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Research Article

The pattern of cardiovascular disease in River Nile State (October 2019-April 2020)

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Abstract

Background: The rise of cardiovascular diseases poses a significant global threat, not only in terms of morbidity and mortality but also due to their substantial economic burden. Understanding the specific patterns of CVDs within various populations is crucial for effective prevention, early diagnosis, and management.

Objective: This study aimed to determine the pattern of cardiovascular disease using echocardiography in River Nile State.

Methods: This prospective cross-sectional hospital-based study conducted from October 2019 to April 2020 aimed to ascertain the pattern of cardiovascular diseases using echocardiography in River Nile State. A sample of 1000 participants from Atbara Teaching Hospital, Atbara Complex, and Shendi Teaching Hospital was included. The study population comprised all Sudanese patients undergoing echocardiography in the region. Inclusion criteria involved patients presenting for echocardiography who consented to participate, while refusal to participate constituted exclusion criteria. Data collection involved obtaining written consent from patients and recording echocardiographic findings, including age, gender, and patterns of heart disease, using standardized data sheets.

Results: The findings revealed a mean age of 72±6.8 years, with females comprising 64.7% of the sample. Hypertensive heart disease (31.5%) and valvular lesions (29.8%) emerged as the most prevalent cardiovascular diseases. Ischemic heart disease (11.2%), rheumatic heart disease (8.3%), and cardiomyopathy (5.7%) were also notable. Patterns of cardiovascular diseases showed significant associations with age and gender, with hypertensive heart disease and valvular lesions more prevalent in older age groups, while congenital heart disease was more prevalent among younger individuals (20–40 years).

Conclusion: The study revealed that hypertensive heart disease (31.5%) and valvular lesions (29.8%) as the dominant CVD patterns. Focusing on these conditions with tailored prevention, early diagnosis, and management is crucial, especially for older individuals.

Keywords: Cardiac diseases, Comorbidity, Nile State, Pattern.

INTRODUCTION

Cardiovascular diseases (CVD) are a major cause of morbidity and mortality worldwide, being responsible for 30% of all deaths and 10% of DALYs (disability-adjusted life years)[1].

In Sudan, the recent Sudan household survey of 2006 showed the prevalence of heart disease to be 2.5%[2] and according to the Federal Ministry of Health, Annual Health Statistical Report of 2008, heart disease ranked fourth in the leading causes of in-hospital deaths [3].

In fact, more than 82% of deaths among patients with cardiovascular disease result from conditions such as coronary or ischemic heart disease, hypertensive heart disease, stroke (both ischemic and hemorrhagic), peripheral arterial disease, congestive heart failure (CHF), and cardiomyopathy[4]. Rheumatic heart disease stands out as the most prevalent cause of acquired heart disease among children and young adults worldwide[4]. Acute rheumatic fever and RHD are closely associated with poverty, particularly in areas with poor sanitation, overcrowded living conditions, malnutrition, and limited access to healthcare[4]. According to the 2015 Global Burden of Diseases (GBD) report, 33.4 million people globally were affected by RHD, with 319,400 fatalities, the vast majority of which occurred in low to middle-income countries[4].

Echocardiography is a veritable tool for the diagnosis and characterization of Acquired heart diseases(AHD)[5, 6]. The echocardiographic machine is currently available in all tertiary and some secondary health institutions in Sudan[7]. With the echocardiographic confirmation of AHD, a prognostication and management plan can confidently be made[8].

Apart from diagnosing AHD for possible treatment, identification of heart diseases by echocardiography generally

helps in patient management because studies have shown that echocardiography as an imaging modality has a role in interventions on both congenital and acquired structural heart diseases[9]. It also helps in the prognostication of patients needing noncardiac operations since perioperative morbidity and mortality are higher in those with structural heart disease than those without[8].

Echocardiographic identification of structural heart diseases followed by successful correction of such diseases has the potential to prevent sudden cardiac deaths caused by polymorphic ventricular tachycardia whose substrate is structural heart disease[10].

METHODS

Study Design and Settings:

This was a prospective cross sectional analysis spanning from October 2019 to April 2020. The research took place at Atbara Teaching Hospital, Atbara Complex, and Shendi Teaching Hospital in River Nile State. Atbara Teaching Hospital, established in 1902, comprises four major departments and eleven minor ones. It has a staff of 42 consultants specializing in various fields, along with six registrars. The hospital operates with a daily duty system overseen by one consultant and two registrars, including a daily referral clinic and a family planning section.

The Shendi Alamal Center is a modest facility equipped with ultrasound and echocardiography capabilities. It consists of a single room housing two devices: one for ultrasound and another for echocardiography.

Eldamer Teaching Hospital, founded in 1940, features four major departments and five minor ones. It is staffed by 15 consultants across different specialties and has four registrars, along with a daily referral clinic.

Study Population:

This research encompassed all Sudanese patients residing in River Nile State who underwent echocardiography at the hospitals mentioned above.

Inclusion criteria included patients who presented for echocardiography. Additionally, the patients who declined to participate in the study were excluded.

Sample size and sampling technique:

The study achieved complete coverage of all Sudanese adult patients diagnosed with heart disease during the study period who met the inclusion criteria. The study sample consisted of 1000 participants who fulfilled the inclusion criteria.

Data Collection Tools and Methods:

Data was gathered from patients subsequent to obtaining written consent. A structured data sheet, encompassing echocardiographic findings, was utilized for data collection. The form was completed by both the researcher and attending physicians, documenting patient demographics such as age, gender, and patterns of heart disease.

Data analysis: data was analyzed using Statistical Packages for Social Sciences (SPSS) version 23.0. Frequencies and Chi-square tests were used when appropriate. The P value was considered significant if < 0.05.

RESULTS

The age distribution of the patients showed that

375(37.5%) aged 60 – 80 years, 347(34.7%) between 41 – 60 years, 168(16.8%) between 20 – 40 years, 70 (7%) above 80 years and 40(4%) less than 20 years. The mean age was 72±6.8 years. Females were 647(64.7%) and males were 353(35.3%). Female to male ratio was 1.8: 1. 628(62.8%) from Atbara city, 201(20.1%) from A-damer, 100(10%) from Berber and 71(7.1%) from Shendi. The echocardiography results revealed that the most prevalent patterns of heart disease were hypertensive heart disease, accounting for 315 cases (31.5%), followed closely by valvular lesions with 298 cases (29.8%). Additionally, other observed patterns of heart diseases included ischemic heart disease (112 cases, 11.2%), rheumatic heart disease (83 cases, 8.3%), normal echocardiograms (82 cases, 8.2%), cardiomyopathy (57 cases, 5.7%), congenital heart disease (17 cases, 1.7%), pulmonary hypertension (22 cases, 2.2%), and heart failure (14 cases, 1.4%).Moreover, the echocardiograms of 82 patients were normal(8.2%).

The patterns of cardiovascular disease were found to be significantly associated with age and gender, specifically hypertensive heart disease and valvular lesions associated with older ages (40 years and above, while congenital heart disease was associated with age group 20 – 40 years (P value < 0.05).

Table 1: sociodemographic characteristics of patients who came for echocardiography in river Nile states.

Characteristic	n (%)
Gender	
Male	353(35.3%)
Female	647(64.7%)
Age group in years	
above 80 years	70 (7%)
60 – 80 years	375(37.5%)
41 – 60 years	347(34.7%)
20 – 40 years	168(16.8%)
less than 20 years	40(4%)
Residence	
Atbara city	628(62.8%)
A-damer city	201(20.1%)
Berber city	100(10%)
Shendi. City	71(7.1%)
Education level	
Illiterate	317(31.7%)
primary education	298(29.8%)
Secondary education	214(21.4%)
university	171(17.1%)

Table 2: symptoms, habits, and comorbidities of disease category diagnose by echocardiography;

Symptoms	Yes		No	
	N	%	N	%
Chest pain	641	64.1	359	35.9
Shortness of breath	601	60.1	399	39.9
Cough	735	73.5	265	26.5
Palpitation	326	32.6	674	67.4
Lower limb swelling	159	15.9	841	84.1
Dizziness	137	13.7	863	86.3
Loss of consciousness	84	8.4	916	91.6
Habits	N		%	
None	621		62.1	
Smoking	116		11.6	
Snuffer	147		14.7	
Shisha	66		6.6	
Alcohol	50		5.0	
Total	1000		100	
Lifestyle	N		%	
Physical exercise	479		47.9	
Intake fatty diet	218		21.8	
Co-morbidities	N		%	
Hypertension	592		83.1	
Diabetes	566		79.5	
Asthma	39		5.5	

Table 3: Distribution of the patients according to current patterns of heart disease;

Diagnosis based on Echo findings	N	%
Normal	82	8.2
Hypertensive heart disease	315	31.5
Valvular lesion	298	29.8
Ischemic heart disease	112	11.2
Cardiomyopathy	57	5.7
Rheumatic heart disease	83	8.3
Congenital heart disease	17	1.7
Heart failure	14	1.4
Pulmonary hypertension	22	2.2
Total	1000	100.0

Table 4: Distribution of the patients according to correlation between patterns of cardiovascular diseases and age group;

Patterns	< 20 years	20 - 40 years	41 - 60 years	60 - 80 years	> 80 years	Total
Normal	0	25	33	22	2	82
Hypertensive heart disease	8	37	127	127	17	315
Valvular lesion	8	53	82	122	33	298
Ischemic heart disease	2	10	47	47	7	112
Cardiomyopathy	3	20	20	12	2	57
Rheumatic heart disease	3	8	25	37	10	83
Congenital heart disease	2	10	2	3	0	17
Heart failure	0	3	7	4	0	14
Pulmonary hypertension	13	2	5	2	0	22
Total	40	168	347	374	70	1000

Table 5: Distribution of the patients according to correlation between gender and pattern of cardiovascular diseases;

Patterns	Male	Female	Total
Normal	21	61	82
Hypertensive heart disease	89	226	315
Valvular lesion	152	146	298
Ischemic heart disease	40	72	112
Cardiomyopathy	20	37	57
Rheumatic heart disease	11	72	83
Congenital heart disease	6	11	17
Heart failure	4	10	14
Pulmonary hypertension	10	12	22
Total	353	647	1000

DISCUSSION

To our knowledge, this is the first study of cardiovascular disease patterns in echocardiography in the river Nile state. Identifying the most common cardiovascular pattern in echocardiography in Atbara, Edamer, and Shendi teaching hospitals is essential for policy-making and healthcare planning. The result of this study however demonstrates there has been considerable change, The common age group was 60 – 80 years in 375(37.5%) of the patients. The mean age was 72±6.8 years. Females were 647(64.7%) and males were 353(35.3%). The female-to-male ratio was 1.8: 1. The patients

were from the main four cities of the River Nile State, including Atbara, A-damer, Berber, and Shendi. The common tribe was Gaalyeen 571(57.1%). Similar to the study in Khartoum State Suliman found that 57.3% were males and 42.7% were females. In the CCU, M: F ratio was 1.4:1, and in the wards 1.3:1[11]. Another study aimed to determine the pattern of hospital admissions and patient outcomes in medical wards at Atbara Teaching Hospital in River Nile State, Sudan[12]. A total of 2,614 patient records were analyzed. The age group with the highest admissions was the 56–65-year-old age group (19.4%). Shafi et al studied the echocardiographic pattern of heart diseases at a Southwest Nigerian private clinic[13]. The age range was 18–95 years with a mean of 52.35 ± 18.03 years

In this study, it was found that 521 individuals (52.1%) did not engage in physical activity, while 218 individuals (21.8%) reported a high intake of fatty diets. Similar to this, another study showed that about 31.3% of adults aged 15 or older (28.2% men and 34.4% women) were insufficiently physically active[14]. The risk of ischemic heart disease and diabetes mellitus is reduced by almost a third in adults who participate in 150 minutes of moderate physical activity each week (or equivalent). In addition, physical activity assists in weight loss and improves blood glucose control, blood pressure, lipid profile, and insulin sensitivity. These effects may, at least in part, explain its cardiovascular benefits [15].

In our research, the majority of the patients 621(62.1%) had no social habits, while some reported snuffer, smoking, using shisha, and drinking alcohol. Similar to this finding, a previous study showed that cigarette smoking was associated with the risk of heart disease[15]. Cigarettes are the major form of smoked tobacco[15]. Risks to health from tobacco use result not only from direct consumption of tobacco but also from exposure to second-hand smoke[16]. Approximately 10% of cardiovascular disease is attributed to smoking; however, people who quit smoking by age 30 have almost as low a risk of death as never-smokers[17].Other studies showed that drinking at low levels without episodes of heavy drinking may be associated with a reduced risk of cardiovascular disease, but there is evidence that associations between moderate alcohol consumption and protection from stroke are non-causal[18]. At the population level, the health risks of drinking alcohol exceed any potential benefits[18].

In our study, the presenting symptoms of the patients were cough 735(73.5%), chest pain 641(64.1%), shortness of breath 601(60.1%), palpitation 326(32.6%), lower limb swelling 159(15.9%), dizziness 137(13.7%) and loss of consciousness 84(8.4%). Similar to this study, Suliman in Khartoum State found that the indications for admissions were ADHF (acute decompensated heart failure) 73%, ACS (acute coronary syndromes) 47%, Arrhythmia 20%, IE (infective endocarditis) 3%, and others 3%[11].

Regarding comorbidities, in our study associated chronic diseases were reported in 712(71.2%) of the patients (Figure 8) including hypertension 592(83.1%), diabetes mellitus 566(79.5%), and asthma 39(5.5%). Another study aimed to determine the pattern of hospital admissions and patient outcomes in medical wards at Atbara Teaching Hospital in River Nile State, showed that Non-communicable diseases constituted 71.8% of all cases[12]. While Ojji et al found that the commonest cause of heart failure identified was hypertension in 61.5% of the patients[7].

Current diagnosis based on Echo findings were hypertensive heart disease 315(31.5%), valvular lesion 298(29.8%), ischemic heart disease 112(11.2%), rheumatic heart disease 83(8.3%), normal Echo 82(8.2%), cardiomyopathy 57(5.7%), congenital heart disease 17(1.7%), pulmonary hypertension 22(2.2%) and heart failure 14(1.4%). The patterns of cardiovascular disease were significantly associated with age and gender, for example, hypertensive heart disease and valvular lesions were associated with older ages (40 years and above, while congenital heart disease were associated with age group 20 – 40 years (P value < 0.05). Similar to the study by Suliman in Khartoum State showed that 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%). RHD admissions peaked in the 21-30 years old age group, NIDCM in 41-50 years old, and HHD and IHD in 51-60 years old[11].

In another study conducted by Alkhalifa et al. in Khartoum State, it was concluded that isolated Mitral Stenosis was relatively infrequent, accounting for only 9% of cases[19]. This lower prevalence could be attributed to a diminished detection rate associated with the gradual progression of stenosis and the presence of subtle early signs. Furthermore, inconsistencies in the reported history of rheumatic fever might contribute to an underestimation of the prevalence of Rheumatic Heart Disease (RHD). The study also identified a significant correlation between the severity of the lesion and irregular prophylaxis (P < 0.001). Similarly, Ajayi et al in Nigeria showed that the common echocardiographic diagnoses were hypertensive heart disease (HHD), 39.9%, and valvular heart disease (VHD), 15.0%. Rheumatic heart disease accounted for 67.7% of those diagnosed with VHD or 10.2% of the study population[20]. Congenital heart disease was diagnosed in 1.7% of the cases comprising ventricular septal defect (0.5%), atrial septal defect (0.5%), persistent patent ductusarteriosus (0.4%), and bicuspid aorta (0.2%). The confirmation rate for HHD was 66.1%, while 70% and 57.1% of those referred on account of unexplained leg swelling and dyspnea, respectively, had heart disease. Heart disease was confirmed in 45.5% of the patients referred for routine tests. Ekpe et al documented the echocardiographic patterns of AHDs in Nigeria[7]. There were 190 diagnoses in the 163 patients with 27 patients having a double diagnosis, consisting of 88 (54%) males and 75 (46%) females. The mean age was 50.4 years (age range 9-85 years). Ten types of acquired heart pathologies were identified and they included hypertensive heart disease in 49.47%, rheumatic heart disease in 26.32%, cardiomyopathy in 11.05%, endomyocardial fibrosis in 4.74%, and pericarditis in 3.68%. Others were corpulmonary, pulmonary hypertension, intracardiac thrombi, left atrial myxoma, and degenerative heart disease which accounted for the remaining 4.74%. Ojji et al showed that The commonest cause of heart failure identified was hypertension in 61.5% of the patients; 75.5% had systolic heart failure, whereas 23.5% had heart failure with preserved ejection fraction[21].

CONCLUSION

Heart disease is an important cause of morbidity and mortality in Sudan. The study showed that the common patterns of cardiovascular disease were hypertensive heart disease, valvular lesions, and ischemic heart disease.

Policymakers and health planners should be made aware of the changing patterns of heart disease in this community.

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