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Original Article

Pattern of rheumatic heart disease among patients attending at a tertiary care hospital in Somalia: first report from Somalia

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Abstract: Rheumatic heart disease (RHD) is the leading cause of valvular heart disease in underdeveloped nations. It remains a significant public health issue in Sub-Saharan African countries. This study aimed to determine the pattern, severity, and complications of RHD in Somalia. This was a retrospective cross-sectional study of all patients diagnosed with rheumatic heart disease. A total of 8526 echocardiographic examinations were done in our center over a two-year study period from January 2020 to December 2021. Patients with congenital cardiac disease, post-operative cases, myxomatous and old age degenerative disease were all excluded. Of 433 patients, 286 (66.1%) were female, and the mean age was 46.5 ± 20.3. The isolated mitral valve (MV) affected 222 (51.3%). Dual involvement of mitral and aortic valve (AV) was present in 190 (44%). Overall isolated or combined valve involvement, mitral regurgitation (MR) was the most common valve lesion 345 (79.7%), followed by mitral stenosis (MS) 160 (37%). According to the severity of lesions, severe MR was 230 (53.1%) patients, followed by severe MS (n=129, 29.8%). The most common complication of RHD depicted in our study were secondary pulmonary hypertension and enlarged left atrium, 23.8% (n=103) and 19.6% (n=85), respectively. In conclusion, in our study majority of RHD patients were females. Both isolated and in combination, MV was the most commonly affected, and mitral regurgitation was the most common valvular lesion. In our study high percentage of patients already had complications at the time of diagnosis.

Keywords: Rheumatic heart disease, group A streptococcal, transthoracic echocardiography, valvular heart disease, cardiac thrombus

Introduction

Rheumatic fever (RF) and rheumatic heart disease (RHD) are preventable and nonsuppurative complications of group A streptococcal pharyngitis due to a delayed immune response [1].

Even though the incidence of rheumatic heart disease (RHD) has declined in developed countries, it is one of the leading causes of cardiovascular disease in most developing nations [2, 3]. It has remained a major contributor to morbidity (arrhythmia, heart failure, andstroke) and premature death in the active population due to gradual deterioration.

In the past, RHD was identified in individuals who had a history of ARF by auscultation for a heart murmur. The stethoscope was the sole noninvasive diagnostic instrument accessible to doctors in low-income nations and isolated regions, where ARF and RHD are most common [4, 5]. Echocardiography has proven to be more sensitive and specific than auscultation [6].

The modified World Health Organization (WHO) criteria [7] define RHD using echocardiography including fulfilling Doppler criteria (a regurgitant jet of >1 cm in length, regurgitated jet in at least 2 planes, a mosaic color jet with a peak velocity of >2.5 m/s, and jet persisting throughout systole or diastole) associated with at least 2 morphologic signs including leaflet restriction, subvalvular thickening, and valve leaflet thickening. Mitral stenosis, mitral valve involvement with aortic regurgitation (AR) in the absence of an

alternative explanation for AR, and isolated mitral regurgitation with a history of rheumatic fever were additional criteria for the diagnosis of "definite" RHD by echocardiography (RF). The treatment of patients with RHD is complicated, and it is outside the scope of this review to go into detail about all the subtleties of clinical care of RHD. As increasing valvular disease severity, medicinal and surgical management become more intense [8].

For patients with RHD to be successfully managed, detailed care planning and regular review are essential. This method might be difficult and burdensome for the patient and the healthcare system in areas with low resources. For patients with RHD, the surgical technique selection is extremely vital. For instance, when surgery is possible, valve repair rather than replacement is the preferred procedure for mitral incompetence due to lower procedural risk, greater left ventricular function preservation, avoidance of long-term anticoagulation, and demonstrably improved outcomes. In contrast to mitral valve replacement, this treatment has a greater rate of early reoperations (up to 10% of patients develop mitral regurgitation within two years), thus it must be balanced against this risk. The success of this procedure also partially depends on the surgeon's competence with it [9].

The World Health Organization (WHO) estimates that rheumatic heart disease (RHD) affects around 15.6 million people worldwide [10]. Due to lack of complete data collection in the low- and middle-income nations where RHD is most prevalent could make the burden of the disease even more severe.

The World Health Organization (WHO) initially published guidelines for the prevention and management of acute rheumatic fever and rheumatic heart disease more than 60 years ago [11].

The decrease in the prevalence of ARF/RHD in prosperous countries harms this disease-related research and development. African cardiologists have also neglected this disease, primarily trained in low-prevalence countries.

Acute rheumatic fever and rheumatic heart disease mortality have decreased dramatically in many nations, and this decline can be attributed to the establishment of control programs and advancements in health systems [12, 13]. Notwithstanding these improvements, rheumatic heart disease still has a high prevalence and a high mortality rate across many continents, including Africa and South Asia [14, 15].

According to the David A. Watkins Global, Regional, and National Burden of fatal and nonfatal Rheumatic Heart Disease report, there were 319,400 (95% confidence interval, 297,300 to 337,300) fatalities from rheumatic heart disease in 2015 [16].

Many central and sub-Saharan countries have data on the pattern of rheumatic heart disease; a study by Gökhan Alıcı et al. in 2020 about the spectrum of cardiovascular disorders in Somalia found that 7% of the patients had rheumatic heart disease [17]. However, there is a lack of data on the pattern, severity, and contributing factors; as a result, this comprehensive data on the RHD was compiled to determine this research gap.

The objective of this study was to investigate basic pattern of RHD suchas distribution by age, sex, prevalence, most common type of valvular lesion and commonly affected valve as assessed by echocardiographyin a large cohort from a tertiarycare referral hospital in Somalia.

Method

Study design and setting

This was a retrospective cross-sectional study to investigate RHD conducted at the Mogadishu Somali Turkish Training and research hospital and is the largest hospital in the country. We used the recently established hospital information system (FONET).

Study population

All adult patients visited to the outpatient cardiology departement in two years periop were included in the study. While patients with congenital cardiac disease, post-operative cases, myxomatous and old age degenerative disease, and patients with missed data were excluded from the study (**Figure 1**). Socio-demographic data were retrieved, including sex, age group, and patients' Echocardiography records from January 2020 to December 2021. These data can be used to grasp more about the scope of RHD instances.

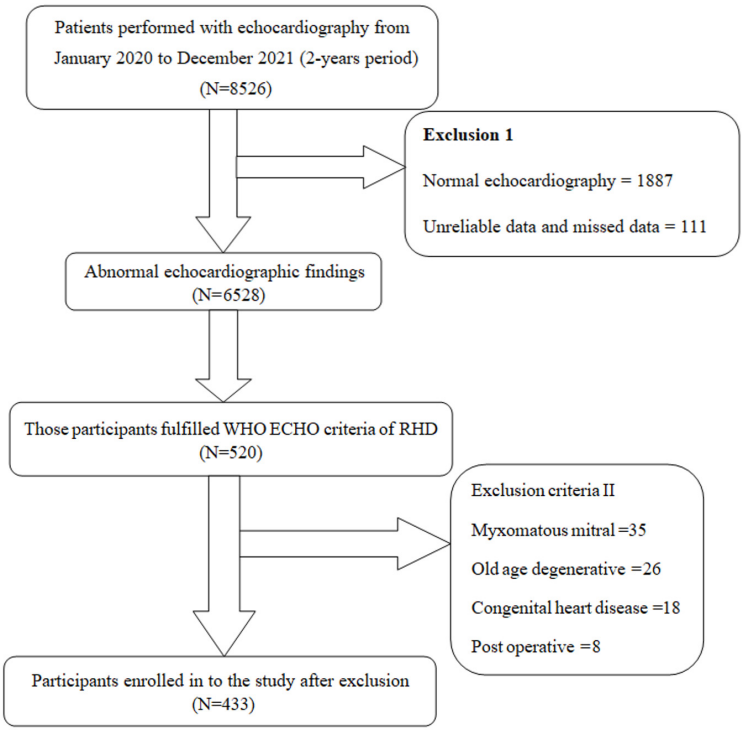

Figure 1. Shows participants those excluded and enroled in our study.

The modified World Health Organization (WHO) criteria define RHD using echocardiography including fulfilling Doppler criteria (a regurgitant jet of >1 cm in length, regurgitated jet in at least 2 planes, a mosaic color jet with a peak velocity of >2.5 m/s, and jet persisting throughout systole or diastole) associated with at least 2 morphologic signs including leaflet restriction, subvalvular thickening, and valve leaflet thickening [7]. Mitral stenosis, mitral valve involvement with aortic regurgitation (AR) in the absence of an alternative explanation for AR, and isolated mitral regurgitation with a history of rheumatic fever were additional criteria for the diagnosis of "definite" RHD by echocardiography (RF).

Sample size

All adult patients visited to outpatient cardiology departement in two years perior and fulfil the modified World Health Organization (WHO) criteria defined RHD [7].

Study procedure

From the echocardiographic data in the medical records, we attempted to determine the pattern of RHD. Transthoracic echocardiography was done by expert cardiologists and well-trained resident cardiology doctors using ToshibaAplio™ ultrasound system (TUS-A500, Shimoishigami, Japan) following the American Society of Echocardiography guidelines. Due to the shortage of pediatric cardiologists, a senior cardiologist carried out all the pediatric echocardiography diagnoses. The diagnosis of RHD was based on the World Heart Federation's (WHF) echocardiographic imaging criteria in individuals with or without an ARF history [18]. According to the American College of Cardiology/American Heart Association (ACC/AHA) guidelines, classification of valve disease severity is based on multiple criteria, including symptoms, valve anatomy, valve hemodynamics and the effects of valve dysfunction on ventricular and vascular function (eg, end-organ damage) [19]. The valve disease severity were classified as mild, moderate, or severe.

Functional tricuspid regurgitation (TR) is defined as a geometrical distortion of the normal spatial relationships of the tricuspid leaflets, annulus, chords, papillary muscles, and right ventricular (RV) walls. It's a common cause of tricuspid regurgitation and most frequently results from left heart disease including mitral valve abnormalities and cardiomyopathy and RV dysfunction secondary to pulmonary disease (Cor pulmonale) [20]. Valvular cardiomyopathy was defined by ventricular dilatation with normal or decreased wall thickness and systolic function reduction (an ejection fraction less than 40%). In the presence of established valvular disease [21]. Patient records were retrieved, and only those exhibiting echocardiographic characteristics of rheumatic involvement were included in the study. During data retrieval, details regarding participants whose electrocardiograms were complicated by atrial fibrillation were also reviewed.

Multiple valvular heart disease (VHD) means the combination of stenotic or regurgitant lesions occurring in more than two different car-

Table 1. Age and sex distribution of participants with RHD

Variables		Frequency (n)	Precentage (%)
Age (years), mean ± SD (range)		46.5 ± 20.3 (6-96)	
Age Group by Years	<18	33	7.6
	18-29	74	17.1
	30-49	136	31.4
	50-69	121	27.9
	≥70	69	15.9
	Total	433	100
Sex	Male	147	33.9
	Female	286	66.1
	Total	433	100

SD = Standard Deviation.

Table 2. Various valvular involvements among participants

Valves involvement	Number (N)	Percentage (%)
Isolated Mitral valve	222	51%
Isolated aortic valve	21	5%
Mitral and aortic valve	190	44%

diac valves, and mixed VHD implies a variety of stenotic and regurgitant lesions on the same valve [22].

The ethics committee of Mogadishu Somali Turkish Training and Research Hospital approved our study (Reference No: MSTH/9925). The name and other identifiers of the patients were not interoperated in the research data; instead, we used a unique code to create a new identification for the subject.

Statistical analysis

The data were collected and entered in MS excel 10. The patient's codes, age, sex, rheumatic valve involvement, the severity of the lesion, and associated complication were all listed in the excel. Statistical analyses were performed using the Statistical Package for Social Sciences (SPSS for Windows version 26, SPSS v26, IBM Inc., Armonk, NY, US) program. A detailed descriptive statistics percentage, mean and standard deviation were calculated. The graphical and tabular presentation was made for appropriate variables.

Results

Demographic characteristics, prevalence and classification of RHD

A total of 8526 trans-thoracic echocardiographic (echo) examinations were done in our center over a two-year study period. Of these, 6528 had abnormal echocardiographic features. 433 patients of the 6528 (7%) had echo diagnoses of RHD. 66% (n=286) of the patients were female, and 34% (n=147) were male. Their age ranged from 6 to 96 years, with a mean age of 46.5 ± 20.3.

92% of the participants belongs to adults (18 years of age and above). Participants with RHD below 18 years were 31 (8%). The most commonly affected age group was 30-49 (31%), followed by 50-69 (28%). Age and sex distribution were summarized in **Table 1**.

Pattern of RHD

According to valve involvement in all participants, the isolated pure mitral valve (n=222, 51%) was the most commonly affected valve in our study, while isolated aortic valve involvement was detected in only 21 (5%) patients. Dual valve involvement of mitral and aortic valves was present in 190 (44%) patients (**Table 2**).

The most typical isolated valve lesion was mitral regurgitation (n=181, 41.8%), followed by isolated MS (n=41, 9.4%); isolated aortic stenosis was noted in 12 (2.7%) patients, while only 9 (2.1%) patients had isolated aortic regurgitation. Among patients with isolated or combined valvular lesions, MR was the most common abnormality 345 (79.7%) noted, followed by MS 160 (37%). The commonest mixed lesion was MR with AR in 59 (13.6%), followed by MS with MR in 55 (12.7%) patients. AS and AR was found only in 3 (0.7%) patients.

There was no rheumatic involvement on the right heart valves in our study since tricuspid regurgitation (TR) was reported in 60 (13.9%) as functional TR. **Figure 2** illustrates the pattern of valvular distribution among participants.

Severity of RHD

Assessment of the severity of the different lesions showed that 233 (53.8%) patients had

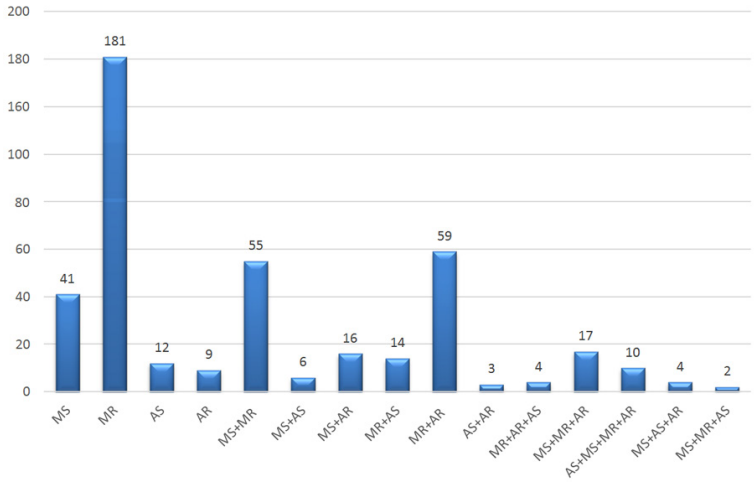

Figure 2. Distribution of valvular lesions in RHD patients.

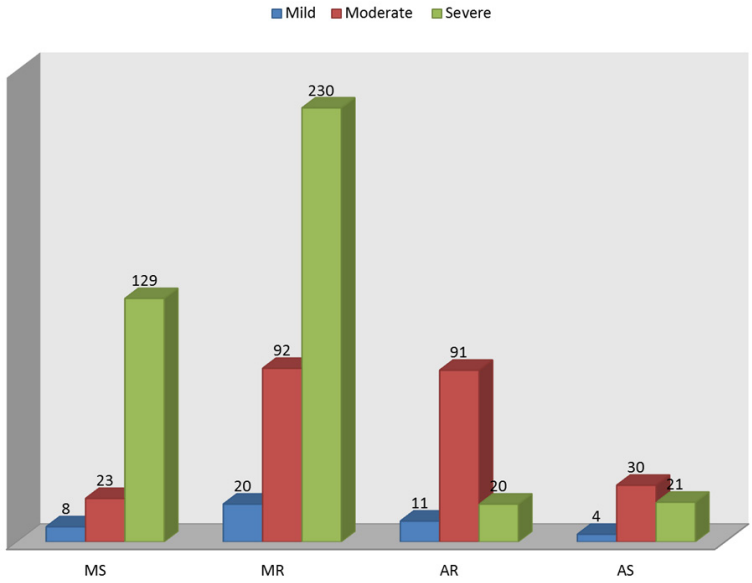

Figure 3. Severity of RHD among participants in isolated and combined with other valve.

severe MR, 129 (29.8%) had severe MS, 21 (4.8%) had severe AS, and 20 (4.6%) had severe AR. **Figure 3** demonstrates the severity of the valvular lesion in our study.

Complications of RHD

Secondary pulmonary artery hypertension (PASP>30 mmHg measured by TR jet velocity) was detected in 103 (23.8%) patients. Enlarged left atrium (>4.5 cm) was noted in 85 (19.6%), functional tricuspid regurgitation was seen in 60 (13.9%), valvular cardiomyopathy in 69 (15.9%), atrial fibrillation (AF) in 34 (7.9%), Left atrial clot was noted in 9 (2.1%) and LV thrombus 8 (1.8%). **Figure 4** shows the complications of RHD seen at echocardiography.

Discussion

Although RHD is rare in western countries, it is still a significant public health issue in developing countries [23]. It is one of the leading causes of hospitalization for cardiovascular illness and a prominent indication for cardiac surgery in developing nations [24].

This study was conducted in Somalia's single teaching and referral hospital over 2 years. RHD was found to account for 7% of our study participants, close to the study conducted by Sani et al. (9.8%) and Abrar et al. (5.7%) [17, 25], but lower than the findings of Shrestha et al. (15.8%) [26]. Africa continues to experience high poverty rates, starvation, overpopulation, substandard housing, and a lack of healthcare facilities. These are the main contributing factors to chronic rheumatic valvular heart disease and acute rheumatic fever [17].

Patients aged between 18-49 years were more common cases reported in the present report. Similarly to our study, Laudari and his collagenous said that most patients were of productive age and had a poor income [27]. Kafle et al. and his colleagues reported in their study that 50% of the participants were between the ages of 21 and 40 [28]. This study, like many others, demonstrated that RHD is still a disease primarily affecting the young population. However, because the participants in the echocardiography were primarily adults and since cardiovascular surgery is not available in Somalia, patients of all ages were found to have rheumatic effects in their valves and presented with late complications of rheumatic heart disease.

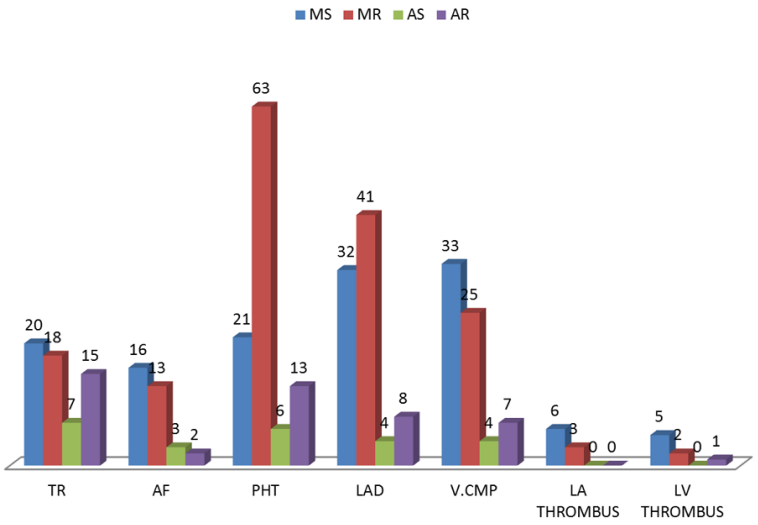

Figure 4. Pattern of anatomical and functional complications of RHD among participants. TR = tricuspid regurgitation, AF = Atrial fibrillatin, PHT = pulmonary Hypertensin, V.CMP = Valvular cardiomyopathym, LA = Left atrium, LV = left ventricle.

According to the sex, females with RHD made up roughly 2/3 (66.1%) of the participants in our study, which matches a study carried out by Faheem et al. [29]. This has also been observed in many studies; the cause of this rise is unclear; however, factors include increased group A streptococcal colonization in pregnancy and diminished access to healthcare for women are concerning.

A study by Malla et al. found that the mitral valve was the most usually affected (78.8%), much higher than ours [30]. Our investigation established that the mitral valve was the most commonly affected (51%), similar to previous articles [27, 29].

The commonest isolated valve lesion was mitral regurgitation (n=181, 41.8%), followed by isolated MS (n=41, 9.5%); isolated aortic stenosis was noted in 12 (2.8%) patients, while only 9 (2.1%) patients had isolated aortic regurgitation. This is similar to previous studies by Shrestha, Al-Khalifa, and their colleagues [26, 31]. In contrast to our research, a study conducted by Malla et al. found that the most prevalent lesion was MS, followed by MR, while AS was the least common [30]. Regarding multivalvular lesions, the commonest mixed lesion was MR with AR (n=59, 13.6%). Close to our study, in Shrestha et al.'s study, MR with AR was the most common finding (17.9%) [26].

TR was a more prevalent complication in our study, about 13.9% (n=60). However, it was mostly functional TR caused by pulmonary hypertension. Rheumatic involvement causes tricuspid regurgitation, which is uncommon but always linked with mitral valve dysfunction and left heart disease [32, 33]. Atrial fibrillation (AF) was detected in 34 (7.9%)patients. A recent meta-analysis of 83 studies from 42 countries revealed the global prevalence of AF in RHD to be 32.8%, with substantial heterogeneity (4.3%-79.9%) based on the country's development level [34]. RHD remains a significant cause of AF in Africa, China, the Middle East, and India, where it is present in nearly one-third of patients with AF [35].

Due to the aggravation of AF to left atrial (LA) enlargement, we noted that 19.6% (n=85) of our study participants had LA enlargement. Atrial fibrillation causes the Left atrium to lose its organized mechanical activity, which increases the risk of spontaneous echo contrast and thrombus [26]. There are 9 (2.1%) participants with left atrial thrombus in our study, which was very close to a study of Laudari and his colleagues (n=8, 3.40%) [27].

M Sani and his coworkers reported that 2% of their participants of Rheumatic heart disease had LV thrombus [17], similar to our study, which detected 2% of LV thrombus (n=8).

Cardiomyopathy is more likely to be caused by faults that induce volume-overloaded states (regurgitation) than by lesions that cause pressure overload (valvular stenosis) [25]. Since MR was our study's most prevalent valvular lesion and can precipitate volume-overloaded states, 69 (15.9%) of our study participants had rheumatic valvular cardiomyopathy. Contemporary to this study, a study by M Sani and his colleagues noted (31.8%) of participants have a complication [25].

Our study has several limitations, the most significant being that it is a retrospective analysis

with data gathered from a single teaching hospital. This study alone cannot correctly reflect the situation in the whole population. It can only be generalized to some countries. Despite its limitations, this study contributes to the need for more accurate and trustworthy data that can be used to depict this disease's impact in Somalia. Due to the need for a functional health system in Somalia, only those communities with financial access to health care went to the hospitals. This is another weakness in this study that suggests that the disease burden is considerably more significant than predicted. Due to a lack of adequate primary, secondary, and tertiary program centers, most patients presented to the health institution with the late complication of RHD.

In conclusion, RHD is a big issue in Somalia. To better care for such patients in our country, it is critical to be aware of the patterns and severity of RHD valvular lesions and the therapeutic options available. Both isolated and combined, MV was our study's most commonly affected valve. At the same time, mitral regurgitation was the most common valvular lesion. Our findings add to the growing body of evidence that Sub-Saharan Africa is a significant hub for RHD, implying that an ASAP (Awareness, Surveillance, Advocacy Prevention) program, as proposed in the Drakensberg Declaration a few years ago [29] and recently re-emphasized in the Mosi-o-Tunya Call to Action [36], should be implemented as soon as possible in our setting.

Disclosure of conflict of interest

None.

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