ARCHIVES OF THE TURKISH SOCIETY OF CARDIOLOGY

Official journal of the TURKISH SOCIETY OF CARDIOLOGY

Return to Work and Associated Factors After the First Hospitalization for Heart Failure

Kalp Yetersizliği Nedeniyle İlk Hastaneye Yatış Sonrası İşe Dönüş ve İlişkili Faktörler

ABSTRACT

Objective: Heart failure is a public health problem worldwide. Employment is vital in terms of personal, social, and economic aspects for patients with chronic diseases. The aim of this study is to investigate returning to work and the associated factors after first hospitalization for heart failure in working-age patients.

Methods: In this retrospective cohort study, patients with the first hospitalization for heart failure in 2017-2020 who were employed before hospitalization were included. The demographic, occupational, and disease-related variables were compared in subjects with and without returning to work. Next, the relationship between the variables and the number of days off work was examined in participants who had returned to work.

Results: The data of 204 participants were analyzed. About 90% of the participants returned to work after 1 year. There was a significant relationship between not returning to work and higher age, female sex, higher New York Heart Association class, ejection fraction ≤40%, and history of chronic kidney disease. Among the participants who had returned to work, income level, cause of work exit, employer support, and the number of rehabilitation sessions had a significant relationship with the number of days off work.

Conclusion: The results of this study showed that gender, age, ejection fraction level, history of chronic kidney disease, and New York Heart Association class were the most influential factors in returning to work after first heart failure hospitalization. Furthermore, income, cause of work exit, employer support, and the number of rehabilitation sessions were the most important factors contributing to the number of days off work.

Keywords: Days off work, heart failure, return to work, work demand

ÖZET

Amaç: Kalp yetersizliği dünya çapında bir halk sağlığı sorunudur. İstihdam, kronik hastalığı olan hastalar için kişisel, sosyal ve ekonomik açılardan hayati önem taşımaktadır. Bu çalışmanın amacı, çalışan hastalarda kalp yetersizliği nedeniyle ilk yatıştan sonra işe dönüş ve ilişkili faktörleri araştırmaktır.

Yöntemler: Bu retrospektif kohort çalışmaya, 2017-2020 yılları arasında ilk kez kalp yetersizliği nedeniyle yatışı olan ve yatıştan önce çalışan hastalar dahil edildi. İşe dönen ve dönmeyen katılımcılarda demografik, mesleki ve hastalıkla ilgili değişkenler karşılaştırıldı. Daha sonra işe dönen katılımcılarda değişkenler ile izinli gün sayısı arasındaki ilişki incelendi.

Bulgular: 204 katılımcının verileri analiz edildi. Katılımcıların yaklaşık %90'ı 1 yıl sonra işe döndü. İşe dönmeme ile ileri yaş, kadın cinsiyet, yüksek New York Heart Association sınıflaması, ejeksiyon fraksiyonu ≤%40 ve kronik böbrek hastalığı öyküsü arasında anlamlı bir ilişki vardı. İşe dönen katılımcılar arasında gelir düzeyi, işten ayrılma nedeni, işveren desteği ve rehabilitasyon seans sayısı ile izinli gün sayısı arasında anlamlı bir ilişki bulundu.

Sonuç: Bu çalışmanın sonuçları cinsiyet, yaş, ejeksiyon fraksiyon düzeyi, kronik böbrek hastalığı öyküsü ve New York Heart Association sınıfının ilk kalp yetersizliği yatışı sonrası işe dönüşte en etkili faktörler olduğunu göstermiştir. Ayrıca gelir düzeyi, işten ayrılma nedeni, işveren desteği ve rehabilitasyon seanslarının sayısı, izinli gün sayısını etkileyen en önemli faktörlerdi.

Anahtar Kelimeler: İş talebi, işe dönüş, izin günleri, kalp yetersizliği

ORIGINAL ARTICLE
KLİNİK ÇALIŞMA

Mahin Hosseininejad, M.D.[1]
Hedieh Bikdeli, M.D.[1]
Shokoufeh Hajsadeghi, M.D.[2]
Saber Mohammadi, M.D.[1]

[1]*Department of Occupational Medicine, Iran University of Medical Sciences Faculty of Medicine, Tehran, Iran*
[2]*Research Center for Prevention of Cardiovascular Disease, Institute of Endocrinology & Metabolism, Iran University of Medical Sciences, Tehran, Iran*

Corresponding author:
Saber Mohammadi
✉ mohammadi.s@iums.ac.ir

Received: January 16, 2022
Accepted: May 11, 2022

Cite this article as: Hosseininejad M, Bikdeli H, Hajsadeghi S, Mohammadi S. Return to work and associated factors after the first hospitalization for heart failure. *Turk Kardiyol Dern Ars.* 2022;50(6):445-451.

DOI:10.5543/tkda.2022.22345

Heart failure (HF) is a worldwide public health condition. The advances in primary prevention of HF have led to its reduced occurrence, while improvements in medical care have increased survival rate, which in turn, increased the prevalence of HF. Occurrence and survival both play a crucial role in the hospitalization burden in patients with HF.[1] Given that approximately 26 million people suffer from HF worldwide, it is known as a global pandemic.[2] In 2012, the medical costs for HF were about $31 billion, which equals 10% of total medical costs for cardiovascular diseases in the United States.[3]

According to a study in Europe, the prevalence of HF increased with age and was 1.36% in the age group of 25-49 years and 16.14% in the age group over 80 years.[4,5]

Based on the studies conducted in our country in recent years, the mortality of HF was reported to be about 32%. Moreover, the results of some studies have shown that self-care was not optimal in patients with HF and it requires modification.[6]

Despite the medical advances and improved survival of patients with HF, the complication still negatively affects different facets of patients' lives including personal, social, and occupational aspects. The occurrence of HF in working age could lead to missed workdays and sometimes early exit from work with decreased workability.[7]

In addition to the financial importance, employment is vital for maintaining self-esteem and quality of life in patients with chronic diseases. Job loss could result in an increased risk of depression and mental health problems which may accompany a rise of suicide.[8-10]

Accordingly, a better understanding of returning to work after HF hospitalization is substantially important as strategies to facilitate returning to work in people with HF in working age could prevent different related personal, social, and economic problems.

So far, few studies have been conducted on the status of return to work in patients with HF, and to our knowledge, no study has been conducted in this field in our country.

This study aimed to examine returning to work and the associated factors following the first HF hospitalization in working-age people.

Methods

Participation in this study was voluntary. The patients were not charged for entering the study. All patient data remained confidential, and in cases where phone call with participants was necessary, the patients were not pressured to continue the

ABBREVIATIONS

ACEIs	Angiotensin-converting enzyme inhibitors
AF	Atrial fibrillation
BUN	Blood urea nitrogen
COPD	Chronic obstructive pulmonary disease
EF	Ejection fraction
HF	Heart failure
HFrEF	Heart failure with reduced ejection fraction
NYHA	New York Heart Association

Table 1. Univariate Analysis of the Relationship Between Qualitative Variables with the Return to Work in the Total Study Population (n=204)

	Return to Work, n (%)		
	Yes (n=182)	No (n=22)	*P*
Gender			
Male	148 (81.3)	10 (45.5)	<.001
Female	34 (18.7)	12 (54.5)	
Marital status			
Single	10 (5.5)	1 (4.5)	.008
Married	163 (89.6)	16 (72.8)	
Other (divorced or widow)	9 (4.9)	5 (22.7)	
Cause of work exit			
Fired	28 (15.4)	1 (4.5)	.34
Inability to do work	110 (60.4)	16 (72.8)	
Unwillingness to do work	44 (24.2)	5 (22.7)	
Education			
Low	25 (13.7)	4 (18.2)	.75
Medium	95 (52.2)	12 (54.5)	
High	62 (34.1)	6 (27.3)	
Insurance type			
Social security	131 (72.0)	14 (63.6)	.41
Other	51 (28.0)	8 (36.4)	
Rehabilitation			
No	139 (76.4)	6 (27.3)	<.001
Yes	43 (23.6)	16 (72.7)	
Smoking status			
No	98 (53.8)	13 (59.1)	.38
Yes	84 (46.2)	9 (40.9)	
Income			
Low	41 (22.5)	10 (45.5)	.025
Medium	99 (54.4)	11 (50)	
High	42 (23.1)	1 (4.5)	
NYHA class			
1	4 (2.2)	0 (0)	<.001
2	77 (42.3)	2 (9.1)	
3	89 (48.9)	8 (36.4)	
4	12 (6.6)	12 (54.5)	
Ejection fraction (%)			
≤40	72 (39.6)	20 (91)	<.001
>40	110 (60.4)	2 (9)	
Work demand in first job			
Sedentary and light	145 (79.7)	15 (68.2)	.21
Medium and heavy	37 (20.3)	7 (31.8)	

NYHA, New York Heart Association.

conversation when they were unwilling to answer the questions. This study was confirmed by the ethics committee of Iran University of Medical Sciences (No: IR.IUMS.FMD.REC.1399.297).

Study Population

In this retrospective cohort study in 2021, we included patients aged 18-70 years who were first hospitalized with a diagnosis of HF in 2017-2020 and were employed before hospitalization.

The exclusion criteria were second and more hospitalization for HF, unwillingness to participate in the study, being unemployed at the time of hospitalization, or insufficient information in patient records, which could not be completed through phone calls. The patients' medical records were assessed for the required variables including age at the time of hospitalization, gender, date of hospitalization, marital status, receiving cardiac rehabilitation (physician-supervised outpatient rehabilitation programs in the post-discharge period), New York Heart Association (NYHA) class, percentage of ejection fraction (EF) at the time of hospitalization and discharge, presence of other chronic diseases (ischemic heart disease, cancer, atrial fibrillation [AF], chronic kidney disease, chronic obstructive pulmonary disease [COPD], diabetes mellitus, hypertension, and stroke), and medications (glucose-lowering agents including insulin and oral agents, angiotensin-converting enzyme inhibitors [ACEIs], angiotensin receptor blockers, aspirin, digoxin, clopidogrel/ticagrelor, mineralocorticoid receptor antagonists, statins, beta-blockers, and loop diuretics). Hemoglobin, hematocrit, blood urea nitrogen (BUN), serum creatinine, and sodium levels were recorded as influential factors in HF prognosis using the data from patients' medical record.[11] Next, a checklist of the following variables was prepared: education level, the cause of separation from work, date of first full-time workday after hospitalization, monthly income, job satisfaction (score from 1 to 10, lower score indicating lower job satisfaction), employer support (score from 1 to 10), co-workers support (score from 1 to 10), insurance type, and insurance support. In our study, all patients were covered by basic insurance. We asked patients to assign a score of 1 to 10 on the level of their satisfaction with insurance services in terms of payment for hospitalization and treatment, medications, etc. (lower score indicating lower support). Phone calls with patients were made using the numbers in their medical records and they were interviewed using the items.

To assess work demand, the participants were asked about the following physical exposures using a 5-point Likert scale (never, one-fourth time, one-half time, three-fourth time, and more than three-fourth time)[12]:

1. working in a sitting position,
2. working in bending, squatting, kneeling positions, work above shoulder height,
3. lifting or carrying heavy objects.

Table 2. Univariate Analysis of the Relationship Between Pharmacotherapy and Comorbidities with the Return to Work in the Total Study Population (n=204)

	Return to Work, n (%)			
Pharmacotherapy	**Yes (n=182)**	**No (n=22)**	***P***	**Odds Ratio (95%CI)**
Angiotensin-converting enzyme inhibitors (ACEIs)	85 (46.7)	10 (45.5)	.91	1.05 (0.43-2.55)
Angiotensin receptor blockers (ARBs)	44 (24.2)	2 (9.1)	.17	3.18 (0.71-14.18)
ACEIs and/or ARBs	118 (64.8)	11 (50.0)	.24	1.84 (0.75-4.48)
Glucose-lowering agents	59 (32.41)	4 (18.1)	.11	2.15 (0.69-6.66)
Aspirin	93 (51.1)	13 (59.1)	.47	0.72 (0.29-1.77)
Digoxin	15 (8.2)	3 (13.6)	.39	0.56 (0.15-2.14)
Clopidogrel /ticagrelor	56 (30.8)	8 (36.4)	.59	0.77 (0.30-1.95)
Mineralocorticoid receptor antagonists	30 (16.5)	6 (27.3)	.21	0.52 (0.19-1.45)
Statins	101 (55.5)	12 (54.5)	.93	1.03 (0.42-2.52)
β-Blockers	103 (56.6)	12 (54.5)	.85	1.08 (0.44-2.26)
Loop diuretics	138 (75.8)	16 (72.7)	.75	1.17 (0.43-3.19)
Others	101 (55.5)	13 (59.1)	.74	0.86 (0.35-2.12)
Comorbidities				
Hypertension	113 (62.1)	17 (77.3)	.16	0.48 (0.17-1.36)
Ischemic heart disease	107 (58.8)	15 (68.2)	.39	0.66 (0.25-1.71)
Atrial fibrillation	16 (8.8)	2 (9.1)	.96	0.96 (0.20-4.50)
Diabetes mellitus	59 (32.4)	4 (18.2)	.17	2.15 (0.69-6.66)
Chronic kidney disease	6 (3.3)	9 (40.9)	<.001	20.3 (6.2-65.8)
Chronic obstructive pulmonary disease	42 (23.1)	4 (18.2)	.60	1.35 (0.43-4.20)
Cancer	6 (3.3)	3 (13.6)	.026	4.63 (1.07-20.0)
Stroke	7 (3.8)	0 (0)	.31	
Others	54 (29.7)	11 (50.0)	.053	0.42 (0.17-1.03)

Accordingly, different jobs were categorized into sedentary, light, medium, and high groups.[13] According to the definition of heart failure with reduced ejection fraction (HFrEF) in the European Society of Cardiology 2021 guidelines for diagnosis and treatment of HF, the participants were categorized into 2 groups (EF ≤ 40% and > 40%) based on EF at discharge.[14]

Outcome Measures

Patients' return to work status was asked in the phone interview using a question: "Have you returned to work after the first hospitalization for HF?" Based on the answer given, individuals were divided into 2 groups: returned to work and not returned to work.

Also, in participants who had returned to work, the details of returning to work including returning to the previous job or a different job, and the exact date of full-time permanent employment were asked. Based on the answers received, individuals were divided into 2 groups, returning to work within 6 months or 12 months after first hospitalization.

Statistical Analysis

This study included 2 stages of analysis. First, all inter-participant demographic, occupational, and disease-related variables were examined and compared in people with and without returning to work. The significant variables in univariate analysis were assessed through multivariate logistic regression. Next, the relationship between the above variables and the number of days off work was examined in participants who had returned to work through univariate analysis and linear regression. All analyses were performed using the Statistical Package for the Social Sciences software for Windows, version 24.0 (IBM Corp.; Armonk, NY, USA) and the statistical significance level was set at <.05.

Table 3. Univariate Analysis of the Relationship Between Quantitative Variables with the Return to Work in the Total Study Population (n = 204)

	Return to Work		
	Yes (n = 182)	No (n = 22)	
	Mean ± SD		*P*
Age (years)	53.06 ± 7.3	56.59 ± 7.0	.03
Work experience (years)	20.64 ± 10.6	24.04 ± 10.0	.15
Job satisfaction (1-10)	7.47 ± 0.9	7.27 ± 1.2	.35
Rehabilitation sessions	2.06 ± 3.9	6.90 ± 5.1	<.001
Co-workers support (1-10)	7.45 ± 1.1	6.86 ± 1.7	.01
Manager support (1-10)	7.01 ± 1.7	6.81 ± 1.8	.62
Insurance support (1-10)	7.33 ± 1.0	7.54 ± 1.1	.37
Child number	2.21 ± 1.2	1.90 ± 1.2	.29
Smoking (pack/year)	8.46 ± 13.3	5.18 ± 10.5	.26
Time of hospitalization (days)	4.68 ± 3.1	9.09 ± 4.6	<.001
Admission ejection fraction (%)	37.36 ± 8.5	25.45 ± 13.4	<.001
Discharge ejection fraction (%)	44.12 ± 6.4	30.68 ± 12.1	<.001
Body mass index (kg/m^2)	26.05 ± 3.71	24.34 ± 5.68	.058
Hemoglobin (g/dL)	13.25 ± 1.7	10.77 ± 1.7	<.001
Hematocrit (%)	41.24 ± 3.9	36.56 ± 4.0	<.001
Blood urea nitrogen (mg/dL)	25.65 ± 13.5	49.36 ± 38.8	<.001
Serum creatinine (mg/dL)	1.27 ± 0.5	2.00 ± 1.1	<.001
Serum sodium (mmol/L)	138.01 ± 6.4	135.50 ± 10.3	.11

SD, standard deviation.

Table 4. Univariate Analysis of the Relationship Between Qualitative Variables with Days Off Work in Subjects with the Return to Work (n = 182)

		Days Off Work	
		Mean ± SD	*P*
Gender	Male	42.03 ± 67.8	.10
	Female	65.70 ± 102.5	
Marital status	Single	75.60 ± 105.6	.43
	Married	45.17 ± 74.4	
	Other (divorced or widow)	37.22 ± 62.4	
Cause of work exit	Fired	136.14 ± 101.7	<.001
	Inability to do work	24.49 ± 47.0	
	Unwillingness to do work	44.29 ± 74.7	
Education	Low	83.6 ± 98.3	.018
	Medium	45.49 ± 74.6	
	High	32.95 ± 62.4	
Insurance type	Social security	44.48 ± 77.5	.57
	Other	51.52 ± 71.5	
Rehabilitation	No	34.41 ± 59.2	<.001
	Yes	85.39 ± 105.7	
Smoking status	No	48.92 ± 81.1	.63
	Yes	43.57 ± 69.3	
Income	Low	77.34 ± 101.6	.005
	Medium	42.86 ± 70.8	
	High	24.76 ± 42.37	
NYHA class	1	4.75 ± 1.5	.30
	2	38.44 ± 73.2	
	3	52.21 ± 77.1	
	4	69.08 ± 88.9	
Ejection fraction (%)	≤40	64.20 ± 97.2	<.001
	>40	34.83 ± 55.0	
Work demand in first job	Sedentary and light	38.86 ± 69.52	.025
	Medium and heavy	76.18 ± 91.64	

NYHA, New York Heart Association; SD, standard deviation.

Results

In this study, we examined 309 patients hospitalized for the first time with the diagnosis of HF in 2017-2020. In total, 105 patients were removed from the study according to the exclusion criteria (19 for unwillingness to participate in the study, 63 for unemployment at the time of hospitalization, and 23 for insufficient information in their medical records which could not be completed through phone call). Finally, the data of 204 participants were analyzed.

The majority of the study population were male (77%) and married (87.7%). Approximately half of the participants had high school diplomas and were smokers. Moreover, the majority of the participants (86.2%) were in classes II and III of the NYHA classification. Fifty-nine patients (28.9%) underwent rehabilitation and the percentage of receiving rehabilitation increased significantly with increasing NYHA class, so that in classes 1, 2, 3, and 4, it was 0%, 10.1%, 33%, and 79.2%, respectively (P <.001).

Table 5. Univariate Analysis of the Relationship Between Pharmacotherapy and Comorbidities with Days Off Work in Subjects with the Return to Work (n=182)

	Days Off Work (Mean ± SD)		
	Medication (Yes)	**Medication (No)**	***P***
Angiotensin-converting enzyme inhibitors (ACEIs)	50.29 ± 76.1	43.09 ±75.7	.52
Angiotensin receptor blockers (ARBs)	50.59 ± 81.8	45.13 ±74.0	.67
ACEIs and/or ARBs	49.69 ± 78.0	40.48 ± 71.6	.43
Glucose-lowering agents	39.52 ± 72.7	49.78 ±77.2	.39
Aspirin	47.11 ± 73.2	45.76 ±78.7	.90
Digoxin	59.46 ± 86.7	45.28 ±74.9	.48
Clopidogrel/ticagrelor	58.64 ± 88.7	41.03 ± 68.9	.14
Mineralocorticoid receptor antagonists	32.03 ± 54.7	49.30 ± 79.10	.25
Statins	47.33 ± 76.6	45.35 ± 75.1	.86
β-Blockers	48.20 ± 74.3	44.17 ± 78.0	.72
Loop diuretics	43.13 ± 72.3	56.86 ± 85.7	.29
Others	40.90 ± 67.8	53.38 ± 84.5	.27
	Comorbidity (yes)	**Comorbidity (no)**	
Hypertension	48.80 ± 77.5	42.60 ± 73.1	.59
Ischemic heart disease	50.47 ± 83.9	40.72 ± 62.4	.39
Atrial fibrillation	54.56 ± 76.1	45.67 ± 75.9	.65
Diabetes mellitus	39.52 ± 72.7	49.78 ± 77.2	.39
Chronic kidney disease	62.5 ± 103.3	45.9 ± 75.0	.59
Chronic obstructive pulmonary disease	71.61 ± 91.8	38.9 ± 68.8	.01
Cancer	41.83 ± 84.3	46.61 ± 75.7	.88
Stroke	63.28 ± 79.0	45.78 ± 75.8	.55
Others	40.4 ± 66.8	49.00 ± 79.3	.48

All of the participants had insurance and the majority of them (71.1%) were under the coverage of a specific insurance organization (the Social Security Organization). Loss of workability was the most common cause of separation from work.

Return to work after 6 months was 79.9% (n=163) and after 12 months, it was 89.2% (n=182). Only 10.8% of participants (22 people) did not return to work 1 year after HF hospitalization. In participants who had returned to work, the average number of days off work was 46.45 days with a minimum of 3 days and a maximum of 351 days. Among them, 82.9% of the participants (151 people) returned to their previous job and 17.1% (31 people) got a different job.

Tables 1 and 2 show the univariate analysis of the relationship between returning to work and qualitative variables. There was a significant relationship between not returning to work and female sex, divorced or widow marital status, receiving rehabilitation, low monthly income, higher class of NYHA classification, EF ≤ 40%, and history of cancer and CKD.

The univariate analysis based on an independent t-test revealed that there was a significant relationship between not returning to work and higher average age, more rehabilitation sessions, fewer co-workers support, more hospitalization days, lower EF at hospitalization and discharge, lower level of hemoglobin and hematocrit, and higher BUN, and serum creatinine (Table 3).

Table 6. Univariate Analysis of the Relationship Between Quantitative Variables with Days Off Work in Subjects with the Return to Work (n=182)

	Pearson Correlation Coefficient	***P***
Age (years)	−0.045	.54
Work experience (years)	−0.94	.20
Job satisfaction	0.016	.83
Rehabilitation sessions	0.32	<.001
Co-workers support	−0.161	.03
Manager support	0.32	<.001
Insurance support	−0.16	.83
Child number	−0.014	.84
Smoking (pack/year)	0.06	.41
Time of hospitalization (days)	0.22	.002
Admission ejection fraction (%)	0.23	.001
Discharge ejection fraction (%)	−0.23	.001
Body mass index (kg/m^2)	0.02	.78
Hemoglobin (g/dL)	−0.015	.84
Hematocrit (%)	−0.021	.77
Blood urea nitrogen (mg/dL)	−0.009	.90
Serum creatinine (mg/dL)	−0.044	.55
Serum sodium (mmol/L)	−0.015	.83

Table 7. The Relationship Between Study Variables with the Return to Work in the Total Study Population (Logistic Regression) and Days Off Work in Subjects with the Return to Work (Linear Regression)

Total Population (n=204)				Subjects with Return to Work (n=182)		
	β	*P*	Odds Ratio		*β*	*P*
Gender	–2.294	.034	0.101	Education	–0.081	.258
Age	–0.138	.048	0.871	Work demand	–0.034	.657
Marital status	0.962	.426	2.618	Manager support	–0.189	.033
Income	0.504	.435	1.656	Income	–0.206	.003
Co-workers support	0.600	.091	1.822	Co-workers support	–0.026	.734
Hospital stay days	–0.008	.942	0.992	Hospital stay days	0.069	.331
NYHA class	–1.729	.037	0.178	Cause of work exit	–0.194	.017
Ejection fraction	3.212	.011	24.836	Ejection fraction	–0.154	.020
Rehabilitation sessions	–0.103	.254	0.902	Rehabilitation sessions	0.288	<.001
CKD*	–3.564	.008	0.028	COPD†	0.011	.876
Cancer	–1.743	.080	0.175	---	---	---
Hematocrit	0.176	.082	1.193	---	---	---

*Chronic kidney disease;
†Chronic obstructive pulmonary disease.

The significant variables in univariate analysis were analyzed through a logistic regression test to assess the effect of different independent variables on returning to work (dependent variable). It was determined that gender, age, EF level, history of CKD, and NYHA class had a significant relationship with returning to work.

By studying the participants who had returned to work (n=182), we examined the relationship between the number of days absent from work and other variables. The average number of days absent from work in subjects with low education level, low income, exit from work because of lay-off, heavier work demand, EF ≤ 40%, history of COPD, and history of receiving rehabilitation was significantly higher (Table 4 and 5). The Pearson correlation test revealed that there was a positive and significant relationship between the number of days absent from work with the number of rehabilitation sessions, employer support, and the number of hospitalization days and a negative and significant relationship between co-workers support and EF level (Table 6).

Ultimately, the significant variables in univariate analysis were used in linear regression test to examine the effect of different independent variables on the number of days absent from work (dependent variable). It was revealed that income, cause of exit from work, employer support, and the number of rehabilitation sessions had a significant relationship with the number of days absent from work (Table 7).

Discussion

In this study, we assessed the status of returning to work and the associated factors after the first HF hospitalization in a teaching hospital in 2017-2020. In this retrospective cohort study, return to work after 6 months was 79.9% and after 12 months was 89.2%. Only 10.8% of participants did not return to work 1 year after HF hospitalization. In participants who had returned to work, the average number of days off work was 46.45 days. The logistic regression analysis demonstrated that gender, age, EF, history of CKD, and NYHA class were the most influential factors in returning to work. In addition, the linear regression analysis showed that income level, cause of exit from work, employer support, and the number of rehabilitation sessions were the most influential factors in the number of days absent from work.

A cohort study by Rorth et al[10] in Denmark had similar results to our study and it was found that younger age, male gender, and higher income were the factors that led to returning to work, and CKD was associated with a decreased chance of returning to work. The percentage of returning to work 1 year after hospitalization was higher in our study (89.2% vs 67.7%).

The rate of return to work in our study was higher than the study of Reibis et al[15] (89.2% vs 76.4%) that was conducted on 220 patients hospitalized with symptoms of left-sided HF.

Female gender and older age in a study by Cancelliere et al[16] in Canada were among the factors that led to separation from work after different diseases including cardiovascular diseases. Moreover, in the above study, the return to work was higher in subjects with lower intensity of the disease, which is in line with the results of our study, as we also found that the rate of return to work decreased with increasing NYHA class.

In a prospective cohort study by Smedegaard et al[17] in Denmark, examination of 30- to 65-year-old people who had a heart attack, revealed that the percentage of returning to work was 91.1% in 1 year. In that study, HF was the contributing factor to separation from work.

In our study, no association was found between returning to work and taking any type of medication. Rorth et al[10] found that ACEIs/angiotensin II receptor blockers, digoxin, and beta-blockers were associated with an increased likelihood of returning to work. In contrast, mineralocorticoid receptor antagonists and loop diuretics were associated with less return to work. A possible explanation for the lack of a statistically significant relationship

between medication use and return to work in our study could be a small number of patients in the group of non-return to work.

In this study, contrary to expectations, the rate of return to work was lower in subjects who underwent rehabilitation. A possible justification for this is that patients with mild disease had less commitment to participate in rehabilitation programs due to fewer symptoms and returned to work without problems (in our study, almost all individuals with NYHA classes 1 and 2 returned to work and the percentage of receiving rehabilitation increased significantly with increasing NYHA class). Another explanation might be that the patients that returned to work had found less time for joining a rehabilitation unit. In previous studies, there are suggestive findings that rehabilitation has favorable effects on return to work.[18] Nevertheless, this issue needs to be further explored in future studies.

So far, few studies have been conducted on the status of return to work in patients with HF, and to our knowledge, this was the first study on this area in our country.

Also, another strength of this study was the assessment of various demographic, occupational, and disease-related factors that may affect return to work in patients with HF.

Insufficient information in the patients' medical record, accessibility of patients' phone numbers, insufficient cooperation of participants in answering different questions, and recall bias in the number of days off work and the exact date of the first full-time workday after hospitalization, were the limitations of this study.

It is recommended that future studies should conduct a longer follow-up and incorporate a multicenter design.

Conclusion

The results of this study showed that gender, age, EF level, history of chronic kidney disease, and NHYA class were the most influential factors in the return to work after the first hospitalization for HF. Furthermore, income level, cause of separation from work, employer support, and the number of rehabilitation sessions were the most important factors contributing to the number of days absent from work.

Ethics Committee Approval: The study was approved by the medical ethics committee of the Iran University of Medical Sciences (No: IR.IUMS.FMD.REC.1399.297).

Informed Consent: Verbal informed consent was obtained from the patients who agreed to take part in the study.

Peer-review: Externally peer-reviewed.

Author Contributions: Concept – M.H., S.M.; Design – M.H., S.M.; Supervision – S.H., S.M.; Materials – S.H.; Data Collection and/or Processing – M.H., H.B.; Analysis and/or Interpretation – M.H., S.M.; Literature Search – M.H., S.M.; Writing Manuscript – M.H., H.B., S.M; Critical Review – M.H., S.H., S.M.

Declaration of Interests: The authors declare that they have no competing interest.

Funding: This study was conducted with support from the Deputy for Research at Iran University of Medical Sciences.

References

1. Roger VL. Epidemiology of heart failure. *Circ Res*. 2013;113(6):646-659. [CrossRef]
2. Ponikowski P, Anker SD, AlHabib KF, et al. Heart failure: preventing disease and death worldwide. *ESC Heart Fail*. 2014;1(1):4-25. [CrossRef]
3. Mozaffarian D, Benjamin EJ, Go AS, et al. Heart disease and stroke statistics—2016 update: a report from the American Heart Association. *Circulation*. 2016;133(4):e38-e360. [CrossRef]
4. Ceia F, Fonseca C, Mota T, et al. Prevalence of chronic heart failure in Southwestern Europe: the EPICA study. *Eur J Heart Fail*. 2002;4(4):531-539. [CrossRef]
5. Savarese G, Lund LH. Global public health burden of heart failure. *Card Fail Rev*. 2017;3(1):7-11. [CrossRef]
6. Sarrafzadegan N, Mohammmadifard N. Cardiovascular disease in Iran in the last 40 years: prevalence, mortality, morbidity, challenges and strategies for cardiovascular prevention. *Arch Iran Med*. 2019;22(4):204-210.
7. Labbafinejad Y. Influence of short term and long-term sickness absence on work ability index. *Iran Occup Health*. 2019;16:1-12.
8. Hyde M, Hanson LM, Chungkham HS, Leineweber C, Westerlund H. The impact of involuntary exit from employment in later life on the risk of major depression and being prescribed antidepressant medication. *Aging Ment Health*. 2015;19(5):381-389. [CrossRef]
9. Jonsson U, Alexanderson K, Kjeldgård L, Westerlund H, Mittendorfer-Rutz E. Diagnosis-specific disability pension predicts suicidal behaviour and mortality in young adults: a nationwide prospective cohort study. *BMJ Open*. 2013;3(2):e002286. [CrossRef]
10. Rørth R, Wong C, Kragholm K, et al. Return to the workforce after first hospitalization for heart failure: a Danish Nationwide cohort study. *Circulation*. 2016;134(14):999-1009. [CrossRef]
11. Libby P, Bonow OR, Mann DL, et al. *Braunwald's heart disease: a textbook of cardiovascular medicine*. 12th ed. Philadelphia: Elsevier Health Sciences; 2022.
12. Hiesinger K, Tophoven S. Job requirement level, work demands, and health: a prospective study among older workers. *Int Arch Occup Environ Health*. 2019;92(8):1139-1149. [CrossRef]
13. Talmage JB, Melhorn JM, Hyman MH. *AMA Guides to the Evaluation of Work Ability and Return to Work*. 2nd ed. Chicago, Illinois: American Medical Association Press; 2011.
14. McDonagh TA, Metra M, Adamo M, et al. ESC Guidelines for the diagnosis and treatment of acute and chronic heart failure: developed by the Task Force for the diagnosis and treatment of acute and chronic heart failure of the European Society of Cardiology (ESC) With the special contribution of the Heart Failure Association (HFA) of the ESC. *Eur Heart J*. 2021;42(36):3599-3726. [CrossRef]
15. Reibis R, Kühl U, Salzwedel A, et al. Return to work in heart failure patients with suspected viral myocarditis. *SAGE Open Med*. 2017;5:2050312117744978. [CrossRef]
16. Cancelliere C, Donovan J, Stochkendahl MJ, et al. Factors affecting return to work after injury or illness: best evidence synthesis of systematic reviews. *Chirop Man Therapap*. 2016;24(1):32. [CrossRef]
17. Smedegaard L, Numé AK, Charlot M, Kragholm K, Gislason G, Hansen PR. Return to work and risk of subsequent detachment from employment after myocardial infarction: insights from Danish nationwide registries. *J Am Heart Assoc*. 2017;6(10):e006486. [CrossRef]
18. Pedersen SM, Kruse M, Zwisler ADO, Helmark C, Pedersen SS, Olsen KR. Return to work: does cardiac rehabilitation make a difference? Danish nationwide register-based study. *Scand J Public Health*. 2021:14034948211062656. [CrossRef]