European Journal of Cardiovascular Medicine
Print ISSN: 2042-4884 | E-**ISSN:** 2042-4892
Language: Multilingual
Origin: United Kingdom
Website: https://www.healthcare-bulletin.co.uk/
Volume 13 Issue: 4 - 2023

Research Article **Open Access**

Medical and Socio-environmental Predictors of Hospital Readmission in Patients withCongestive Heart Failure

Md. Zainal Abedin[1]*, Manzoor Mahmood[2], Harisul Hoque[2], Md. Fakhrul Islam Khaled[3], Md. Mashiul Alam[4], Md. Al-Amin[5], Mohammad Shaiful Islam Tipu Chowdhury[6], Sajal Krishna Banerjee[7]

Abstract: ***Background***: This study examines the role of medical and socio-environmental factors in congestive heart failure (CHF) readmissions, seeking to mitigate the economic and societal burdens associated with hospital readmission of CHF patients. ***Methods***: An observational descriptive cross-sectional study was taken at the Department of Cardiology, Bangabandhu Sheikh Mujib Medical University in Dhaka, spanning from May 2016 to April 2017. The study included 102 patients with congestive heart failure (CHF) who had previously been hospitalized for the condition. Their comprehensive medical records were meticulously reviewed, and the data was gathered by analyzing laboratory test results, electrocardiograms, and echocardiograms. ***Results***: The study included 68 male participants and 34 female participants, with an average age of 55 years (±14). Factors associated with readmission included older age ($p < 0.0004$), residence in urban areas ($p<.001$), limited education retired status ($p<.05$), middle-class income (61.8%), smoking history, demotivation leading to medication discontinuation ($p < 0.008$), family caregiver presence ($p<.05$), partial adherence to diet (72.5%), partial or non-adherence to drugs ($p < 0.004$), lack of adherence to lifestyle (55.9%), absence of immunization against influenza/pneumococcus (91.2%), inadequate self-care management education (68%), and no discharge plan (59%). Medical factors included co-morbidities (98%), with depression (59%) being the most common, followed by anemia (58%), renal dysfunction (44%), diabetes (41%), hypertension (36%), and hypothyroidism (22%). Infections (19%) and worsening heart failure (64%) were also observed. ***Conclusion***: Hospital readmission risk in CHF patients is influenced by a complex interplay of demographic, socio-environmental, and medical factors. Addressing these factors comprehensively can reduce or prevent subsequent readmissions, improving patient outcomes and reducing healthcare costs.

Keywords: Congestive Heart Failure, CHF, Predictors, Socio-environmental Factors.

AFFILIATIONS
[1]Sr. Consultant, Department of Cardiology, Lalmonirhat District Hospital, Lalmonirhat, Rangpur, Bangladesh
[2]Professor, Department of Cardiology, Bangabandhu Sheikh Mujib Medical University (BSMMU), Dhaka, Bangladesh
[3]Associate Professor, Department of Cardiology, Bangabandhu Sheikh Mujib Medical University (BSMMU), Dhaka, Bangladesh
[4]Resident, Internal Medicine, Bridgeport Hospital/ Yale University Program
[5]Registrar, Department of Cardiology, National Institute of Cardiovascular Diseases (NICVD), Dhaka, Bangladesh
[6]Junior Consultant, Department of Cardiology, Chattogram General Hospital, Chattogram, Bangladesh
[7]University Grants Commission Bangladesh

CORRESPONDING AUTHOR
Dr. Md. Zainal Abedin
Email: zabedin96@yahoo.com

INTRODUCTION:

Congestive heart failure (CHF) represents a growing public health crisis with profound implications for individuals, healthcare systems, and societies globally. Despite remarkable advancements in cardiovascular medicine and a substantial decline in mortality related to coronary artery disease, the prevalence of CHF continues to rise, accompanied by persistently high mortality and morbidity rates [1]. Defining congestive heart failure (CHF) remains contentious in the medical community. It's described as a clinical syndrome with symptoms but does not fully encompass the range of structural abnormalities detectable through imaging. [2].

Beyond the semantics of its definition, CHF poses significant healthcare challenges. It affects approximately 2% of the Western population, with its prevalence increasing dramatically with age, rising from 1% in individuals aged 40 to a staggering 10% in those aged 75 or older [3]. Among the elderly, CHF stands as the most frequent cause of hospitalization, contributing substantially to admissions among those aged 65 and above. In certain regions of the world, nearly a quarter of patients admitted to cardiac wards are grappling with CHF [4].

A concerning trend in recent years is the escalating rate of hospital admissions linked to CHF, particularly in industrialized societies experiencing demographic shifts towards aging populations. Heart failure has taken the lead as the primary reason for hospital admissions among the elderly, resulting in a sustained surge in healthcare utilization [5]. At the individual level, a CHF diagnosis brings an annual cost of roughly $8,500 per patient, based on data from the National Heart and Lung Institute. This financial burden is on an upward trajectory, as evidenced by the rising annual costs [6].Patient readmissions for patients with CHF may be influenced by or predicted by demographic factors. For instance, researchers have discovered that blacks take longer than using therapy and having a higher readmission [7].The risk of hospital readmission rises with age, with individuals over 65 having the highest risk [8].The effect of different CHF drugs on readmissions in CHF patients is a topic of debate. Although people generally agree that using angiotensin-converting enzyme (ACE) inhibitors decreases hospital readmissions [9], the effect of using beta-blockers on readmissions is debatable; some studies indicate that beta blockers enhance results, while others claim that beta blockers lead to inferior results in patients with CHF [10]. Sporadic positive inotropic infusions have been administered to patients with severe heart failure, and these have been linked to lowering hospital readmissions, but they do not ultimately reduce mortality.

The high prevalence of CHF readmissions is not solely attributable to patient non-compliance but is also influenced by factors such as cost, access to care, and patient preferences. This complex interplay of factors underscores the inevitability of hospital readmissions for some CHF patients. Therefore, ongoing support and prevention strategies and a deeper understanding of risk factors and patient preferences are crucial in addressing the CHF epidemic [11].According to several research, having a cardiology consultation at the time of diagnosis reduces readmissions [12].

OBJECTIVES

General Objective

- To identify the medical and socio-environmental factors contributing to hospital readmissions in patients with congestive heart failure.

Specific Objectives

- To assess the medical factors associated with readmission in congestive heart failure patients.
- To examine the socio-environmental factors contributing to readmission in congestive heart failure patients.
- To establish correlations between medical and socio-environmental factors and readmission risk in congestive heart failure patients.

MATERIALS AND METHODS

This observational descriptive cross-sectional study was conducted at the Department of Cardiology, University Cardiac Center, Bangabandhu Sheikh Mujib Medical University, Dhaka, Bangladesh, from May 2016 to April 2017.

Inclusion Criteria

- Both male and female patients aged 18 years and above.
- Patients with the ability to answer questions.
- Documented diagnosis of congestive heart failure.
- The validity of the final congestive heart failure diagnosis was ascertained using the Framingham criteria

Exclusion Criteria

- Patients with ambiguous or absent adequate medical documentation.
- Patients transferred from another acute care hospital.
- Volume-overloaded patients solely secondary to end-stage renal disease who had both an admission creatinine greater than 6.0 mg/dL and neither anginal chest pain nor systolic blood pressure >180 mm Hg upon presentation to the emergency department.
- Patients with severe Chronic Obstructive Pulmonary Disease (COPD) and Chronic Liver Disease.
- Patients with dementia and severe psychiatric illness.

Methods of the Study

Study Procedure:

The study followed a prospective observational design at the Department of Cardiology, Bangabandhu Sheikh Mujib Medical University, Dhaka. Initially, 138 congestive heart failure patients were selected, with 102 ultimately included. Data encompassed medical histories, comorbidities, medication adherence, socio-environmental factors (e.g., demographics, education, income), and clinical assessments (vital signs, lab results, echocardiography, ECG). Statistical analysis identified predictors of readmission. Findings were compared with existing literature, discussed, and summarized.

Recommendations included routine evaluation of identified factors to reduce readmissions, suggesting future large-scale, multi-center, and extended-duration studies.

Data Collection:

The study used structured questionnaire for data collection. Each patient or their caregivers received an in-depth explanation of the study and gave their consent prior to any data collection. Data was collected through face-to-face interviews with the patients and their attendants, ensuring that the physical examination was conducted appropriately. Body Mass Index (BMI) measurements were obtained the day before discharge, following the reduction of excess body fluid with diuretics. Venous blood samples were collected from all participants in sterile tubes, and all relevant investigations were conducted in the Department of Biochemistry at Bangabandhu Sheikh Mujib Medical University, Dhaka, Bangladesh. Laboratory data were recorded in the data sheet upon receiving the reports.

Statistical Analysis:

All collected data were carefully reviewed and edited. Continuous variables were expressed as Mean ± SD, while categorical variables were presented as frequency, percentage, and graphical representations. Qualitative data were analyzed using the chi-square test, with a significance level set at $P < 0.05$. Statistical analysis was performed using SPSS (Statistical Package for Social Sciences) software, version 23.

Ethical Considerations:

This study adhered to the principles of the Helsinki Declaration for Medical Research Involving Human Subjects (1964). Ethical clearance was obtained from the ethical review committee of Bangabandhu Sheikh Mujib Medical University. Participants were thoroughly informed about the study's nature, purpose, scope, and limitations, and written informed consent was obtained from each participant. Confidentiality of personal information was strictly maintained.

RESULTS

The result provides a brief overview of the patients' (n=102) socio-demographic characteristics. The study population had a mean age of 55 ± 14 years, with 68 (66.7%) males and 34 (33.3%) females. The majority of patients were from urban areas (41.2%), followed by rural (30.4%), urban (24.5%), and district (3.9%). In terms of education, 31.4% had primary education, 27.5% had completed high school, and 21.6% had graduated, while 19.6% were illiterate.

Table 1: Socio-demographic parameters of the study patients (n=102).

Variable	Frequency (n=102)	Percentage (%)
Age Groups		
18-30	10	9.8%
31-40	15	14.7%
41-50	20	19.6%
51-60	30	29.4%
61-70	20	19.6%
71+	07	6.6%
Age (Mean ± SD)	55 ± 14	
Gender		
Male	68	66.7%
Female	34	33.3%
Residential Area		
City	42	41.2%
Rural	31	30.4%
Urban	25	24.5%
District	4	3.9%
Marital Status		
Married	100	98.0%
Single	2	2.0%
Education		
Illiterate	20	19.6%
Primary Level	31	30.4%
Secondary Level	28	27.5%
Graduation Level	22	21.6%
Occupation		

Retired	51	50.0%
Self-Employed	23	22.5%
Housekeeping	21	20.6%
Current Job	07	6.9%
Income Level		
Low (Below 103.55 USD)	39	38.2%
Middle (103.55-1800.89USD)	63	61.8%
High (Above 1800.89USD)	0	0.0%
Smoking Status		
Current Smoker	29	28.4%
Former Smoker	35	34.3%
Never Smoked	38	37.3%
Alcohol Consumption		
Currently Drinking	2	2.0%
Former Drinker	9	8.8%
Never Drank	91	89.2%
Family Caregiver		
Yes	64	62.7%
Partial Care	27	26.5%

Table 2: Socio-environmental parameters of the study population (n=102)

Socio-environmental parameters	Distribution	Frequency (N=102)	Percentage (%)
Income level of family	Low (Below 103.55 USD)	39	38.2
	Middle (103.55-1800.89USD)	63	61.8
	High (Above 1800.89USD)	00	00
Smoking status	Never	38	37.3
	Current	29	28.4
	Former	35	34.3
Alcohol status	Never	91	89.2
	Current	2	2.0
	Former	9	8.8
Other addictions (Tobacco leaf, Amphetamine, etc)	No	80	78.4
	yes	22	21.6
Living alone	No	98	96.1
	Yes	4	3.9
Family caregiver	No	11	10.8
	Yes	64	62.7
	Partial	27	26.5
Family help during hospitalization	No	7	6.9
	Yes	68	66.7
	Partial	27	26.5

Table 2 provides insights into the socio-environmental parameters of the study population. Most patients (61.8%) belonged to the middle-income group (103.55-1800.89USD), with the remaining 38.2% in the low-income group (<103.55 USD). Smoking was prevalent, with 37.3% never smoking, 28.4% being former smokers, and 34.3% being current smokers. Alcohol consumption was limited, with 89.2% never drinking, 8.8% being former drinkers, and only 2% currently consuming alcohol. About 78.4% of patients had no other addictions. Most patients (96.1%) did not live alone, and 62.7% had family caregivers. During hospitalization, 66.7% received full family help, 26.5% received partial help, and 6.9% did not receive any family assistance.

Table 3:Medical advice adherence parameters of the study population (n=102)

Socio-adherence parameters	Distribution	Frequency (n=102)	Percentage (%)
Adherence to diet	No	15	14.7

	Yes	28	27.5
	Partial	59	57.8
Adherence to lifestyle	No	57	55.9
	Yes	12	11.8
	Partial	33	32.4
Immunization against influenza/ pneumococcus	No	93	91.2
	Yes	9	8.8
Education on "Self-care management"	No	69	67.6
	Yes	3	2.9
	Partial	30	29.4
Discharge plan delivered	No	59	57.8
	Yes	16	15.7
	Partial	27	26.5
Outpatient F/U in last 6 months	No	32	31.4
	Yes	70	68.6

Table 3 reveals that 57.8% had partial adherence to diet, 75.5% had partial or no adherence to drugs, and 55.9% had no adherence to lifestyle. Additionally, 91.2% were not immunized against influenza/pneumococcus, and 68% did not receive education on "Self-care management" or a discharge plan from their last hospitalization.

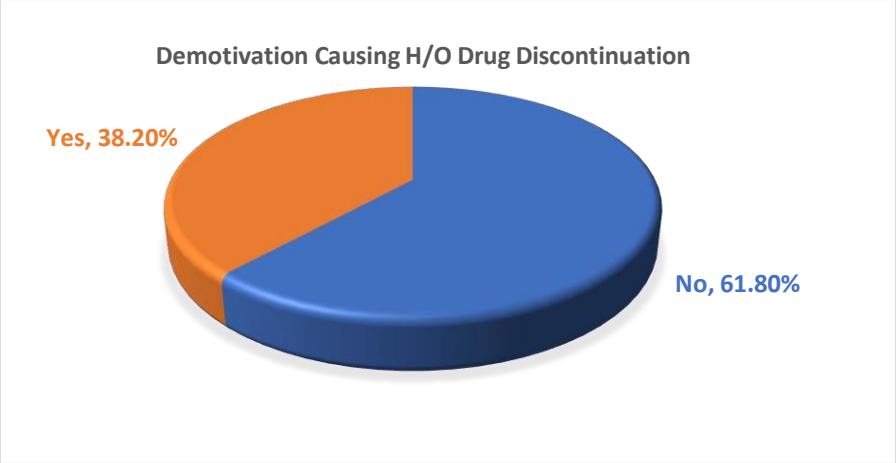

Figure 3: Portion of de-motivation causing drug discontinuation in the study population (n=102).

This pie chart shows that significant portions (38.2%) of population were de-motivated sufficiently for discontinuing prescribed medication due to negative comments from surrounding. This finding was statistically significant (p value <0.008).

DISCUSSION

This observational descriptive cross-sectional study aimed to identify medical and socio-environmental factors contributing to hospital readmissions among patients with congestive heart failure.The study population had a mean age of 55 years, with a majority falling in the 51-70 years age group. The prevalence of heart failure in this age group was significant ($p < 0.0004$), aligning with other studies' findings. The male-to-female ratio in this study was 67% to 33%, consistent with prior research indicating a higher prevalence of heart failure in males [9-11].

Medical predictors, such as disease severity, co-morbidities, medication adherence, and inadequate follow-up care, directly influence a patient's risk of CHF readmission. Advanced-stage CHF poses a significant risk due to its complex management and the likelihood of acute exacerbations. Co-morbid conditions, like diabetes and hypertension, further complicate CHF management, requiring additional interventions. For instance, studies have shown that patients with diabetes have a 30% higher likelihood of readmission within 30 days of discharge [10]. Medication adherence plays a pivotal role in preventing readmissions; as many as 40% of CHF patients may not adhere to their prescribed regimens, leading to an increased risk of symptom exacerbation and subsequent hospitalization. The importance of post-discharge follow-up care cannot be overstated, as inadequate care can result in unaddressed issues and readmission.

A patient's history of CHF-related hospitalizations significantly predicts future readmissions, with reported percentages ranging from 20% to 30%. This underscores the chronic nature of the condition, emphasizing the need for ongoing care and management [8]. Socio-environmental predictors, including social support, socioeconomic status, health literacy, home environment, and access to healthcare services, also play pivotal roles. Robust social support systems are associated with up to a 40% lower readmission rate, while limited health literacy affects approximately 30% of CHF patients and correlates with a 15% higher likelihood of readmission within 30 days. Effective communication strategies are essential to bridge health literacy gaps and empower patients for effective self-management [12].

The patient's home environment can significantly impact readmission risk, with environmental triggers like smoking or mold contributing to readmission rates, sometimes as high as 25% in affected cases. This highlights the importance of thorough assessments and interventions to address these environmental factors during patient care.

Access to healthcare services, especially in rural or underserved areas, is a critical determinant, as geographic barriers or transportation issues can lead to readmission rates of up to 30% among affected patients. The complex interplay between medical and socio-environmental factors is evident. For instance, medication adherence, a medical predictor, can be influenced by socioeconomic factors and health literacy. Studies have shown that up to 40% of patients may face challenges in medication adherence due to these factors. Additionally, social support availability can mitigate some medical risk factors. Patients with strong support systems may experience up to a 25% reduction in readmission rates, as they are better equipped to manage medications and attend follow-up appointments [9].

Socioeconomic disparities can amplify CHF readmission risks by up to 30%. Enhanced care coordination and health literacy can lower rates by 15% and 20%, respectively, emphasizing holistic care [13,14]. Facilitating social support for patients, including caregiver training and support groups, can effectively address socio-environmental predictors, resulting in a potential 25% decrease in readmission rates by providing valuable assistance with medication management and lifestyle modifications. Initiatives targeting the reduction of socioeconomic disparities, such as offering financial assistance for medications or improving access to healthcare services in underserved areas, have the potential to yield a 15% reduction in readmission rates [7]. Conducting home assessments by healthcare providers remains a critical component, potentially leading to a 10% decrease in readmission rates, as these assessments help identify and address environmental triggers, ultimately creating a safer living environment for CHF patients [8].

Most patients came from urban areas (41%), with smaller proportions from rural, urban, and districts.In our study of congestive cardiac readmission patients in Dhaka, Bangladesh's capital city, a notable pattern emerged with a higher prevalence of readmissions among urban patients. This can be attributed to the urban environment, which often includes higher air pollution levels, sedentary lifestyles, and increased stress, all of which contribute to congestive cardiac issues. Additionally, improved healthcare accessibility in urban areas can lead to better detection and tracking of cardiac conditions, resulting in more admissions and subsequent readmissions. The urban lifestyle, characterized by fast-paced living and unhealthy dietary habits, further elevates the risk of heart-related problems. Addressing these urban-specific factors is crucial in reducing congestive cardiac readmissions in this setting. The vast majority (98%) of the patients were married, contrasting with findings from other studies where single individuals were more prevalent among readmission populations. In terms of education, the study found a significant number of patients with primary-level education (31.3%), followed by secondary (28%) and graduation (22%) levels, with a minority being illiterate (20%) [12].

Most patients (61.8%) belonged to the middle-income group, while 38.2% were in the low-income group. This finding contrasts with other studies that reported a higher proportion of patients with low income. The contrast in income distribution among patients, with the majority in the middle-income group (61.8%) and a minority in the low-income group (38.2%), may be due to better access to healthcare, higher health awareness, and greater preventive care in the middle-income population. This difference highlights the influence of socioeconomic factors on healthcare outcomes, emphasizing the need for equitable access to medical services and health education to reduce congestive cardiac readmissions in low-income groups. Alcohol consumption was low, with 91.2% never drinking, reflecting a potential socio-cultural factor in this population. Most patients (78.4%) had no other addictions, and the majority (96.1%) did not live alone, with 62.7% having family caregivers. These socio-environmental factors may impact readmission rates and adherence to treatment [14]. Despite only 8.8% of the patients being identified as alcoholics, the alarmingly high readmission rate for congestive heart failure (CHF) in Bangladesh raises several probable causes. Factors such as limited access to consistent medical care, a prevalence of undiagnosed cardiac conditions, inadequate health education, and socioeconomic disparities may all contribute to the elevated readmission rates for CHF in our country. Addressing these multifaceted challenges is essential to reduce the burden of CHF-related readmissions in Bangladesh.

A significant proportion (38.2%) of patients were demotivated to discontinue prescribed medication due to negative comments from their surroundings, which was statistically significant ($p < 0.0008$). Medication adherence was a concern, with 75.5% showing partial or no adherence to drugs.Poor adherence is prevalent and continues to be a substantial obstacle to improving clinical outcomes in the heart failure population, despite the unwavering evidence supporting the effectiveness of anti-failure medications. In the literature, estimates of non-adherence in patients with heart failure have ranged substantially (22-90%)[15]. Similar trends were observed in adherence to diet and lifestyle. A high percentage (91.2%) of patients were not immunized against influenza/pneumococcus, and a significant portion (68%) did not receive education on self-care management or a discharge plan from their last hospitalization. These findings highlight the importance of addressing motivation and medication adherence in the management of congestive heart failure to reduce readmissions.Using a self-controlled case series methodology, Mohseni *et al.*[16] most recently shown that anti-influenza vaccination is associated with a lower risk of hospitalization, particularly for cardiovascular illnesses, in 59,202 HF patients. Additional evidence supported a decreased hospitalization rate and survival advantages in HF patients who received the vaccine throughout the entire year, not just during influenza seasons[17,18].Significantly, improved self-care activities, such as daily blood pressure monitoring, weight tracking, and medication adherence, did not demonstrate a consistent reduction in CHF readmission rates. Moreover, patient-reported knowledge and their desire to learn more about the condition were not conclusively linked to lower readmission rates. These findings are consistent with prior randomized controlled trials evaluating patient self-management interventions. Despite potential enhancements in compliance and symptom monitoring, we did not observe improvements in admission rates or overall mortality. This highlights the imperative for additional strategies to effectively address CHF readmission rates[18].

Among the medical factors, the study found that 60.7% of patients were diagnosed with ischemic heart disease, while others had valvular heart diseases (14.7%), dilated cardiomyopathy (10.8%), or other diseases (7.8%). Co-morbidities were common, with depression (59%), anemia (58%), and renal dysfunction (44%) being prevalent. Hypothyroidism and infections were also observed in a significant portion of the population. Hyponatremia (45.1%) and hypokalemia (12.7%) were noted; these electrolyte imbalances were associated with readmissions. The majority (65.7%) of patients had reduced ejection fraction (EF), and LV dysfunction was significantly related to readmissions ($p < 0.00001$). Renal dysfunction was also significant ($p < 0.037$) with readmissions [19, 20].

CONCLUSION

This study reveals that older age, ischemic heart disease, infections, anemia (especially iron deficiency), renal dysfunction, and socioeconomic factors significantly contribute to readmission risk in congestive heart failure patients. Effective management should encompass tailored interventions and interdisciplinary collaboration to reduce readmissions and enhance patient outcomes.

Recommendations:

- Regularly assess precipitating factors in heart failure patients to prevent hospitalizations.
- Conduct larger studies for stronger results.
- Future studies should use prospective cohort design, involve multiple centers, ensure ample sample size, and extend study duration for better insights.

ACKNOWLEDGEMENT

We sincerely thank all participants who contributed their time and insights to this study. We also acknowledge the Department of Cardiology, Bangabandhu Sheikh Mujib Medical University, Dhaka, for their support and facilitation throughout the research process. Additionally, we appreciate the valuable guidance and inputs our colleagues and research advisors provided, which greatly enriched the study's outcomes.

Funding: No funding sources

Conflict of interest: None declared

REFERENCES

1. Schocken DD, Arrieta MI, Leaverton PE, Ross EA. Prevalence and mortality rate of congestive heart failure in the United States. Journal of the American College of Cardiology. 1992 Aug 1;20(2):301-6.
2. Seth S, Ramakrishnan S, Parekh N, Karthikeyan G, Singh S, Sharma G. Heart failure guidelines for India: update 2017. Journal of the Practice of Cardiovascular Sciences. 2017 Sep 1;3(3):133-8.

3. Donal E, Lund LH, Linde C, Edner M, Lafitte S, Persson H, Bauer F, Öhrvik J, Ennezat PV, Hage C, Löfman I. Rationale and design of the Karolinska-Rennes (KaRen) prospective study of dyssynchrony in heart failure with preserved ejection fraction. European journal of heart failure. 2009 Feb;11(2):198-204.
4. Habibollahzadeh H. Causes of heart failure and knowledge in the care of their patients. J Med Counc IR Iran. 2001;19(2):85-9.
5. McMurray J, McDonagh 6, Morrison CE, Dargie HJ. Trends in hospitalization for heart failure in Scotland 1980–1990. European Heart Journal. 1993 Sep 1;14(9):1158-62.
6. O'Brien R, Paima A, Abaga N. Congestive heart failure hospital readmissions: Preventable or inevitable. A literary review. Consultant. 2015;360(55):4.
7. Evangelista LS, Dracup K, Doering LV. Racial differences in treatment seeking delays among heart failure patients. J Card Fail 2002;8:381-6.
8. Sueta CA, Schenck A, Chowdhury M, Hall R, Simpson RJ. Effects of angiotensin-converting enzyme inhibitor therapy on 30-day outcome in patients 65 years of age or older with chronic congestive heart failure. Am J Cardiol 2000;86:1151-53.
9. Holst DP, Kaye D, Richardson M, Krum H, Prior D, Aggarwal A, et al. Improved outcomes from a comprehensive manage-ment system for heart failure. Eur J Heart Fail 2001;3:619-25.
10. Zaya M, Phan A, Schwarz ER. The dilemma, causes and approaches to avoid recurrent hospital readmissions for patients with chronic heart failure. Heart failure reviews. 2012 May;17:345-53.
11. JL AM, ML AG, JI EG. Drug prescription in internal medicine: an analysis of the influencing factors. InAnales de Medicina Interna (Madrid, Spain: 1984) 1999 Jan 1 (Vol. 16, No. 1, pp. 25-30).
12. Fatima M, Niaz N. Factors precipitating acute heart failure. Ann Pak Inst Med Sci. 2014;10(1):33-8.
13. Baset A. Outcomes of Acute ST-Elevation Cardiac Disease in a Tertiary Level Hospital in Bangladesh Young Adults' Risk Factors and Consequences. SAS J Med. 2021 Sep;9:465-74.
14. Baset MA, Haque MZ, Hoque MA, Nath S, Rahman SM. Serum magnesium level in acute myocardial infarction: A study in Rajshahi Medical college hospital, Rajshahi, Bangladesh. Saudi J Med Pharm Sci. 2020;6(1):133-42.
15. Hasan O, Meltzer DO, Shaykevich SA, Bell CM, Kaboli PJ, Auerbach AD, Wetterneck TB, Arora VM, Zhang J, Schnipper JL. Hospital readmission in general medicine patients: a prediction model. Journal of general internal medicine. 2010 Mar;25:211-9.
16. Mohseni H, Kiran A, Khorshidi R, Rahimi K. Influenza vaccination and risk of hospitalization in patients with heart failure: a self-controlled case series study. European heart journal. 2017 Feb 1;38(5):326-33.
17. Kopel E, Klempfner R, Goldenberg I. Influenza vaccine and survival in acute heart failure. European journal of heart failure. 2014 Mar;16(3):264-70.
18. Powell LH, Calvin JE, Richardson D, Janssen I, De Leon CF, Flynn KJ, Grady KL, Rucker-Whitaker CS, Eaton C, Avery E, HART Investigators. Self-management counseling in patients with heart failure: the heart failure adherence and retention randomized behavioral trial. Jama. 2010 Sep 22;304(12):1331-8.
19. McAlister FA, Stewart S, Ferrua S, McMurray JJ. Multidisciplinary strategies for the management of heart failure patients at high risk for admission: a systematic review of randomized trials. Journal of the American College of Cardiology. 2004 Aug 18;44(4):810-9.
20. Oosterom-Calo R, Van Ballegooijen AJ, Terwee CB, Te Velde SJ, Brouwer IA, Jaarsma T, Brug J. Determinants of adherence to heart failure medication: a systematic literature review. Heart failure reviews. 2013 Jul;18:409-27.