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RESEARCH ARTICLE

Factors Associated with Readmission of Cardiovascular Patients: A Cross-sectional Study in Iran

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Abstract:

Objective:

Cardiovascular diseases are the main cause of death in both men and women around the world. Considering the heavy economic and social burden of readmission of cardiovascular patients on the patients and their families as well as the health care system, this study aimed at determining the factors associated with hospital readmission of cardiovascular patients in four public hospitals affiliated with Shiraz University of Medical Sciences, Iran.

Methods:

This cross-sectional study was conducted on cardiovascular patients hospitalized in public hospitals affiliated with Shiraz University of Medical Sciences, Iran. A total of 264 patients were studied, 132 of whom had been readmitted and were selected through the census method. The other 132 patients had not been readmitted and were randomly selected through stratified sampling proportional to the size and simple random sampling method. The patients were examined using a questionnaire developed according to previous studies and experts' opinions. To analyze the data collected, we used the t-test, chi-square, Fisher's exact test, Mann-Whitney test, and logistic regression through the SPSS 23.0 software.

Results:

The results showed that the following factors were associated with the readmission of the cardiovascular patients: being hospitalized 6 to 9 months before the current admission (OR=19.03, P-value<0.001), having arrhythmia (OR=6.34, P-value<0.001), having right ventricular dysfunction (OR=4.99, P-value=0.019), having fluid and electrolyte disorder (OR=3.89, P-value=0<0.001), undergoing angiography (OR=2.96, P-value=0.003), having chest pain (OR=2.42, P-value=0.014), having cardiovascular and non-cardiovascular co-morbidities (OR=1.45, P-value=0<0.001), and having non-elective admission (OR=2.10, P-value=0.034).

Conclusion:

Given the influencing factors, management and follow-up of the patients, especially the high-risk ones, after discharge and providing them with the necessary training to prevent various complications could reduce their readmission rates.

Keywords: Factors, Patient Readmission, Cardiovascular diseases, Public Hospital, Iran, Aortic atherosclerosis.

Article History

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1. INTRODUCTION

Cardiovascular diseases (CVDs), also known as heart diseases, are a group of disorders of the heart and blood vessels. There are many different types of CVDs. Four of the

main types are coronary artery disease (CAD) or coronary heart disease (CHD), cerebrovascular disease, peripheral artery disease (PAD), and aortic atherosclerosis [1]. Cardiovascular diseases (CVDs) are the main cause of death in the world. According to the WHO statistics, cardiovascular diseases accounted for 38% of the 17 million premature deaths (under the age of 70) in 2019 that occurred due to non-communicable diseases [2]. In addition, it is estimated that 54% of the deaths from non-communicable diseases in the Eastern Mediterranean

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region occur due to cardiovascular diseases [3]. Cardiovascular diseases cause disability, low quality of life, and high costs [4], and at the macroeconomic level, they impose a heavy burden on the economy of low- and middle-income countries [2]. In Iran also CVDs are the first leading cause of death and have a high prevalence rate (> 9000 cases per 100 000 people). It has been estimated that by 2025, the burden of CVDs in Iran will be more than double the rate in 2005 [5, 6].

Despite the progress in the field of cardiovascular diseases, the readmission rate of these patients is still relatively high and is considered as a major health problem [7]. Readmission refers to the re-hospitalization of a patient following his/her initial hospitalization in the same or other hospitals within a certain time interval, for example, 30 to 90 days after the previous admission [8 - 10]. The reason why readmission has been given special attention is that it imposes a lot of costs on the patients and hospitals and is the most important criterion for evaluating the quality of care and the discharge process [11].

It is estimated that the United States incurs \$41.3 billion annually for patients readmitted within 30 days of discharge. For this reason, the Hospital Readmissions Reduction Program (HRRP) has been implemented by Medicare and Medicaid since 2012 to improve the quality of hospital care and reduce the costs of health care. The implementation of this program has decreased the rate of patient readmission from 21.5% in 2007 to 17.5% in 2015 [8].

In general, apart from follow-up treatments and completion of the treatment recommended by physicians based on the course of the disease and the treatment procedures, re-visits and readmissions are a kind of waste of healthcare resources, including capital, equipment, and manpower. Although not all readmissions can be avoided, some can be prevented by providing higher-quality nursing care [12]. Thus, preventing hospital readmission may not only make it possible to optimally use scarce resources of the health system such as hospital facilities and equipment, but it can help the patients recover in the community and within their families, and prevents the occurrence of unwanted and preventable complications in the hospital, such as hospital and nosocomial infections [13]. However, to prevent or reduce hospital readmission, it is necessary to know the factors associated with it.

The results of studies conducted in this field have shown that some factors associated with the readmission of cardiovascular patients are as follows: demographic factors (such as age, gender, marital status, ethnicity, type of insurance, and employment) [14 - 20], type of admission [14, 21], length of stay, smoking [22, 23], chest pain [16, 24], previous admission [25], ejection fraction percentage [26, 27], cardiovascular and non-cardiovascular co-morbidities [15, 17, 28 - 31], and having an infection [27, 32, 33].

Since the researchers who searched in various sources did not succeed in finding a comprehensive study on the factors associated with the readmission of cardiovascular patients, especially in Iran, the present study was conducted with the aim of reducing avoidable readmissions of such patients and, consequently, improving the management of resources in

public hospitals affiliated to Shiraz University of Medical Sciences, Iran.

2. MATERIALS AND METHODS

This was a cross-sectional study conducted on cardiovascular patients hospitalized in four public hospitals affiliated with Shiraz University of Medical Sciences, Iran. Of the 7362 hospitalized cardiovascular patients, 132 of those who had been readmitted were studied through the census method. To balance the data, we also selected 132 patients who had not been readmitted [34]. In other words, 132 hospitalized patients without readmission were selected from the studied hospitals through the stratified sampling proportional to the size, and in each hospital, through the simple random sampling method based on the number of patients' medical records.

To collect the data, we used a questionnaire containing demographic and clinical data as well as the data related to the service providers developed based on the factors included in previous studies and based on the opinions of experts (44 factors in total). Examining the patients' medical records and contacting them on the phone were also applied to gather the required data.

The obtained data were analyzed using the SPSS 23.0 software; the chi-square test, Fisher's exact test, and t-test were used. Given the non-normality of the data of two variables namely active beds and length of stay (due to the standard deviation higher than twice the mean), the Mann-Whitney test was used as well. Then, the variables whose statistical relationship with the readmission was P-value < 0.2 were entered into the logistic regression model and analyzed through the Forward method [35 - 37]. Also, a P-value < 0.05 was considered statistically significant.

2.1. Ethical Considerations

This study was approved by the Ethics Committee of Shiraz University of Medical Sciences (Code: IR.SUMS.REC.1398.272). The patients were free to participate in the study, and once the objectives of the research were explained to them, their written informed consent was obtained. The questionnaires and checklists were completed anonymously, and the patients were assured of the confidentiality of their answers to the questions.

3. RESULTS

The results showed that most of the studied patients were male (55.31%), married (95.45%), illiterate (39.01%), housewives (42.42%), and landlords (78.40%); had public health insurance (96.96%), lived in cities (74.24%), and were Iranians (98.86%). Most of them did not use herbal medicines after discharge (54.92%), adhered to cardiovascular patients' diets (85.60%), had been discharged on the weekend (64.39%), had chest pain (50.75%), had been prescribed special drugs (97.72%), had fluid and electrolyte disorders (61.74%), had non-elective admissions (53.40%), went home after discharge (99.24%), had been discharged in the spring (34.46%), were treated by subspecialists (56.43%), had high blood pressure (67.42%), and had cardiovascular and non-cardiovascular co-morbidities (60.22%). Furthermore, the majority of the patients

did not have a peripheral vascular disease (83/71%), depression (90.90%), infection (92.04%), right ventricular dysfunction (87.87%), arrhythmia (81/06), and hyperlipidemia (59.8%), and were not pregnant (86.98%). Most of the patients examined had normal hematocrit levels (98.60%), normal hemoglobin levels (59.84%), normal red blood cell levels (59.46%), normal heart rates (95.82%), and normal cholesterol levels (96.31%) as well. All of the patients were trained on how to take medicine (100%).

The majority of the patients had been discharged with the physician's permission (91.3%), did not use illegal drugs (68.2%), had not undergone surgeries (77.7%), had not been hospitalized 6 to 9 months before the current admission (74.2%), had not undergone dialysis (96.2%), and had not undergone angiography during hospitalization (58.7%). The comparison of patients with and without readmission in terms of qualitative and quantitative factors studied in the patients are presented in Tables 1 and 2.

Table 1. Comparison of patients with and without readmission in terms of qualitative demographic and clinical factors and factors related to the studied service providers .

Factors		Readmitted Patients (%)	Non-readmitted Patients (%)	Total	P-value
Gender	Male	53 (44.91%)	65 (55.08%)	118 (100%)	0.13*
	Female	79 (54.10%)	67 (45.89%)	146 (100%)	
Marital status	Married	125 (49.60%)	127 (50.39%)	252 (100%)	0.55*
	Single	7 (58.33%)	5 (41.66%)	12 (100%)	
Education level	Illiterate	48 (46.60%)	55 (53.39%)	103 (100%)	0.28*
	Primary	24 (66.66%)	12 (33.33%)	36 (100%)	
	Secondary	22 (46.80%)	25 (53.19%)	47 (100%)	
	Diploma	26 (50.98%)	25 (49.01%)	51 (100%)	
Employment status	University degree	12 (44.44%)	15(55.55%)	27(100%)	0.17*
	Unemployed	51(51.51%)	48 (48.48%)	99 (100%)	
	Housewife	49 (43.75%)	63 (56.25%)	112 (100%)	
	Employee	18 (66.66%)	9 (33.33%)	27 (100%)	
Housing status	Retired	14 (53.84%)	12 (46.15%)	26 (100%)	0.65*
	Landlord	102 (49.27%)	105 (50.72%)	207 (100%)	
Public health insurance	Tenant	30 (52.63%)	27 (47.36%)	57 (100%)	0.24**
	Yes	127 (49.60%)	129 (50.39%)	256 (100%)	
Residence	No	5 (62.50%)	3 (37.50%)	8 (100%)	0.26*
	Urban	102 (52.04%)	94 (47.95%)	196 (100%)	
Nationality	Rural	30 (44.11%)	38 (55.88%)	68 (100%)	0.71**
	Iranian	131 (50.19%)	130 (49.80%)	261 (100%)	
Taking herbal medicines	Foreigner	1 (33.33%)	2 (66.66%)	3 (100%)	0.1*
	No	66 (45.51%)	79 (54.48%)	145 (100%)	
Adherence to cardiovascular disease diets	Yes	66 (55.46%)	53 (44.53%)	119 (100%)	0.16*
	No	23 (60.52%)	15 (39.47%)	38 (100%)	
Discharge on weekend	Yes	109 (48.23%)	117 (51.76%)	226 (100%)	0.44*
	No	82 (48.23%)	88 (51.76%)	170 (100%)	
Discharge destination	Yes	50 (53.19%)	44 (46.80%)	94 (100%)	0.74**
	Home	131(50%)	131 (50%)	262 (100%)	
Admission type	Public or private medical centers	1 (50%)	1 (50%)	2 (100%)	<0.001*
	Elective	45 (36.58%)	78(63.41%)	123(100%)	
Discharge season	Non-elective	87 (61.70%)	54(38.29%)	141(100%)	0.063*
	Spring	42 (46.15%)	49(53.84%)	91(100%)	
	Summer	36 (48%)	39(52%)	75(100%)	
	Fall	33 (55.93%)	26(44.06%)	59(100%)	
Hospitalized 6 to 9 months before the current admission	Winter	21 (53.84%)	18(46.15%)	39(100%)	<0.001*
	No	72 (36.73%)	124(63.26%)	196(100%)	
Physician's degree	Yes	60 (88.23%)	8(11.76%)	68(100%)	0.65*
	Specialist	59 (51.75%)	55 (48.24%)	114 (100%)	
Hypertension	Sub-specialist	73 (48.99%)	76 (51/00%)	149 (100%)	<0.001*
	No	29 (33.71%)	24 (45.28%)	53 (100%)	
	Yes	103 (57.86%)	75 (42.13%)	178 (100%)	

(Table 1) contd....

Factors		Readmitted Patients (%)	Non-readmitted Patients (%)	Total	P-value
Hyperlipidemia	No	71 (44.93%)	87 (55.06%)	158 (100%)	0.04*
	Yes	61 (57.54%)	45 (42.45%)	106 (100%)	
Having cardiovascular and non-cardiovascular co-morbidities	No	32 (30.47%)	73 (69.52%)	105 (100%)	<0.001*
	Yes	100 (62.89%)	59 (37.10%)	159 (100%)	
Undergoing surgery	No	92 (44.87%)	113 (55.12%)	205 (100%)	<0.001*
	Yes	40 (67.79%)	19 (32.20%)	59 (100%)	
Having a peripheral vascular disease	No	111(50.22%)	110(49.77%)	221(100%)	0.86*
	Yes	21(48.83%)	22(51.16%)	43 (100%)	
Having chest pain	No	52 (40.00%)	78 (60.00%)	130 (100%)	<0.001*
	Yes	80 (59.70%)	54 (40.29%)	134 (100%)	
Having depression	No	125 (52.08%)	115 (47.91%)	240 (100%)	0.32*
	Yes	7 (29.16%)	17 (70.83%)	24 (100%)	
Being pregnant	No	132 (50.57%)	129 (49.42%)	261 (100%)	0.24**
	Yes	0(0%)	3 (100%)	3 (100%)	
Having an infection	No	113 (46.50%)	130 (53.49%)	243 (100%)	<0.001**
	Yes	19 (90.47%)	2 (9.52%)	21 (100%)	
Undergoing dialysis	No	124 (48.81%)	130 (51.18%)	254 (100%)	0.09**
	Yes	8 (80.00%)	2 (20.00%)	10 (100%)	
Having right ventricular dysfunction	No	104 (44.82%)	128 (55.17%)	232 (100%)	<0.001**
	Yes	28 (87.50%)	4 (12.50%)	32 (100%)	
Undergoing angiography	No	67 (4.22%)	88 (56.77%)	155 (100%)	<0.001*
	Yes	65 (59.63%)	44 (40.36%)	109 (100%)	
Having arrhythmia	No	92 (42.99%)	122 (57.00%)	214 (100%)	<0.001*
	Yes	40 (80.00%)	10 (20.00%)	50 (100%)	
Prescription of special medicine	No	4 (66.66%)	2 (33.33%)	6 (100%)	0.34**
	Yes	128 (49.61%)	130 (50.38%)	258 (100%)	
Having fluid and electrolyte disorders	No	4 (66.66%)	2 (33.33%)	6 (100%)	<0.001**
	Yes	105 (64.41%)	58 (35.58%)	163 (100%)	
Hematocrit level	Normal	68 (42.23%)	93 (57.76%)	161 (100%)	0.02*
	Abnormal	64 (58.09%)	41 (39.04%)	105 (100%)	
Hemoglobin level	Normal	68 (43.03%)	90 (56.96%)	158 (100%)	0.06*
	Abnormal	64 (60.37%)	42 (39.62%)	106 (100%)	
Red blood cell level	Normal	66 (42.03%)	91 (57.96%)	157 (100%)	0.07*
	Abnormal	66 (61.68%)	41 (38.31%)	107 (100%)	
Blood cholesterol level	Normal	92 (50.27%)	91 (49.72%)	183 (100%)	0.89*
	Abnormal	40 (49.38%)	41 (50.61%)	81 (100%)	
Heartbeat	Normal	104 (47.48%)	115(52.51%)	219 (100%)	0.07*
	Abnormal	28 (62.22%)	17 (37.77%)	45 (100%)	
Illegal drug use	No	81 (45.00%)	99 (55.00%)	180 (100%)	0.01*
	Yes	51 (60.71%)	33 (39.28%)	84 (100%)	

*Chi-square, ** Fisher's exact test.

Table 2. Comparison of the patients with and without readmission in terms of quantitative demographic and clinical factors and factors related to the studied service providers.

Factors	Readmission	Mean (SD)	P-value
Age	With readmission	62.32 (13.47)	0.62*
	Without readmission	63.15 (13.85)	
Weight	With readmission	71.71 (14.42)	0.87*
	Without readmission	71.99 (13.74)	
Length of stay	With readmission	5.23 (4.28)	<0.001**
	Without readmission	3.77 (2.26)	

(Table 2) contd....

Factors	Readmission	Mean (SD)	P-value
Active bed	With readmission	30.49 (258.20)	0.17**
	Without readmission	352.29 (294.18)	
Nurse to CCU beds	With readmission	1.60 (0.16)	0.65*
	Without readmission	1.59 (0.17)	
Body Mass Index (BMI)	With readmission	25.76 (3.77)	0.80*
	Without readmission	25.88 (4.11)	
Ejection fraction percentage	With readmission	13.16 (14.21)	<0.001*
	Without readmission	47.81 (13.16)	

* t-test, ** Mann-Whitney test

Table 3. Results of logistic regression to determine the factors associated with the readmission (with and without readmission).

Factors	B	SE	P-value	Odds Ratio (OR)	95.0% Confidence Interval	
					Lower Bound	Upper Bound
Having hospitalization within 6 to 9 months before the current admission	2.94	0.50	0<0.001	19.03	7.02	51.52
Having arrhythmia	1.84	0.49	0<0.001	6.34	2.39	16.82
Having right ventricular dysfunction	1.60	0.68	0.019	4.99	1.29	19.194
Having cardiovascular and non-cardiovascular co-morbidities	1.45	0.37	0<0.001	4.29	2.06	8.88
Having fluid and electrolyte disorder	1.35	0.36	0<0.001	3.89	1.91	7.91
Undergoing angiography	1.08	0.36	0.003	2.96	1.44	6.07
Having chest pain	0.88	0.36	0.014	2.42	1.19	4.91
Having non-elective admission	0.74	0.35	0.034	2.10	1.05	4.20

According to the results of the statistical tests, the following factors were entered into the logistic regression model due to their P-value<0.2: gender (P-value=0.13), employment status (P-value=0.17), use of herbal medicines (P-value=0.1), adherence to cardiovascular patients' diets (P-value=0.16), type of admission (elective or non-elective) (P-value<0.001), discharge season (P-value=0.063), hospitalization within 6 to 9 months before the current admission (P-value<0.001), having hypertension (P-value<0.001), having hyperlipidemia (P-value=0.04), having cardiovascular and non-cardiovascular co-morbidities (P-value<0.001), having surgery (P-value<0.001), having chest pain (P-value<0.001), having an infection (P-value<0.001), undergoing dialysis (P-value=0.05), having right ventricular dysfunction (p-value<0.001), undergoing angiography (P-value<0.001), having arrhythmia (P-value<0.001), being pregnant (P-value=0.08), having fluid and electrolyte disorders (P-value<0.001), hematocrit level (P-value=0.02), hemoglobin level (P-value=0.06), red blood cell level (P-value=0.07), heart rate (P-value=0.07), illegal drug use (P-value=0.01), length of stay (P-value<0.001) ejection fraction percentage (P-value<0.001), and active beds (P-value e=0.17).

The results of the logistic regression indicated that the factors including having a history of hospitalization within 6 to 9 months before the current admission, arrhythmia, right ventricular dysfunction, cardiovascular and non-cardiovascular co-morbidities, fluid and electrolyte disorders, chest pain, and non-elective admission, and undergoing angiography were factors associated with predicting readmission (P-value<0.05) (Table 3).

Based on the OR, the chance of readmission of the patients hospitalized 6 to 9 months before the current admission was 19.03 times that of other patients. Besides, the probability of

readmission of the patients with arrhythmia, right ventricular dysfunction, cardiovascular and non-cardiovascular co-morbidities, fluid and electrolyte disorders, angiography during hospitalization, chest pain, and non-elective admission was 6.34, 4.99, 4.29, 3.89, 2.96, 2.42, and 2.10 times that of other patients, respectively.

4. DISCUSSION

Readmission causes disruption in the lives of patients and their families and imposes a remarkable financial burden on the healthcare system. It is a costly and sometimes life-threatening event which is associated with gaps and deficiencies in care [12, 38]. The present study aimed at determining the factors associated with the readmission of cardiovascular patients in public hospitals affiliated with Shiraz University of Medical Sciences, Iran.

The results of this study showed that the factors such as having hospitalization within 6 to 9 months before the current admission, arrhythmia, right ventricular dysfunction, cardiovascular and non-cardiovascular co-morbidities, fluid and electrolyte disorders, chest pain and non-elective admission, and undergoing angiography were associated with the readmission of cardiovascular patients.

In the present study, having hospitalization within 6 to 9 months before the current admission was associated with the readmission of cardiovascular patients. It seems that the previous admission of a patient to the hospital could be a reason for the deterioration or recurrence of the disease. The studies conducted by Hummel *et al.* (2014) [39], Saito *et al.* (2016) [25], and McLaren *et al.* (2016) [40] confirm the results of the current research.

In this study, having arrhythmia was known as a factor

associated with the readmission of cardiovascular patients. Cardiac arrhythmia refers to the abnormal (fast, slow, or irregular) heart rhythm and is one of the common and early complications of open-heart surgery, which may cause death or post-operative ailments [41]. Sudden onset of arrhythmias, especially after cardiovascular surgery, can increase readmissions. In the studies carried out by Feng *et al.* (2019) [42], Järvinen *et al.* (2003) [43], Patel *et al.* (2018) [44], and Sherer *et al.* (2016) [45], postoperative atrial fibrillation was realized as a factor associated with hospital readmission.

It was indicated in the present study that having right ventricular dysfunction was associated with the readmission of cardiovascular patients. This might be partially caused by the failure of the right ventricle in maintaining the flow required for the left ventricle [21]. The right ventricular dysfunction could lead to other diseases such as valvular heart diseases, coronary artery diseases, increased pulmonary blood pressure, and heart failure [46], which might cause readmission of these patients. In their study, Lella *et al.* (2015) suggested that the abnormality of the right ventricular function led to long-term cardiac hospitalization [47], which is in line with the results of the current study.

It was found in the present study that having cardiovascular and non-cardiovascular co-morbidities was a factor associated with the readmission of cardiovascular patients. Dakour Aridi *et al.* (2017) believed that the key to reducing unplanned readmissions was the management and follow-up of co-morbidities such as diabetes, cancer, and peripheral vascular disease, especially in the elderly [14]. In the study by Wang *et al.* (2019), non-cardiac co-morbidities such as renal failure, diabetes, and chronic obstructive pulmonary disease, as well as cardiovascular co-morbidities such as arrhythmia, peripheral vascular disease, and heart failure were the factors associated with the readmission of heart failure patients [48], which is consistent with the results of this study. Furthermore, the results of the studies by Tripathi *et al.* (2019) [16], Tregay *et al.* (2015) [49], Shehata *et al.* (2013) [32], and Maniar *et al.* (2014) [27] confirm the results of the present research.

In this study, fluid and electrolyte disorders was associated with the readmission of cardiovascular patients. In heart failure patients, due to the low ejection fraction percentage and blood volume, the kidneys cannot remove excess fluids and electrolytes from the body, and this leads to disorders in the fluids and electrolytes [50]. These disorders and their effect on kidney function increase the patients' need for hospital services and hospitalization. The results of the studies by Khayat *et al.* (2012) [51] and Benuzillo *et al.* (2018) [52] are in line with those of the present study.

According to the results of this study, undergoing angiography was factor associated with the hospital readmission. Angiography is one of the most important methods in the diagnosis of coronary artery diseases, and like many other invasive methods, it causes complications such as hematoma, bleeding, *etc.*, which are caused by trauma to the coronary artery wall [53]. Thus, the readmission rate of the patients undergoing angiography could be high. Dunlay *et al.* (2012) showed in their study that 35% of the patients readmitted had complications due to angiography [54]. In addition, the results of Yousefi *et al.*'s study (2020) [55] confirm the findings of the present research.

Having chest pain was another factor associated with the readmission of the cardiovascular patients in this study. It is the most common symptom in cardiovascular patients, which can affect physiological reactions such as breathing rate, heart rate, cardiac output, and blood pressure [56], causing the deterioration of the patients' condition and, consequently, their hospital readmission. The results of the studies by Rodriguez-Padial *et al.* (2017) [24] and Chen *et al.* (2021) [57] confirm those of the present study.

In the current study, non-elective and emergency admission was found as factor associated with hospital readmissions, so that non-elective and emergency patients were 2.10 times more likely to be readmitted. Emergency admission of cardiovascular patients could be a reason for malaise and the need for more extensive and complex care of such patients. The findings of the studies by Dakour Aridi *et al.* (2017) [14] and Reese *et al.* (2011) [58] confirm the results of this study.

Like any other study, the present research had some limitations, among which were the cross-sectional nature of the study and the incomplete information available in some of the patients' medical records investigated.

CONCLUSION

The results of this study showed that having hospitalization within 6 to 9 months before the current admission, arrhythmia, right ventricular dysfunction, cardiovascular and non-cardiovascular co-morbidities, fluid and electrolyte disorders, chest pain, and non-elective admission, and undergoing angiography were associated with the readmission of cardiovascular patients. Therefore, management and follow-up of the patients, especially the high-risk ones, after discharge and providing them with the necessary training to prevent various complications could reduce their readmission rates.

AUTHORS' CONTRIBUTIONS

RR, PB, and MN designed the study. MS collected the required data. MK and MS analyzed the data. All authors interpreted the data. RR and MS wrote the first draft of the manuscript. All authors reviewed and edited the manuscript and approved the final version of the manuscript.

LIST OF ABBREVIATIONS

WHO	=	World Health Organization
HRRP	=	Hospital Readmissions Reduction Program
SD	=	Standard Deviation
CCU	=	Coronary Care Unit
BMI	=	Body Mass Index
OR	=	Odds Ratio.

ETHICS APPROVAL AND CONSENT TO PARTICIPATE

This study was approved by the Ethics Committee of Shiraz University of Medical Sciences (Code: IR.SUMS.REC.1398.272).

HUMAN AND ANIMAL RIGHTS

All procedures performed in studies involving human participants were in accordance with the ethical standards of institutional and/or research committee and with the 1975

Declaration of Helsinki, as revised in 2013.

CONSENT FOR PUBLICATION

Informed consent was obtained from all participants of this study.

AVAILABILITY OF DATA AND MATERIALS

The data supporting the findings of the article is available from the corresponding author [R.R] on reasonable request.

STANDARDS OF REPORTING

COREQ guidelines were followed.

FUNDING

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CONFLICT OF INTEREST

The authors declare no conflict of interest financial or otherwise.

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