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Spectrum and prevalence of renal dysfunction among heart failure patients attending tertiary care hospital: first report from Somalia

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Abstract

Introduction Heart failure is one of the major global health problems that we face today, worldwide. The main objective of our study is to evaluate the spectrum and prevalence of renal dysfunction among heart failure patients in Mogadishu, Somalia. The design of the study is a retrospective descriptive study aimed at heart failure patients who presented to the largest tertiary care center in southern Somalia between January 2021 to September 2021. Demographic data, co-morbidities, types of heart failure, causes of heart failure and the presence or absence of renal dysfunction were analysed.

Results Overall 180 heart failure patients were enrolled in the study. The mean age of the participants was 62.26 ± 14 years. Regarding the age group, patients aged between 61–80 years was the most abundant participants with ($n = 87$, 48.3%). Regarding the type of heart failure in our study, HFpEF was the most common type in our respondents with frequency of ($n = 85$, 47.2%). When analysed the cause of heart failure among patients; hypertension was the most common cause of heart failure ($n = 90$, 50%). Also, hypertension was the most common co-morbidity among our patients ($n = 106$, 59%), followed by coronary artery diseases ($n = 50$, 28%). The prevalence of renal dysfunction in heart failure patients was ($n = 37$, 20.6%). Our analysis showed that among the 37 renal dysfunction patients, 12.3% of them ($n = 22$) were CKD (chronic kidney disease) while the remaining 8.3% ($n = 15$) had AKI (acute kidney injury). We found a significant correlation between gender and renal dysfunction in heart failure patients with (95% CI: 0.098–0.574, OR: 0.237, p value: < 0.001). Males were 2 and half times more likely to develop renal failure than females.

Conclusions we found that the prevalence of renal dysfunction in heart failure patients is 20.6%. It was more prevalent in males and elderly population.

Keywords Renal dysfunction, Heart failure, Somalia, East Africa

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Introduction

Heart failure is one of the major global health problems that we face today, worldwide. It is estimated that 38 million people in the world are living with heart failure, and some studies have concluded that heart failure has a poorer prognosis than some cancers [1]. At the moment, 2% to 4% of the world's population has chronic heart failure. The 5-year death rate for women due to heart failure is 45%, while the 5-year death rate for men is 60% [2].

It is known that patients who have congestive heart failure have the greatest risk of developing acute renal dysfunction [3]. CKD is also a common finding in heart failure patients, approximately 50% of heart failure patients, because they have many similar risk factors that can lead to both of the diseases [4]. CKD and heart failure often coincide at the same time, and having both at the same time is far worse than having either one alone [5].

Additionally, CKD alone can contribute to poor outcomes in patients suffering from heart failure [6]. Furthermore, heart failure can also be seen in patients who are already suffering from CKD and is also a leading complication of death in these patients [7]. Furthermore, heart failure is a strong and independent predictor of mortality among hemodialysis and peritoneal dialysis patients [8, 9]. Although some studies have described the prevalence of renal dysfunction in heart failure patients in the world [10, 11], it has not been deservedly studied in Somalia. There is a dearth of data regarding the prevalence, risk factors, and outcomes of renal dysfunction among heart failure patients. The main objective of our study is to evaluate the spectrum and prevalence of renal dysfunction among heart failure patients in Mogadishu, Somalia.

Methods

The design of the study is a retrospective descriptive study aimed at heart failure patients who presented to the largest tertiary care center in southern Somalia [12], Mogadishu Somali Turkish Training and Research Hospital between January 2021 to September 2021. The ethical approval was granted by the ethical review institution board of the Somali Turkish Training and Research Hospital (Approval no: MSTH/7129). In addition, all patients previously consented to the use of their data for study purposes were examined. This study was carried out following the Helsinki Declarations and the personal data of the patients were not revealed.

We obtained the patients data from Mogadishu Somali Turkish Training and Research Hospital database using dates and ICD-10 diagnostic codes for both renal dysfunction and heart failure. 180 heart failure patients who came to the hospital during the study period were

included in this study. Patients who were younger than 18 years, patients who had missed data from the system, and patients who did not previously consented the use of their data were excluded from this study. The patients were classified into five groups according to their age; 18–25, 26–40, 41–60, 61–80, >80 years old, respectively.

The sociodemographic data of the patients including age and gender were analyzed during this study. Furthermore, the cause of heart failure, the type of heart failure according to ejection fraction (EF) and the presence or absence of renal impairment among these patients were also examined. Regarding the co-morbidities, we assessed the presence of diabetes mellitus, hypertension, cerebrovascular disease, hyperlipidemia, obesity, smoking and chronic obstructive pulmonary disease.

Glomerular filtration rate (GFR) was measured using The CKD Epidemiology Collaboration (CKD-EPI) formula [13]. The renal dysfunction were classified according GFR; patients who had GFR less than 60ml/min per 1.73 square meters and or presence of elevated serum creatinine for more than 3 months were considered as CKD in our study [14]. Patients who did not meet the above mentioned criteria but had an upnormal renal function were considered as AKI.

The diagnosis of heart failure was obtained with Transthoracic Echocardiographic examination. The echocardiography was performed by an experienced cardiologist using Toshiba Aplio 500 (3-5MHz probe). The echocardiographic examinations was performed from subcostal, apical and parasternal views following the recommendations of American Society of Echocardiography [15]. Heart failure with EF of less than 40% was considered as heart failure with reduced ejection fraction (HFrEF), heart failure with EF in between 40 to 50% was considered heart failure with mid-range ejection fraction, and heart failure with EF of more than 50% was considered to be heart failure with preserved ejection fraction [16].

The data was collected using Microsoft excel and was then imported to and analyzed using Statistical Package for Social Sciences (SPSS, V26, IBM, Armonk, NY, USA). The descriptive data analysis were presented as means, standard deviations and medians. We compared categorical variables using Chi-square and Fisher's test. A bivariate analysis was used to determine the association between variables. *P* value of less than 0.05 was considered as statistically significant result.

Results

Of the 180 heart failure patients that were enrolled in the study, the mean age of the participants was 62.26 ± 14 years. The maximum age of our respondents was 92 years while the minimum age of our respondents was 20 years. Regarding the age group, patients aged between 61–80

years was the most abundant participants ($n=87$, 48.3%). The other common age groups in our study were 41–60 years old with ($n=66$, 36.7%), >80 years, 26–40 years, 18–25 years with a frequencies of ($n=13$, 7.2%), ($n=12$, 6.7%), and ($n=2$, 1.1%), respectively. Of the 180 participants, 56.7% of them ($n=102$) were males while 43.3% ($n=78$) were females (Table 1).

Table 1 Demographic characteristics among our patients

	Frequency (n)	Percentage (%)
Age (years)		
18–25	2	1.1
26–40	12	6.7
41–60	66	36.7
61–80	87	48.3
>80	13	7.2
Gender		
Male	102	56.7
Female	78	43.3
Co-morbidities		
Hypertension	106	59
CAD	50	28
Diabetes mellitus	45	25
Hyperlipidemia	42	23.3
Smoking	36	20
Obesity	30	17
COPD	15	8.3
Type of heart failure		
HFpEF	85	47
HFrEF	63	35
HFmrEF	32	18

CAD Coronary artery disease, COPD Chronic obstructive pulmonary disease, HFmrEF Heart failure with mid-range ejection fraction, HFpEF Heart failure with preserved ejection fraction, HFrEF Heart failure with reduced ejection fraction, N Number of patients

Regarding the type of heart failure in our study, HFpEF was the most common type in our respondents with frequency of ($n=85$, 47.2%), followed by HFrEF and HFmrEF with frequency of ($n=63$, 35%) and ($n=32$, 17.8%), respectively. Regarding the age groups; HFpEF and HFmrEF were more common in 61–80 years old patients with (51%) and (56%), while HFrEF was mostly found in 41–60 years old patients with (43%) (Table 1).

In this study, we found that the prevalence of renal dysfunction in heart failure patients to be 20.6% ($n=37$). The remaining of our respondents ($n=143$, 79.4%) had normal renal function. Our analysis showed that among the 37 respondents that were having renal dysfunction, 12.3% of them ($n=22$) were CKD while the remaining 8.3% ($n=15$) had AKI. Out of the 37 heart failure patients with renal dysfunction, ($n=30$, 81%) of them were males while the remaining ($n=7$, 19%) were females. AKI and CKD were both observed to be more common in males, patients with HFrEF, and patients with co-morbidities, with (93% vs 73%), (47% vs 55%), (80% vs 95%), respectively. We found a significant correlation between gender and renal dysfunction in heart failure patients with (95% CI: 0.098–0.574, OR: 0.237, p value: <0.001). Males with heart failure were 2 and half times more likely to develop renal failure than females (Table 2).

The co-morbidities of the patients were assessed; the most common co-morbidity was hypertension ($n=106$, 59%), followed by coronary artery diseases ($n=50$, 28%), diabetes mellitus ($n=45$, 25%), and hyperlipidemia ($n=42$, 23.3%). The least common of co-morbidity in our patients was COPD ($n=14$, 8.8%). Patients who are obese, those with a history of smoking, hypertension, coronary artery disease, and obesity were found to be more common to have chronic renal failure with (100%), (67%), (57%), (54%), respectively (Table 3). When analyzed the causes of heart failure among patients; hypertension was

Table 2 The rate of renal dysfunction among heart failure patients according to demographic variables

	Non renal dysfunction	Acute renal dysfunction	Chronic renal dysfunction	Total patients	(95% CI)	Odds ratio	P Value
Age (years)							
18–25	1 (1%)	1 (7%)	0 (0%)	2 (1%)	0.738–1.937	1.196	< 0.468
26–40	7 (5%)	2 (13%)	3 (14%)	12 (7%)			
41–60	55 (38%)	4 (27%)	7 (32%)	66 (37%)			
61–80	70 (49%)	6 (40%)	11 (50%)	87 (48%)			
>80	10 (7%)	2 (13%)	1 (4%)	13 (7%)			
Sex							
Male	72 (50.3%)	14 (93%)	16 (73%)	72 (50.3%)	0.098–0.574	0.237	< 0.001**
Female	71 (49.6%)	1 (7%)	6 (27%)	78 (43%)			

CI Confidence interval

** Means statistically significant co-relation

Table 3 Distribution of co-morbidities according renal impairment in heart failure patients

Co-morbidities	Non renal dysfunction	Acute renal dysfunction	Chronic renal dysfunction	Total patients	(95% CI)	Odds ratio	P Value
Diabetic	34(24%)	6(40%)	5(23%)	45	0.330–1.646	0.737	< 0.457
Hypertensive	85(59%)	9(60%)	12(55%)	106	0.536–2.467	1.149	< 0.721
History of CAD	37(35%)	6(40%)	7(32%)	50	0.259–1.365	0.594	< 0.220
Hyperlipidemia	35(24%)	4(27%)	3(14%)	42	0.682–4.732	1.797	< 0.236
Smoking	27(75%)	3(8%)	6(17%)	36	0.333–1.984	0.813	< 0.649
Obesity	25(83%)	0(0%)	5(17%)	30	0.525–4.431	1.525	< 0.438
COPD	14(93%)	0(0%)	1(7%)	15	0.532–35.037	4.317	< 0.171

CAD Coronary arterial disease, CI Confidence interval, COPD Chronic obstructive pulmonary disease

the most common cause of heart failure ($n=90$, 50%), while ischemic heart disease, valvular heart disease and cardiomyopathy were ($n=52$, 28.9%), ($n=31$, 17.2%), ($n=7$, 3.9%), respectively (Fig. 1). Hypertension was also the most common cause of heart failure in all age groups except 41–60 years old patients. The most common cause of heart failure among these patients was ischemic heart disease.

Discussion

In the general population, the prevalence of chronic kidney disease in 2014 was estimated at around 4.5% [17], but a more recent study in 2019 stated that the prevalence of chronic kidney disease was 13.4% globally [18]. Renal

hypoperfusion and venous congestion are thought to be the main causes of deterioration in renal function among patients with decompensated heart failure [19, 20]. In patients with congestive heart failure with or without depressed systolic function, the presence of renal disease is found to be common and also a strong predictor of the morbidity and mortality of these patients [21]. According to Hillege and co-workers, the death rate in heart failure patients may be more heavily tied to a drop in GFR than in left ventricular ejection fraction [22]. Despite its significance and the growing number of heart failure patients, this subject is not well studied worldwide. This is the first study to report the prevalence of renal dysfunction in heart failure patients in Somalia.

Causes of heart failure

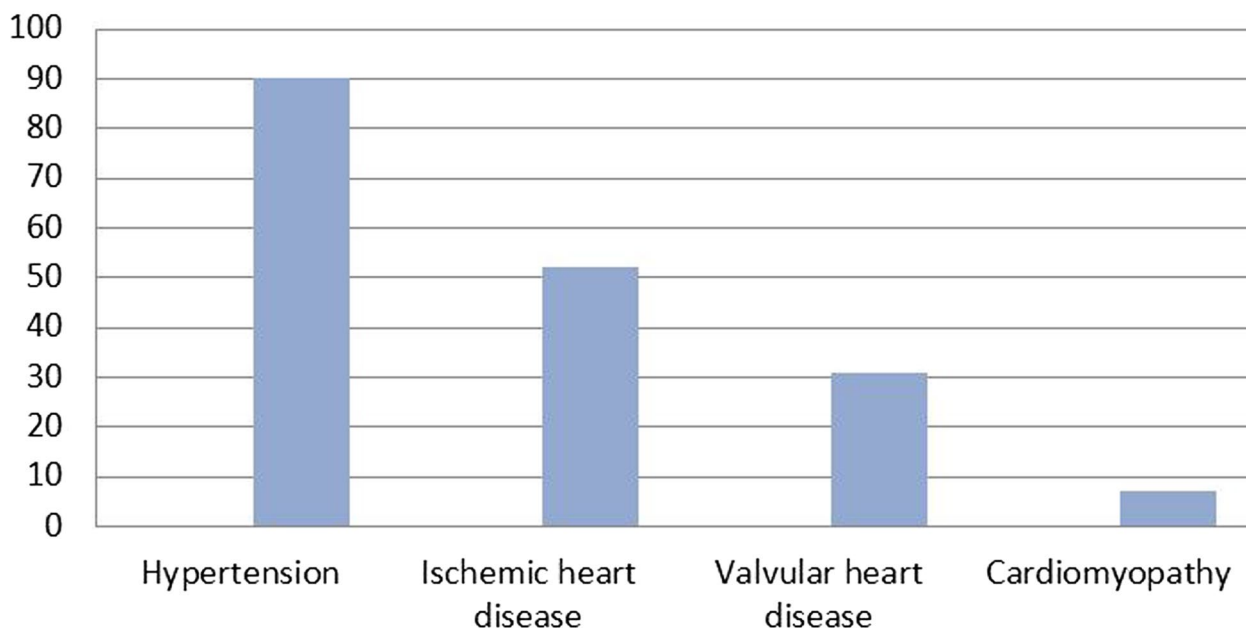


Fig. 1 The causes of heart failure among the studied patients

In the presenting study, we found that the prevalence of renal dysfunction in heart failure patients is (20.6%). A higher prevalence rate was reported in a meta-analysis study, which evaluated over 1 million people in 2014, by Damman and colleagues. They stated that the prevalence of renal dysfunction among heart failure patients was (32%) [17]. In 2012, a study by Cleland and his colleagues stated that epidemiological studies showed that 17–30% of people with acute heart failure had renal dysfunction, and almost 60% of people with chronic heart failure had renal dysfunction [23].

Our study also found that older people with heart failure are more likely to have renal dysfunction when compared to younger people. This result is similar to the conclusion of a meta-analysis done by Damman et al. in 2014, which found that renal disease is common among the elder population with heart failure [17]. There is also a meta-analysis by Smith et al. which found that renal disease is more common in older populations with heart failure [24].

Regarding the gender of the participants, we found that renal dysfunction among heart failure patients was more common in male patients (81%) when compared to female patients (19%), with a ratio of 4:1. We also found a strong correlation between gender and renal dysfunction in heart failure patients. Males with heart failure were two times more likely to develop renal dysfunction than females.

Regarding the co-morbidities, we found that hypertension was the most prevalent co-morbidity among heart failure patients in our study. Heart failure patients who are obese and those with a history of smoking, hypertension, coronary artery disease, and obesity were found to be more likely to have chronic renal dysfunction.

In general, there are a small number of studies dealing with the prevalence and burden of renal dysfunction among heart failure patients worldwide. For example, a study by Ezekowitz et al. stated that kidney failure was more common in chronic heart failure and ischemic heart disease and also associated with coronary atherosclerosis [25]. Furthermore, Damman et al. in 2015 concluded that renal failure can occur in all types of heart failure and is associated with increased morbidity and mortality [20].

There are several limitations that should be considered before evaluating this study; first, it is a retrospective study and only focused on the patients from one single center. Second, the sample size is small and the time frame of the study is relatively short. On the other hand, as strength, Since a number of studies have shown that renal impairment can have a negative impact on the prognosis of heart failure patients worldwide, this subject has not been adequately studied in East Africa, and data

on the subject is scarce in the literature. We hope that the presenting study will constitute integral part about the prevalence of renal dysfunction among heart failure patients in east africa and could pave the way for future studies to decrease the burden of renal dysfunction among heart failure patients and to improve the quality of life among heart failure patients.

Conclusions

The prevalence of renal dysfunction in heart failure patients in the presenting study is 20.6%. Renal dysfunction with heart failure is more prevalent in males and the elderly population. There is a need for a multicentered study to evaluate the prevalence and patterns of renal dysfunction among heart failure patients in Somalia. Since renal dysfunction can contribute to poor outcomes in heart failure patients [4], early screening of the renal profile and patient education can reduce the number of heart failure patients who may develop renal dysfunction and improve the quality of life for these patients.

Abbreviations

AKI	Acute Kidney Injury
CAD	Coronary Artery Disease
CKD	Chronic Kidney Disease
EF	Ejection Fraction
GFR	Glomerular Filtration Rate
HfmEF	Heart Failure with Mid-Range Ejection Fraction
HfpEF	Heart Failure with Preserved Ejection Fraction
HfrEF	Heart Failure with Reduced Ejection Fraction
ICD-10	International Classification of Diseases 10
SPSS	Statistical Package for Social Sciences

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Authors' contributions

MOOJ brought the concept of the study, performed data collection, performed data analysis, and drafted the manuscript. AAH participated the data collection and drafting of the manuscript. MAM participated the data collection and data analysis. AAA participated the data collection and data analysis. MFYM participated data analysis and revised the manuscript for important intellectual content.

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Availability of data and materials

The data is available from the corresponding author.

Declarations

Ethics approval and consent to participate

The ethical approval was granted by the ethical review institution board of the Somali Turkish Training and Research Hospital (Approval no:MSTH/7129).

Consent for publication

Not applicable.

Competing interests

The authors declare that they have no competing interests.

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