Spectrum of Heart Diseases at a referral tertiary care hospital in Somalia, Mogadishu: An echocardiographic study

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June 20, 2021

Abstract

Objective: To investigate the frequencies and patterns of cardiovascular diseases (CVD), assessed by echocardiographic examinations in Mogadishu, the capital of Somalia. Material and Methods: This retrospective, descriptive registry reviewed the pathological echocardiographic findings of 1140 patients aged 0-100 years who were admitted to the cardiology outpatient clinic in a tertiary training hospital in Mogadishu. Results: Out of the 6782 patients reviewed, 1140 patients who met the inclusion criteria were enrolled in the study. Hypertensive heart disease (HHD) (39.8%) and degenerative valvular disease (34.6%) were the most common comorbidities. Congenital heart diseases (CHD)were detected in 13.2% of the patients, with the most common ones including atrial septal defect (ASD) (3.2%) and ventricular septal defect (VSD) (2.3%). Rheumatic heart disease (RHD) was detected in 84 (7.4%) patients, among whom the most common age range was 21-30 years (28.6%), followed by 31-40 years (25%) and 11-20 years (19.1%). Conclusion: In the present study, we found that HHD was the most common comorbidity (39.8%), followed by degenerative valvular disease (34.6%), HFrEF (%30.8), and IHD (24.4%). Moreover, the most common valvular disease was mitral insufficiency (47.5%) and the most common CHD was ASD(3.2%).

Introduction

Cardiovascular diseases (CVD), including congenital heart diseases (CHD), are leading causes of death worldwide[1]. Although the incidence, treatment, types, and outcomes of these diseases have been documented in detail in developed countries, there are still serious concerns in developing and African countries about both the quality and reliability of the available data. According to the World Health Organization (WHO), CVD are the second most common cause of death in Africa and 1.2 million people died from CVD in 2015[2]. In addition to CHD, which have a relatively similar distribution all over the world, rheumatic heart disease(RHD) is secondary to non-communicable diseases and is also naturally preventable and a leading cause of death in low/middle-income developing countries[3]. Every year, 291,000 deaths, accounting for 2% of CVD deaths, occur due to RHD[4].

Echocardiography (echo) is an easy-to-use, inexpensive, non-invasive, and reliable ultrasound-based modality, although its use in many parts of Africa is still highly limited[5]. Accordingly, there is a lack of reliable data regarding the diagnosis, follow-up, treatment, and prevention of CVD diseases in those regions. Moreover, this drawback is thought to be a crucial and noteworthy challenge in reducing preventable non-communicable diseases in low- and middle-income countries. To this end, the present study aimed to investigate the frequency and pattern of CVD assessed by echocardiographic examinations in Mogadishu, the capital of Somalia.

Materials and Methods.

Study population and design

This retrospective, descriptive and observational registry reviewed the echocardiographic findings of patients aged 0-100 years who were admitted to the cardiology outpatient clinic in a tertiary training hospital in Mogadishu, between January 1, 2019, and January 1, 2020. Out of the 6782 patients reviewed, 5642 individuals who had incomplete and unreliable data and/or completely normal echocardiographic findings were excluded from the study. Accordingly, a total of 1140 patients with pathological echocardiographic findings were included in the study. Demographic characteristics and echocardiographic parameters including ejection fraction (EF), interventricular septum (IVS) thickness, left ventricular (LV) diastolic dysfunction grades, mitral valve insufficiency/stenosis, and degenerative, rheumatic, and congenital heart diseases were analyzed for each patient. All the patients showed compliance with the American Society of Echocardiography (ASE) guidelines[6]. Those under the age of 15 were defined as children. Age- and gender-based distributions of acquired, congenital, and rheumatic heart diseases were evaluated. Those with active tuberculosis or a history of TB were evaluated together, regardless of whether they received treatment or not. The study was conducted in accordance with the Helsinki Declaration. Ethical approval was obtained from the local ethics committee. The need for informed consent was waived due to the retrospective nature of the study.

Hypertensive heart disease (HHD) was diagnosed in the presence of signs of heart failure or criteria for left ventricular hypertrophy (LVH) on electrocardiography (ECG) or echocardiography, considered not to be caused by valvular heart disease (VHD) and/or ischemic heart disease (IHD), in known or newly diagnosed hypertensive patients (TA$>$ 140/90 mmHg), regardless of systolic or diastolic dysfunction.

Valvular heart disease (VHD) was defined as an obvious function and size abnormality, insufficiency/stenosis, abnormal thickening of valve leaflets or cusps, coaptation failure, calcification, and loss of normal contour detected by echocardiography in at least one of the heart valves.

Rheumatic heart disease (RHD) was diagnosed in accordance with the 2012 World Heart Federation (WHF) criteria for echocardiographic diagnosis of RHD[7].

Ischemic heart disease (IHD) was diagnosed in patients with a history of angina pectoris or a history of myocardial infarction, or an ECG feature indicating a previous myocardial infarction and a regional wall motion abnormality suggestive of myocardial infarction detected on echocardiography.

Dilated cardiomyopathy (DCM) was defined as left ventricular or biventricular systolic dysfunction and dilatation (LVEDD) $>$58mm for males and $>$52mm for females, not explained by abnormal filling conditions or coronary artery disease, regardless of being primary or secondary[8].

Hypertrophic cardiomyopathy (HCM) was defined as unexplained concentric hypertrophy $>$15 mm in any myocardial segment or presence of septal/posterior wall thickness $>$1.3 in normotensive patients and$>$1.5 in hypertensive patients (these values were chosen as all HCM patients were adults)[9,10].

Pericardial effusion (PE) was diagnosed in the presence of an echo-free space between the visceral and the parietal pericardium. Classification was as follows: mild($<$10mm),moderate (10-20mm), and severe ($>$20mm).

Constrictive pericarditis was diagnosed in the presence of echocardiographic signs of constriction in a patient with suspected or confirmed tuberculosis.

Heart failure with reduced EF (HFrEF) wasdiagnosed in the presence of clinical signs of heart failure, along with a reduced EF of $<$%50 as assessed by echo.

Pulmonary arterial hypertension was defined as the presence of systolic pulmonary artery pressure (SPAP) [?]2.8 m/sec or [?]36 mmHg in echo, in addition to symptoms and other findings that may be associated with pulmonary hypertension[11].

Statistical analysis

Statistical analyses were performed using IBM SPSS Statistics for Windows Version 20.0 (Armonk, NY: IBM Corp.) and the graphics were drawn using Microsoft Excel software. Normality of continuous variables was

assessed by analytical (Kolmogorov-Smirnov test) and visual methods (histograms and probability plots). Continuous variables were expressed as median (interquartile range [IQR]) and categorical variables were expressed as frequencies (n) and percentages (%). Continuous variables were compared using Mann-Whitney U test and categorical variables were compared using Chi-square and Fisher's exact tests.A two-tailed $p$value of <0.05 was considered significant throughout the study.

Results

Of the study population with a total of 1140 participants, 646 (56.7%) were male and the median age was 60 (IQR; 42-70) years.HHD was the most common comorbidity (39.8%), followed by degenerative valvular disease (34.6%), HFrEF (%30.8), and IHD (24.4%).RHD was detected in 84(7.4%) patients. The number of patients with a history of tuberculosis or active tuberculosis was 202 (17.7%), and constrictive pericarditis was diagnosed in 9 (0.8%) patients. 13.2% of the study population had CHD and 21.4% had DCM. Detailed demographic characteristics of the individuals are shown in Table 1.

Median EF was 60% (IQR:40-65). Grade II-IV diastolic dysfunction was diagnosed in 182 (15.9%) patients. The most common valvular disease was mitral insufficiency (47.5%), followed by aortic insufficiency (38.3%) and tricuspid insufficiency (23.2%), and mitral valve stenosis (3.4%) was the least common valvular disease (Table 2). The most common CHD was atrial septal defect (ASD) (3.2%), followed by ventricular septal defect(VSD) (2.3%) and patent ductus arteriosus (PDA) (2.2%) (Figure 1a).ASD was more frequent in females, whereas VSD and PDA had a similar frequency between the two genders (Figure 1b). The most common age group in patients with congenital heart diseases was0-10 years (54.3%), followed by 11-20 (22.5%) years (Table 3). In patients with rheumatic valve diseases, the most common age range was 21-30 years (28.6%), followed by 31-40 years (25%) and 11-20 years (19.1%) (Figure 2).

Discussion

Given the insufficient healthcare services in Somalia, which is an active war zone, we consider that this study is of high value. To the best of our knowledge, this is the first comprehensive echocardiographic study to evaluate such a large cohort of patients in Somalia. In our investigation, HHD was the most common comorbidity (39.8%), followed by degenerative valvular disease (34.6%), HFrEF (%30.8), and IHD (24.4%), RHD (7.4%). Moreover, CHD were diagnosed in 13.2% of the patients, with the most common ones including ASD, VSD, and PDA.

Somalia's total population is 14 million, of which about 4.5 million are children under the age of 14. Healthcare facilities are very limited in Somalia and there are no tertiary healthcare centers in Mogadishu and surrounding cities in the area other than where the present study was conducted. Moreover, there are very few studies in the literature reporting on the risk factor profile and echocardiographic features of the Somali population. In an echocardiographic study conducted in Nigeria, Ogahet al.[12]detected HHD in 56.7% of the patients. In another echocardiographic study, Raphael et al.[13]evaluated 815 adults and 59 children aged [?]15 years and reported that normal echocardiographic findings were detected in only 44% of the patients and that the most common comorbidities were HHD (41%), VHD (18%), coronary artery disease (18%), and peripartum cardiomyopathy (7%) in adults, while CHD were the most common comorbidities in children (34%). In our study, HHD was the most common echocardiographic finding (39.8%), which could be attributed to the excessive salt consumption by the individuals in this region and also to some other factors such as difficult and delayed diagnosis, inadequate medication, and insufficient follow-up.

Although the incidence of rheumatic fever and the resultant RHD has been decreasing over the last decades, rheumatic fever remains an important acquired health problem, particularly in low-middle-income countries[14]. The high rate of RHD diagnosed in our patients(7.4%) supports this assumption. In a study conducted on patients with structural and functional valve abnormalities, 24% of the patients had valvular abnormality, with the most common abnormality being mitral valve insufficiency (59%), and approximately one-third (36%) of the patients were diagnosed with RHD[15]. In our study, the most frequent valvular abnormality was mitral insufficiency(47.5%), independent of RHD. As stated above, RHD is a vital health problem in many African countries, including Somalia, due to certain reasons, especially inadequate health services.

Further comprehensive studies are needed to overcome this problem and raise awareness. Additionally, it is an inevitable requirement to develop inadequate healthcare services and patient follow-up approaches to reduce the incidence of RHD associated with autoimmune pathophysiology.

The prevalence of CHD is relatively similar worldwide, ranging from 4 to 85 per 1000 births[3,16,17].In a study conducted in Somalia, Icen et al. evaluated 460 pediatric patients and reported that CHD were detected in 160 (35%) patients, with the most common CHD including VSD (37%), pulmonary stenosis (PS) (14%), PDA (13%), and Tetralogy of Fallot (ToF) (5%), respectively[18]. The authors attributed this high prevalence of CHD to excessive use of herbal medicines, alcohol-cigarette consumption, inadequate control of chronic diseases,and insufficient vaccination against infectious diseases. Similarly, in our study, we also found a conclusion consistent with this study by determining that 70.5% of the individuals with CHD were 15 years and younger.

Limitations and strengths

Limitations

First, the single-center and retrospective design of the study may be main limitation for the generalizability of the study. Second, only patients with pathological findings detected by echocardiography were included in the study and thus the incidence and prevalence of the diseases and risk factors could not be evaluated. Third, there may be errors due to the absence or lack of transesophageal echocardiography, coronary angiography, telephone, and address records used in data collection, diversification, and standardization. Finally, there were no clinical data of the patients regarding the treatment, follow-up, intra- and post-operative surgical notes, and mortality.

Strengths

First, the number of patients included in the study was relatively high. Second, to the best of our knowledge, this is the most comprehensive study to evaluate the risk factors and CHD together with echocardiographic findings in this region. Finally, the bias effect was minimized since there was no other tertiary healthcare center where the echocardiographic evaluation was performed and individuals who underwent echocardiography constituted the entire study population.

Conclusion

In the present study, we found that HHD was the most common comorbidity (39.8%), followed by degenerative valvular disease (34.6%), HFrEF (%30.8), and IHD (24.4%). Moreover, the most common valvular disease was mitral insufficiency (47.5%) and the most common CHD was ASD(3.2%). Further comprehensive studies with prospective design are warranted to improve the insufficient healthcare services and raise public awareness in Somalia, a war zone where financial and healthcare opportunities are highly limited.

Disclosures and conflict of interests : The authors have nothing to disclose

Acknowledgements: None.

Author Contrıbutıons:

Gökhan Alıcı: Data acquisition,conceptualization, analysis and interpretation, methodology, writing- Original draft preparation, final approval of the manuscript

Ömer Genç: Conceptualization, analysis and interpretation, critical revision

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