

The impact of heart failure on renal functions in patients admitted to Wad-Madani Heart Center in Gezira State, Sudan 2018

El impacto de la insuficiencia cardíaca en las funciones renales en los pacientes ingresados en el centro cardíaco de Wad-Madani en el estado de Gezira, Sudán 2018

Abderrhman Ahmed Mohamed Ismaeil¹, Nahla Ahmed Mohammed Abderahman², Mohammed Ahmed Ibrahim Ahmed³, Sara Abdalmonem Abdalrahim Alhag⁴, Mosab Nouraldein Mohammed Hamad⁵

1. Associate professor of Physiology, Faculty of Medicine, Sinnar University, Sinnar State, Sudan.

2. Assistant professor of Biochemistry, Faculty of Medicine, Department of Biochemistry, Nile Valley University- Atbara, Sudan.

3. Assistant professor of Microbiology, Faculty of Medicine, Department of Microbiology, Nile Valley University- Atbara, Sudan.

4. University of Gezira, Faculty of medicine, MBSc. Student.

5. Head of Parasitology Department, College of Health and Allied Sciences, St. Joseph University In Tanzania, Tanzania United Republic

Corresponding author

Mosab Nouraldein Mohammed Hamad

E-mail: musab.noor13@gmail.com

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Abstract

Background: Renal dysfunction is one of the most common co-morbidities in heart failure, and it raises mortality, morbidity, complexity, and cost of care dramatically. Renal impairment is linked to poor outcomes in heart failure patients.

Objectives: The goal of this study was to assess the prevalence of renal function impairment, as well as clinical predictors and hospital outcomes of renal impairment, among hospitalized heart failure (HF) patients.

Methods: The study was conducted at Wad-Madani Heart Center, a tertiary hospital that serves Gezira and the surrounding state. All adults admitted to Wad-Madani Heart Center and diagnosed with heart failure between June and August 2018 are included in the study. Patients with a known instance of kidney illness, those on dialysis, and those who had had a kidney transplant were excluded. Patients' file, echography report, and Renal function test reported personal and clinical data were collected in a questionnaire. There may be multiple reasons for hospitalization or etiological diagnoses for each patient.

Results: Males made up 54.5 % of the 55 patients in the study, while females made up 45.5%. Below forty years, 3.6%, between forty and sixty years, 32.7%, and above sixty years, 63.6%. Mild HF affects 29.1% of the population, whereas moderate HF affects 52.7% and severe HF affects 18.2%. Hypertension, diabetes, and smoking were the most common cofactors for HF, accounting for 81.8%, 70.9%, and 43.6% of cases, respectively. Impaired renal function developed in 87.3% of cases, whereas 16.4% had mild impairment. Renal failure developed in 32.7% of the intermediate cases, 36.4% of the severe cases, and 1.8% of the cases. Hyperkalemia affects 3.6% of people. More than 5.5 mmol/l and 52.7 hyponatremia in 1.8% of people. Heart failure is caused by ischemic heart disease (IHD) in 78.2% of cases, valve disease in 10.9% of cases, and cardiomyopathy in 20% of cases.

Conclusion: Heart failure is common in Sudan, and it is one of the leading causes of hospitalization. It is more common in men, and it increases in proportionality with age, with most cases occurring beyond sixty years. IHD is responsible for more than three-quarters of HF cases. Renal dysfunction is predicted by increased baseline serum creatinine, urea, and eGFR90 ml/min, as well as a patient's history of diabetes, high blood pressure, and smoking.

Key words: Renal dysfunction, heart failure, Heart Center.

Resumen

Antecedentes: La disfunción renal es una de las comorbilidades más frecuentes en la insuficiencia cardíaca, y aumenta la mortalidad, la morbilidad, la complejidad y el coste de la atención de forma espectacular. La disfunción renal está vinculada a malos resultados en los pacientes con insuficiencia cardíaca (IC).

Objetivos: El objetivo de este estudio fue evaluar la prevalencia del deterioro de la función renal, así como los predictores clínicos y los resultados hospitalarios del deterioro renal, entre los pacientes con insuficiencia cardíaca hospitalizados.

Métodos: El estudio se llevó a cabo en el Centro Cardíaco de Wad-Madani, un hospital terciario que atiende a Gezira y el estado circundante. Se incluyeron en el estudio todos los adultos ingresados en el Centro Cardíaco Wad-Madani y diagnosticados con insuficiencia cardíaca entre junio y agosto de 2018. Se excluyeron los pacientes con un caso conocido de enfermedad renal, los que estaban en diálisis y los que habían recibido un trasplante de riñón. Se recogió en un cuestionario el expediente de los pacientes, el informe de la ecografía y los datos personales y clínicos comunicados por la prueba de función renal. Puede haber múltiples motivos de hospitalización o diagnósticos etiológicos para cada paciente.

Resultados: el 54,5% de los 55 pacientes del estudio eran varones, mientras que el 45,5% eran mujeres. Menores de cuarenta años, 3,6%, entre cuarenta y sesenta años, 32,7%, y mayores de sesenta años, 63,6%. La IC leve afecta al 29,1% de la población, mientras que la moderada afecta al 52,7% y la grave al 18,2%. La hipertensión, la diabetes y el tabaquismo fueron los cofactores más frecuentes de la IC, representando el 81,8%, el 70,9% y el 43,6% de los casos, respectivamente. El 87,3% de los casos presentaba deterioro de la función renal, mientras que el 16,4% tenía un deterioro leve. La insuficiencia renal se desarrolló en el 32,7% de los casos intermedios, en el 36,4% de los casos graves y en el 1,8% de los casos. La hipototasemia afecta al 3,6% de las personas. Más de 5,5 mmol/l y 52,7 de hiponatremia en el 1,8% de las personas. La insuficiencia cardíaca está causada por la Cardiopatía isquémica (CI) en el 78,2% de los casos, la valvulopatía en el 10,9% de los casos y la miocardiopatía en el 20% de los casos.

Conclusión: La insuficiencia cardíaca es frecuente en Sudán y es una de las principales causas de hospitalización. Es más frecuente en los hombres y aumenta proporcionalmente con la edad, presentándose la mayoría de los casos después de los sesenta años. La CI es responsable de más de tres cuartas partes de los casos de IC. La disfunción renal se predice por el aumento de la creatinina sérica, la urea y el FGe90 ml/min, así como por los antecedentes de diabetes, hipertensión arterial y tabaquismo del paciente.

Palabras clave: Disfunción renal, insuficiencia cardíaca, centro cardíaco.

Introduction

Heart failure is a medical disorder in which the heart is unable to provide enough oxygen to the tissues. The most frequent cause of HF is coronary heart disease, which affects the majority of patients. Valvular disease, cardiomyopathy, and hypertension are all key causes.

The clinical sickness is known as "heart failure," although with therapy, a patient can become asymptomatic. Patients with chronic heart failure have had heart failure for an extended period of time¹. Congestive heart failure is defined as acute or chronic heart failure with signs of congestion, such as salt and water retention. The management of the body's salt and water levels by the kidneys is directly dependent on the heart, and the kidneys are directly dependent on the heart's blood flow and pressure. This is especially true in cases like heart failure (HF), where the interdependence of both organs can lead to a vicious circle in which the degeneration of one organ leads to a severe, possibly self-perpetuating, high-mortality condition. The cardiac renal syndrome is a term that stresses the fact that it comprises a variety of frequently overlapping sickness symptoms that are all part of the same disease². It is now well understood that renal disease can cause heart disease, and that heart disease can wreak havoc on the kidneys. One of the most powerful predictors of a poor clinical outcome in heart failure (HF) is renal impairment³. Heart failure affects at least 26 million individuals globally and is becoming more common⁴.

A link between reduced renal function and poor outcomes has been found in several investigations of heart failure patients. Health-care costs for the elderly are high and will continue to rise as the population ages. Patients with renal impairment have a death rate that is more than double that of those without. Furthermore, a decrease in eGFR is linked to a 60-80% increase in mortality⁵. Worsened renal function (WRF) was defined as a rise in serum creatinine of ≥ 0.3 mg/dl (26.5 μ mol/l) in a study of Medicare seniors with HF⁶. Patients with WRF also had longer hospital stays, greater in-hospital expenses, higher in-hospital mortality, and a higher risk of readmission.

Despite major breakthroughs in treatments and prevention, mortality and morbidity remain high, and quality of life remains low⁴. Congestive Heart Failure accounts for 15% of all heart illness, and the incidence of heart disease in Khartoum, Aljazeera, the White Nile, the Red Sea, and the West of Sudan was 40%, 25%, 20%, 10%, and 5%, respectively⁷.

Subject and methods

Study design: A hospital-based prospective, quantitative, descriptive analytical study.

Study area: This research is being carried out at the Wad-Madani Heart Centre, a tertiary hospital that serves Gezira and the surrounding states in the center.

Study population: Between June and August 2018, a total of 55 adult patients were admitted to Wad-Madani Heart Center with heart failure. With an age range of 35 to 90 years, 45.5 percent (n=25) were female and 55.5 percent (n=30) were male.

Exclusion criteria: Patient had a history of kidney disease, was on dialysis, and had a kidney transplant.

Sample size: Except for those listed above, all adult patients diagnosed with heart failure

Sampling method and Data collection tools: Renal function test, questionnaire, patient data, patient ECHO report.

GFR calculation: Cockcroft, Gault calculator was employed in this investigation with four variables: age, weight, gender, and serum creatinine. $(140 - \text{age}) (\text{weight by kg}) / (72 * \text{serum Cr})$ in ml/min is the creatinine clearance value. multiply by 0.85 in females (Cockcroft DW, Gault MH prediction of creatinine clearance from serum creatinine Nephron 1976).

Data analysis: SPSS was used to analyze the data from this investigation (Statistical Package for Social Sciences 25). The numerical value data will be reported as (mean \pm standard deviation SD). The Chi-square test was done to determine whether the variables were significantly different. P=0.05 is regarded as statistically significant.

Ethical consideration: The research was carried out in conformity with the ethics committee of the faculty of medicine at Gezira University. Wad-Madani cardiac centre granted administration authority. The patient's informed consent is protected by a high level of secrecy.

Result

54.5% of the study population were male and 45.5% were female with mean age 65 years, EF 41.8%, Mild HF 29.1%, moderate 52.7% and severe in 18.2%. All patient presented with SOB, 85.5% with LL swelling, 63.6% with abdominal distention. No one presented shock. On examination 16.4% had tachycardia 80% had normal pulse rate and 3.6% had bradycardia. 89% were tachypneic and 11% had normal respiratory rate. Systolic blood pressure was normal in 70.9%, high in 27.3% and low in 1.8%. Diastolic BP was normal in 89.1%, high in 9.8% and low in 1.8%. HTN was measured in 81.8%, DM in 70.9% and smoking in 43.6%. IHD was diagnosed in 78.2%, valvular in 10.9%, cardiomyopathy in 20% and

mixed cause in 3.6%. Regarding Base line renal function, impaired renal function (Urea > 50 mg/dl) was detected in 61.8 % and (Creatinine > 1.4 mg/dl) in 49.1 %. Basal crepitation demonstrated in all subject, LL edema in 91%, JVP raised in 56.4 % of subject. 1.8% had renal failure (GFR<15 ml/ min) and 36.4% with severely decreased GFR (15- 29) ml/min, 32.7% moderate decrease in GFR (30-59) ml/min, 16.4% mild decrease

GFR (60-89) ml/min, and 12.7 had normal GFR. 3.6% with hyperkalemia (more than 5.5 mmol/l) and 52.7% with hypernatremia. Proteinuria was detected in 1.8%. All patient given loop diuretic. 92,7% anti-ischemic. After admission and medication urea impaired in 7.3%, Creatinine in 7.3% and 29.1% with hypernatremia. 5.5% with severely decreased GFR, 54.5% moderate, 27.3% mild, and 12.7% had normal GFR (Table I, Figure 1-5).

Table I: The frequency of participants in the study population.

Variable	Age group	Frequency	Percent%
Age	<40	2	3.6
	40-60	18	32.7
	>60	35	63.6
Presentation	SOB	55	100
	LL swelling	47	85.5
	Abd distension	35	63.6
	cardiogenic shock	0	0
Risk Factor	HTN	45	81.8
	DM	39	79.9
	Smoking	24	43.6
Causes	IHD	43	78.2
	Cardiomyopathy	11	20
	valvular lesion	6	10.9
	Mixed	2	3.6
RR	Normal	6	10.9
	Tachypnea	49	89.1
SBP	Normal	39	70.9
	High	15	27.3
	Low	1	1.8
DBP	Normal	49	89.1
	High	1	1.8
	Low	5	9.1
Serum urea (Admission)	Normal<50	21	38.2
	> 50 Impaired	34	61.8
Serum urea (Discharge)	Normal<50	51	92.7
	> 50 Impaired	4	7.3
Serum Creatinine (Discharge)	<1.4	51	92.7
	>1.4	4	7.3
Serum Na+(Admission)	<135 hypernatremia	29	52.7
	135-145 normal	26	47.3
K+ (Discharge)	<3.5	18	32.7
	3.5-5.5	37	67.3
Proteinuria	Yes	1	1.8
	No	54	98.2
	<90 normal	7	12.7
GFR (Admission)	60-90 mildly decreased	9	16.4
	30-60modarate to sever decreased	18	32.7
	15-29 severely decreased	20	36.4
	<15 kidney failure	1	1.8
GFR categories at (Discharge)	<90 normal	7	12.7
	60-90 mildly decreased	15	27.3
	30-60modarate to sever decreased	30	54.5
	15-29 severely decreased	3	5.5
Echo ejection fraction	45-55 Mild	16	29.1
	35-45 moderate	29	52.7
	<35 sever	10	18.2
ACEI	Yes	38	69.1
	No	17	30.9
ARP	Yes	11	20.0
	No	44	80.0
Anti-ischemic	Yes	51	92.7
	No	4	7.3

Figure 1: The incidence percent of heart failure based on gender.

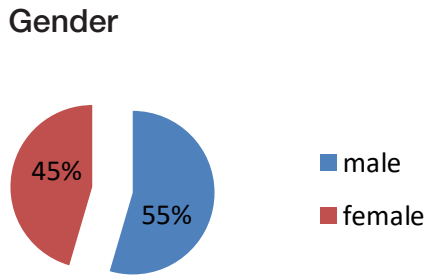


Figure 2: Heart rate at admission.

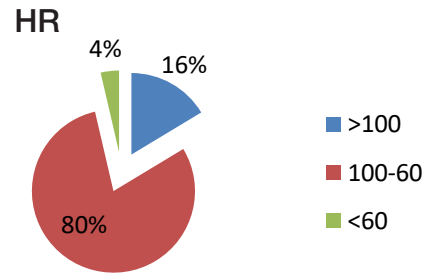


Figure 3: Basal crepitation at admission.

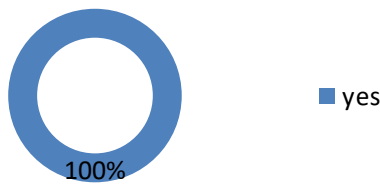


Figure 4: Lower limb edema at admission.

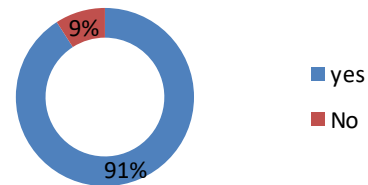
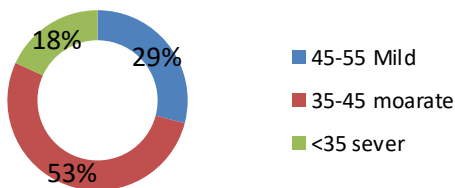


Figure 5: Classification of heart failure according to EF.



Discussion

Heart failure can arise as a result of almost any abnormality of the structure, mechanical function, or electrical activity of the heart, each of which may require quite different treatments, emphasizing the importance of appropriate investigation of patients with suspected heart failure. Many of the typical clinical symptoms and signs of heart failure do not arise directly as a result of the cardiac abnormality but rather from secondary dysfunction of other organs and tissues, such as the kidneys.

Analysis reveals that heart failure is predominant among male with a percent of 54.5% relative to 45.5% among female. In comparison with the study carried out by Omer et al.⁷ in Sudan showed that HD were predominant among male by 56% than female 44%, ascribed to different factors such as social stress, poor economic and heavy responsibility. Moreover, 63.6% of patient with heart failure were more than sixty years. This finding was in agreement with Omer, M. A et al 2016 and Go, et al 2013^{7,8} which showed that HD were pre dominant among 65-77 years old and the incidence of condition increase with age.

Watson, RD9 showed that Presentation, most of the study population complained of dyspnea 95.6%, and two-thirds had lower limb swelling with no specific symptom of heart failure despite that the symptom mention above considered with major presentation, this in agreement with our study who patient presented with SOB 85.5% Odema and 63.6% with abdominal distention no one presented shock, reflecting that most complain of patient result from fluid retention.

HTN, DM, IHD and smoking may induced or accelerate heart failure increases the events of cardiovascular diseases by two to three folds relative to normal people^{10,11} in different areas such as Europe, North America and Australasia. In Sudan indications for admissions by heart disease were ADHF (acute decompensate heart failure) 73%, ACS (acute coronary syndromes) 47%, Arrhythmia 20%, IE (infective endocarditis) 3%, and others 3%. Etiological diagnoses given to patients were IHD (ischemic heart disease) 65%, HHD (hypertensive heart disease) 28%, NIDCM (non-ischemic dilated cardiomyopathy) 11%, RHD (rheumatic heart disease) 7%, pericardial disease 4(%), Others (2%)., HHD and IHD common in 51-60 years old¹¹.

Data which obtained from this study reveal that more than three quadrant of patient of heart failure attending Wad-Madani heart center from June to august had significant reduction on renal function, estimated GFR less than 90 ml/min in 87.3%.This agree with other studies done worldwide⁹. Among 1,004 HF patients studied, WRF developed in 27%. this approve that renal dysfunction is highly prevalent in the HF population. GFR as predictor

of renal affection show 1.8% had renal failure 36.4% severe 32.7% moderate and 16.4 % mild decrease in GFR compared to 12.7% with normal function. Urea increased in 61.8% and creatinine in 49.1% 3.6% with hyperkalemia more than 5.5 mmol/l and 52.7% hyponatremia less than 135 mmol/L, proteinuria in 1.8%. Landmark papers established the relationship between renal hemodynamics, GFR and the severity of HF were published by Cody colleagues¹². They demonstrated the reduction in RBF was out of proportion to the reduction in cardiac index, while GFR was relatively maintained; a phenomenon now easily explained by renal autoregulation. Then, when RBF drops further, GFR declines as autoregulatory capacity is exhausted. These findings have been reproduced in patients on ACEi, with the difference that RBF and GFR declined in parallel since compensatory efferent arteriolar vasoconstriction is reduced by ACEi¹³ then, focus has shifted to venous congestion as another important determinant of reduced GFR. It has now been convincingly shown in modern HF patients that, independent of a reduction in RBF, there is an epidemiologic association between increased CVP or venous congestion and reduced GFR¹⁴.

Conclusion

Heart failure is prevalent in Sudan, and it is one of the major causes of hospital admission with higher incidence among male and has increasing proportionality with aging and mostly occur after sixty year. More than

three quadrant of HF cases caused by IHD. Significant predictors of renal dysfunction include elevated baseline serum creatinine, and urea and eGFR<90 ml/min, patients history of diabetes, elevated BP and smoking increase the risk.

Recommendations

Heart failure not a disease it is syndrome need systemic approach, which include good control of blood pressure and diabetes beside stop alcohol and smoking to maintain health.

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Abbreviations

ACEi = Angiotensin converting enzyme inhibitor, eGFR = Estimated glomerular filtration rate, GFR = Glomerular filtration rate, HF= Heart failure, HHD=Hypertensive heart disease, HTN= Hypertension, IHD= ischemic heart disease, K= Potassium, Na= Sodium, BP= Blood pressure, WRF =Worsening renal function

Conflict of Interest

The authors report no conflicts of interest.

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