient's own estimated RTW time, the number of the vessels with occlusion, and comorbidity were predictors of early RTW. Of these factors, only coworker support would be subject to modification.
Conclusions	This study indicates that improving support from coworkers can increase early RTW after MI.
Keywords	Cardiovascular disease; myocardial infarction; occupational health; coworker support; return to work
For citations	Mahdi Chinichian, Ramin Mehrdad, Mahboobeh Moradi, Gholamreza Pouryaghoub, Tahereh Davarpasand, Negin Kassiri. Factors That Predict Early Return to Work After Myocardial Infarction: Importance of Coworker Support. Kardiologiia. 2023;63(12):60–65. [Russian: Махди Чиничян, Рамин Мехрдад, Махбубе Моради, Голамреза Пурьягуб, Тахере Даварпасанд, Негин Кассири. Предикторы раннего возвращения к работе после инфаркта миокарда: важность поддержки коллег. Кардиология. 2023;63(12):60–65].
Corresponding author	Negin Kassiri. E-mail: neginkassiri@gmail.com

Introduction

According to the latest reports, Cardiovascular Disease (CVD) is the leading cause of death in the United States [1]. In recent years, CVD mortality has significantly decreased [2], but it still remains the leading cause of death. A recent study revealed that CVD was the cause of 26.4% of deaths in the Iranian population [3]. CVD occurs in all age groups, including the working-age group, and it causes a large number of absences and lost days of work [4]. A review of 60 studies in 2016 found that CVD imposes substantial morbidity- and mortality-related costs of productivity [5]. It has been estimated that 90 million days of work are lost each year in the European Union due to CVDs [6].

Since myocardial infarction (MI) is the most common complication due to CVD, early return of MI patients to work can have substantial socioeconomic benefits, and can decrease the cost and burden of MI-related missed workdays. In addition, early return to work (RTW) can reduce impairment and disability due to MI [7, 8], and thus improve the quality of the worker's life. Some studies have shown that RTW within two weeks after MI, especially in low-risk patients, does not cause any significant side effects [9].

Since job modification is more feasible than many other interventions, occupational risk factors are an important part of the RTW schedule for the cardiac patient. Also, changes in the work environment are possible in many workplaces. Few studies in Iran have focused on the occupational and socioeconomic risk factors related to RTW. In this study, we assessed the frequency of total and early RTW, and their associated personal, occupational, medical, socioeconomic, and occupational factors.

Material and methods

Study population

This study was a prospective cohort study performed on male patients who were admitted for MI at the Tehran Heart Centre from April 2020 through February 2022. Inclusion

ISSN 0022-9040. Кардиология. 2023;63(12). DOI: 10.18087/cardio.2023.12.n2310

criteria included pre-employed MI patients and being available for follow up (n=240). Exclusion criteria included age less than 18 yrs and over 75 yrs and presence of a defect in the patients' information that could not be completed by interview. Three patients who were not available for follow-up were excluded from the study.

Data collection and follow up

In the first step, a data collection sheet was filled in during a face-to-face interview by inquiring about demographic and occupational information as well as psychological and socioeconomic status. These data also including age, education level, body mass index (BMI), marital status, number of children, birthplace, smoking history, consumption of opium and alcohol, duration of symptoms before hospitalization, period of employment, having a second job, being self-employed, shift work status, working time per day, employment status of partner, number of supporting people, dependency on the work income, receiving financial support other than the job income, sick leave, interest in returning to work, the patient's own estimated chance of RTW, exercising, immensity of activities at work, the patient's psychological state (general anxiety, anxiety over occupational issues, depression), satisfaction with workplace conditions, with income, and with the job itself. Answers to these general qualitative questions were recorded on scales of 1 to 5 where 1 indicate the least, and 5 indicate the most.

In the second step, a physician gathered the participants' clinical data from their medical records. These data included the number of vessels with occlusion, left ventricle ejection fraction (LVEF), type of medications used, and comorbidity.

In the third step, two weeks later than release from the hospital, follow-up calls were made to the participants to gather additional data, such as the time patient returned to his or her past job (RTW time), final treatment conditions, current symptoms of MI (chest pain, dyspnea), rehabilitation program, and the patient's feeling about support received from the employer, family, and coworkers since the onset of the disease. For the patients who did not RTW after 2 weeks, we made follow-up calls two weeks later and then in monthly intervals for six months. Returning to work within two weeks of release from the hospital was considered as early RTW.

Table 1. Categorical variables of patients with early RTW or with late or no RTW

Variables		Early RTW n=94 (39.7)	Late or no RTW n=143 (60.3)	p*
Personal variables				
Marital status	Single	8 (66.7)	4 (33.3)	0.05
	Married	86 (38.2)	139 (61.8)	
Number of children	≥2	63 (47.4)	72 (52.6)	0.01
	>2	31 (29.8)	73 (70.2)	
Birthplace	Tehran	46 (41.8)	64 (58.2)	0.46
	Other	48 (36.9)	82 (63.1)	
Cigarette smoking	Yes	41 (39.9)	62 (60.2)	0.80
	No	53 (38.7)	84 (61.3)	
Opium use	Yes	6 (23.1)	20 (76.9)	0.07
	No	88 (41.7)	123 (58.3)	
Alcohol consumption	Yes	6 (28.6)	15 (71.4)	0.28
	No	88 (40.7)	128 (59.3)	
Occupational variables				
Work after retirement	Yes	10 (23.8)	32 (76.2)	0.02
	No	84 (43.1)	111 (56.9)	
Years of employment	≥30	66 (45.8)	78 (54.2)	0.02
	>30	28 (30.1)	65 (69.9)	
Second job	Yes	9 (45)	11 (55)	0.69
	No	85 (38.6)	135 (61.4)	
Self-employed	No	41 (46.1)	48 (53.9)	0.34
	Yes	53 (35.1)	98 (64.9)	
Shift work	Yes	13 (35.1)	24 (64.9)	0.54
	No	81 (39.9)	122 (60.1)	
Blue collar	Yes	59 (39.1)	92 (60.9)	0.89
	No	35 (39.3)	54 (60.7)	
Socioeconomic variables				
Wife employed	Yes	20 (40)	30 (60)	0.85
	No	74 (38.9)	116 (61.6)	
Number of supporting people	≥2	42 (40)	63 (60)	0.93
	>2	52 (38.5)	83 (61.5)	
Medical variables				
Final treatment	Medical	16 (48.5)	17 (51.5)	0.00
	PCI	78 (47.9)	85 (52.1)	
	CABG	0 (0)	41 (100)	
Rehabilitation	Yes	6 (16.2)	31 (83.8)	0.00
	No	88 (44)	112 (56)	
Current cardiac symptoms	Yes	5 (27.8)	13 (72.2)	0.29
	No	89 (40.6)	130 (59.4)	
Comorbidity	Yes	62 (40.5)	91 (59.5)	0.49
	No	32 (36.8)	55 (63.2)	

* p value is for comparing "Early RTW" and "Late or no RTW". Data are number (percentage of that number with early RTW or with late or no RTW).

Statistical analysis

Data were analyzed using SPSS software version 20. The prevalence of early RTW is reported with descriptive statistics. We used mean and standard deviation (SD) to describe quantitative variables and the frequency of detection in percent for qualitative variables. The relationships of the demographic characteristics, i.e., socioeconomic status, psychological state, and occupational and medical status, with early RTW and with late or no RTW were determined by chi-square analysis for categorical variables and by t-tests for continuous

Table 2. Continues variables of patients with early RTW or with late or no RTW

Variables	Early RTW n=94 (39.7%)	Late or no RTW n=143 (60.3%)	p*
Personal variables			
Age (yrs)	49.69 (8.24)	53.30 (9.14)	<0.001
Education level (yrs)	12.07 (4.71)	10.73 (5.19)	0.04
Body mass index (kg/m²)	27.86 (4.64)	27.53 (4.16)	0.57
Period of employment (yrs)	26.73 (10.97)	30.34 (12.75)	0.03
Occupational variables			
Support from employer *	3.66 (1.50)	3.44 (1.43)	0.37
Satisfaction with the workplace *	3.91 (1.22)	3.87 (1.10)	0.76
Support from coworkers *	4.25 (1.04)	3.92 (1.20)	0.03
Working time per day (hrs)	9.44 (2.69)	9.34 (3.00)	0.81
Job anxiety *	3.93 (1.25)	3.62 (1.37)	0.08
Heaviness of work *	3.31 (1.21)	3.50 (1.13)	0.21
Satisfaction with job *	3.63 (1.19)	3.45 (1.30)	0.26
Socioeconomic variables			
Patient's estimated RTW time (days)	4.54 (5.44)	17.98 (25.45)	0.00
Satisfaction with income *	3.17 (1.05)	3.06 (1.11)	0.44
Dependency on income *	4.39 (0.89)	4.22 (1.10)	0.21
Other financial support *	1.59 (1.11)	1.45 (0.83)	0.30
Sick leave *	1.71 (0.87)	1.97 (1.12)	0.06
Support from family *	4.71 (0.52)	4.69 (0.64)	0.80
Interest in RTW *	3.81 (1.24)	3.84 (1.18)	0.85
Patient's estimated chance of RTW *	4.09 (0.81)	3.91 (0.97)	0.15
Exercise *	1.96 (1.05)	1.92 (1.02)	0.76
Psychological variables			
Depression *	1.79 (1.07)	1.85 (1.09)	0.65
Anxiety *	2.93 (1.44)	2.86 (1.30)	0.72
Medical status variables			
Physician reassurance about RTW *	3.85 (0.75)	3.69 (0.91)	0.16
Number of vessels with occlusion	1.62 (0.90)	2.06 (0.85)	0.00
LVEF (%)	44.52 (8.43)	41.45 (8.64)	0.01
Symptoms pre-hospitalization (hrs)	55.42 (120.45)	60.58 (202.50)	0.82
Number of types of medications	6.20 (1.22)	6.33 (1.16)	0.42

* p value is for comparing "Early RTW" and "Late or no RTW". Data are mean (SD). *1-5 scale. LVEF, left ventricle ejection fraction.

variables. All continuous variables had normal distributions. A p value of less than 0.05 was considered statistically significant. Logistic regression analysis was used to adjust for the effects of confounding factors. The variables that showed significance in the univariate analysis were analyzed by multivariate logistic regression analysis, and the effective factors in early return to work were determined.

Ethical issues

This study is approved by the ethics committee of Tehran University of Medical Science (TUMS) (ethics committee approval number: IR.TUMS.MEDICINE.REC.1396.2737). All participants were informed about the aim of the study and willingly agreed to take part in the study. Verbal informed consent was obtained.

Results

Two hundred and thirty-seven patients completed the questionnaire and responded to the follow-up telephone calls (loss to follow up: 1%). The mean (SD) age of the participants was 51.8 (8.9) yrs.

Early RTW was reported by 94 patients (39.7%) and, by the end of the period of our follow-up calls which was 6 months, 207 patients (87.3%) had returned to their work. Table 1 shows the categorical variables, and Table 2 shows the continuous variables of patients with early RTW or with late or no RTW.

Regarding personal data, age, marital status, education level, number of years of employment, and number of children were associated with early RTW. The frequency of late or no RTW was higher among those who had more than two children, compared to those who had two or fewer children. Cigarette smoking, opium addiction, and alcohol consumption were not associated with early RTW.

Regarding the occupational variables, the frequency of early RTW after MI was significantly lower in those who had continued to work after retirement. In addition, the duration of employment had a direct association with early RTW. The mean number of years of employment in the early RTW group was four years less than that in the group with late or no RTW. Moreover, coworkers' support was associated with early RTW. Other work-related factors such as shift work, having a second job, blue collar jobs, working time, job anxiety, heaviness of work activities, and job satisfaction were not associated with early RTW.

Some medical treatments were associated with early RTW. None of the patients who had coronary artery bypass grafting (CABG) had early RTW. In addition, lesser number of the vessels with occlusion and greater LVEF were also associated with early RTW. Furthermore, cardiac rehabilitation was strongly associated with late or no RTW in the univariate analysis. On the other hand, the physician's reassurance about the safety of early RTW did not show an association with early RTW. Socioeconomic factors, except for the patient's own estimated time of RTW, were not associated with early RTW.

Using logistic regression analysis (Table 3) and considering early RTW as dependent, we analyzed diffe-

ISSN 0022-9040. Кардиология. 2023;63(12). DOI: 10.18087/cardio.2023.12.n2310

Table 3. Results of logistic regression analysis for predicting RTW after MI.

	SE	Significance	EXP(B)	95% C.I. for EXP(B)	
				Lower	Upper
Age	0.019	0.017	0.955	0.919	0.992
Support from coworkers	0.155	0.016	1.453	1.073	1.967
Marital status	1.165	0.021	0.067	0.007	0.662
Patient's estimated RTW time	0.024	0.000	0.896	0.855	0.938
Number of vessels with occlusion	0.194	0.000	0.499	0.341	0.731
Comorbidity	0.352	0.026	2.185	1.096	4.359

SE, standard error.

rent variables. Age, support from coworkers, marital status, the patient's estimated RTW time, number of the vessels with occlusion, and having comorbidity were predictors of early RTW after MI.

Discussion

The occupational factors that were associated with early RTW were retirement, number of years of employment, and coworkers' support. It appears that both retirement and duration of employment are confounders of age, since in the presence of age, neither were predictors in regression analysis. Age, retirement, and number of years of employment cannot change with interventions, whereas coworker support can improve through educational plans. It seems that further investigations should focus on the effect of improving coworker support on early RTW.

While we found neither satisfaction with the job nor the patient's interest in RTW to had impact on early RTW in the univariate or regression analyses, another study that adjusted for other factors, such as personal and medical factors, found job satisfaction to be an important factor [7, 10].

In total, 87.3% of our participants returned to work. This result is consistent with a previous study by Mirmohammadi et al. that found 77% early RTW in MI patients [11]. Another study on Iranian patients who underwent CABG showed 87.1% total RTW [12]. The close results of total RTW in patients who underwent CABG and total RTW in our patients who underwent various types of treatment suggest that the treatment procedure does not significantly change total RTW, although it may affect early RTW. Another longitudinal study over five years in France corroborates this suggestion by reporting 89.7% RTW, which is approximately the same as our finding [13].

Age and education level were associated with early RTW. This result is consistent with some previous studies [14, 15], although other studies did not find an association between age and RTW in MI patients [16]. Even though BMI is a risk factor for MI, it was not associated with early RTW in our study. Furthermore, in the Kovoor et al. study, there was no difference in BMI between the early and late RTW groups [9].

Older study did not find an association between LVEF and RTW [17]. However, in the present study, we found that greater LVEF had an impact on early RTW. This is consistent with findings of recent study. For example, a study of retirement after MI showed that lower LVEF is an independent predictor of no RTW [18].

The number of vessels with occlusion was a predictor for early RTW. This result is consistent with a Malaysian study that showed patients who had single vessel disease were 8.9 times more likely to RTW than patients with three vessel disease [19]. Another study in the United States confirmed that single vessel disease is a predictor of early RTW [20]. Moreover, we found that none of the patients who had undergone CABG returned to work early. It should be noted that all patients who underwent CABG had more than one vessel with occlusion. Finally, having comorbidity was not associated with early RTW in the univariate analysis, but it was a predictor in the regression analysis.

Cardiac rehabilitation after MI was associated with late or no RTW in the univariate analysis, but not in the regression analysis. There are conflicting results regarding the effectiveness of cardiac rehabilitation for RTW. On the one hand, many studies indicate that cardiac rehabilitation improves RTW [21, 22], but on the other hand, other studies suggested that patients who receive cardiac rehabilitation have poorer results regarding RTW [23]. One possible reason for this apparent contradiction is that usually patients in worse medical situations tend to receive cardiac rehabilitation. In our study, only 15.6% of patients received cardiac rehabilitation, and among them, 83.8% had late or no RTW. It seems that our study is more compatible with the opinion that patients who receive cardiac rehabilitation have poorer results regarding RTW.

None of the socioeconomic risk factors were associated with early RTW, except for the patient's estimated RTW time. This result agrees with a British study, which found no association between socioeconomic factors and RTW [16]. Therefore, overall, medical factors appear to be more important than socioeconomic factors. The association between RTW and the patient's own estimation of their

RTW time is confirmed by a study that showed that the patient's self-rated state of health four weeks after the procedure was a strong predictor of RTW [24, 25]. It seems that patient attitude about him or herself is more important than socioeconomic factors. Although some studies have shown an association between depression and anxiety with RTW and MI outcome [26–28], we found no association between depression and anxiety with early RTW.

Despite the high prevalence of MI and various difficulties and problems related to this disease, there have been no adequate, systematic reviews on the risk factors for RTW in MI patients, and there is a cacophony of contradictions among the existing studies. It seems necessary that systematic reviews of studies on RTW in MI patients be performed.

One of the limitations of this study was that we did not differentiate between patients who had experienced MI for the first time and those who had had a prior MI. Another limitation was the subjective measurement of some variables, such as job satisfaction, stress, depression, anxiety, and quality of life. There is a wide range of definitions of early RTW in other studies, ranging from two weeks to three months. This complicates comparisons between early RTW and late RTW of the current study and those of prior studies.

Conclusion

In patients who were employed before MI, age, coworkers' support, marital status, the patient's own estimated RTW time, number of the vessels with occlusion, and having comorbidity were predictors of early RTW. This study emphasized the importance of psychosocial factors in the process of MI patients returning to work. Having better support from coworkers can increase the possibility of early RTW after MI.

Acknowledgment

This study has been supported by Tehran University of Medical Sciences (TUMS) Deputy of Research. We also thank Mr. Mohammad-Javad Hamzeloo for proofreading this article.

Funding

This research received no specific grants from funding agencies in the public, commercial, or not-for-profit sectors.

No conflict of interest is reported.

The article was received on 24/09/2022

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