

## Screening for Rheumatic Heart diseases among high secondary school female students at El-Obeid city, Sudan

Khalid M.E. Altalib<sup>1,2</sup>, Khalid Yassin Mohamed Ahmed<sup>3</sup>, Mohamed Ahmed Agab<sup>1,2</sup>, Samoal Abdelaziz Dafalla Mohamed Salih<sup>4</sup>, Ahmed Abdelkerim Ahmed Abdallah<sup>5</sup>, Tagwa Saeed Ibrahim Badawe<sup>6</sup>, Samir Sayed Hassan Awad<sup>7</sup>, Abdelsalam M.H. Elfaki<sup>1,2</sup>,

<sup>1</sup>Department of Medicine, Faculty of Medicine, University of Kordofan, El-Obeid, Sudan.

<sup>2</sup>Department of Medicine Sheikan College El-Obeid, Sudan.

<sup>3</sup>Department of Obstetrics and Gynaecology. Elneelain University.

<sup>4</sup>Department of Medicine, Faculty of Medicine, Omdurman Islamic University

<sup>5</sup>Department of Obstetrics and Gynecology, Faculty of Medicine, University of Kordofan, NK, El-Obeid, Sudan.

<sup>6</sup>Department of Cardiology El-Obeid Teaching Hospital.

<sup>7</sup>General Medical Council UK registration, general practitioner trainee.

### Abstract:

**Background and objectives:** Rheumatic heart disease (RHD) remains a significant cause of cardiovascular mortality and morbidity in poor countries. It is a leading acquired cardiovascular disease among young people in low-income and middle-income countries and in some at-risk populations living in rich countries. This study aimed at determining the prevalence of RHD among secondary school female students at Ellobiid, north Kordofan, Sudan.

**Patients and method:** The study took place from December 2017 through June 2018. An ethical clearance was obtained from the state ministry of health. Eight female secondary schools were randomly selected. In each school, a mobile echo machine was used to screen the students. The Participants were randomly selected. In this study, Pathological regurgitation is defined according to WHO criteria as follows: Mitral regurgitation jet equals or more than 2 cm, Aortic regurgitation jet equals or more than 1cm. Morphological criteria are defined as follows: For the mitral valve: anterior mitral valve leaflet thickness more than 3mm, chordae tendineae thickening, restricted leaflet motion, and excessive mitral valve leaflet tip motion in systole. For the aortic valve: Irregular thickening, coaptation defect, restricted leaflet motion and leaflet prolapse. For those with echo criteria of RHD, personal and demographic data were obtained. Cardiovascular system examination was made. A well-designed data sheet was formed and the data were then analyzed using SPSS version 18.

**Results:** In this study, 760 students from 8 female secondary schools were examined by portable echo machine. In this cohort, 27 students were found to have RHD giving a prevalence of 36/1000. The mean age of the affected individuals was 15.9 years. The commonest valvular lesion seen was mild mitral regurgitation in 18 participants (66%), followed by mild aortic regurgitation then combination of mild mitral regurgitation and mild tricuspid regurgitation and mild aortic regurgitation and moderate mitral regurgitation respectively. Twenty participants (74%) had past history of sore throat, while 14 participants confessed to have a remote history of joint pains and fever. Most of the patients were found to have normal auscultatory findings. The only positive clinical sign was pansystolic murmur in the mitral area which was detected in 26% of the participants.

**Conclusion:** We concluded that the use of portable Echo, is a useful technique for early detection of RHD and the prevalence of RHD in our population is moderately high compared with other studies. The application of secondary antibiotic prophylaxis (SAP), is highly recommended to reduce the incidence of RHD.

Correspondence to: Khalid M.E. Altalib [eisa.khalid1@gmail.com](mailto:eisa.khalid1@gmail.com)

**Keywords:** Rheumatic Heart Disease, Portable Echocardiography

**Introduction:** Rheumatic heart disease (RHD) remains a significant cause of cardiovascular mortality and morbidity in poor countries [1] It is a leading acquired cardiovascular disease among young people in Low- and Middle-Income Countries (LMICs) and in some at-risk populations living in rich countries [2,3]. RHD is a consequence of increasing valvular destruction which is readily avoidable by secondary antibiotic prophylaxis (SAP) [4]. RHD might present clinically after along latent phase of subclinical illness, so, the early recognition of the disease by echocardiography and the subsequent initiation of SAP may decrease the magnitude of RHD worldwide [5]. In Sudan, patients with RHD present with severe lesions that necessitate surgical intervention in most of the cases. [6] Recently, echocardiographic screening documented a prevalence that is several times higher than that noticed clinically [4,5]. Availability of well-defined echo criteria for subclinical RHD from the World Heart Federation (WHF) and small hand-held echo (HHE) machines allowed many investigators to accurately study subclinical RHD in diverse backgrounds [7]. In North Kordofan, the prevalence of RHD is high and largely affects young females [8]. To the best of our knowledge, no study was conducted to detect RHD in young female in Elobeid city, so, it is justifiable to conduct such a study. This study aimed at determining the prevalence of RHD among secondary school female students at Elobeid, north Kordofan, Sudan.

**Patients and methods:** The study took place from December 2017 through June 2018. An ethical clearance was obtained from the state ministry of health. Eight female secondary schools were randomly selected. In each school, a mobile echo machine was used to screen the students. The Participants were randomly selected. In this study, Pathological regurgitation is defined according to WHO criteria as follows: Mitral regurgitation jet equals or more than 2 cm, Aortic regurgitation jet equals or more than 1cm. Morphological criteria are defined as follows: For the mitral valve: anterior mitral valve leaflet thickness more than 3mm, chordae tendineae thickening, restricted leaflet motion, and excessive mitral valve leaflet tip motion in systole. For the aortic valve: Irregular thickening, coaptation defect, restricted leaflet motion and leaflet prolapse. For those with echo criteria of RHD, personal and demographic data were obtained. Cardiovascular system examination was made. A well-designed data sheet was formed and the data were then analyzed using SPSS version 18.

**Results:** In this study, 760 students from 8 female secondary schools were examined by portable echo machine. In this cohort, 27 students were found to have RHD giving a prevalence of 36/1000. The screening was done indifferent areas as shown in the table below. In north Kordofan, the number of screened participants was 3315 participants, the age of participants was ranged between 5 – 50 years and the prevalence rate was 125/1000 in those belong to age group 5-15 years.

**Table 1** Number of subjects and areas screened, prevalence & definite borderline ratio of RHD cases

| State          | Number screened            | Age (Years)           | Prevalence/1000 | Definite Borderline/ Ratio |
|----------------|----------------------------|-----------------------|-----------------|----------------------------|
| Khartoum       | 3000                       | 10-15                 | 0.3             | 0.1:1                      |
| South Darfur   | 15151                      | 10-15                 | 19              | 1.9:1                      |
| North Kordofan | Total: 3315<br>625<br>2675 | 5-50<br>5-15<br>15-50 | 62<br>125<br>45 | 2.9:1                      |
| Al Gazeera     | 1303                       | 10-15                 | 26              | 1.1:1                      |
| While Nile     | 1636                       | 5-30                  | 31              | 2:1                        |
| Total          | 10769                      |                       | 31 (mean)       | 1.6:6                      |

The mean age of the affected individuals was 15.9 years. The commonest valvular lesion seen was mild mitral regurgitation in 18 participants (66%), followed by mild aortic regurgitation then combination of mild mitral regurgitation and mild tricuspid regurgitation and mild aortic regurgitation and moderate mitral regurgitation respectively. Twenty participants (74%) had past history of sore throat, while 14 participants confessed to have a remote history of joint pains and fever. Most of the patients were found to have normal auscultatory findings. The only positive clinical sign was pansystolic murmur in the mitral area which was detected in 26% of the participants.

**Discussion:** This study showed that the prevalence of RHD among high secondary school female students is 36/1000. In one study conducted in north Kordofan, the prevalence of RHD was found to be more than 60/1000<sup>(8)</sup> which is almost double the result of our study. This can be attributed to many factors. Firstly, although the two studies took place in the same state, that study was conducted in different localities with different demographic characteristics. The study was conducted in rural areas where health services are lacking which may explain the high prevalence. Secondly the methodology was different in many aspects: In our study we considered individuals as having RHD only when they fulfilled the criteria of RHD according to WHO guidelines, while in the other study those with border line RHD were enrolled. Moreover, unlike our study this study included wider range of age group and males in addition to females were registered. Another study conducted by Elfaki concluded that RHD is a major health problem in Elobeid and it mainly affects young females in child-bearing age<sup>(10)</sup>, the result of our study is in keeping with this one. In Mozambique, the prevalence of RHD detected by echo was 30.4 per 1000 children compared with 2.3 per 1000 diagnosed clinically<sup>(11)</sup>. The echo diagnosis is comparable to our study while the clinical detection is less than ours. The prevalence of RHD detected by echo is less than that in our study in many African countries

including Uganda, Eritrea, Mali and Senegal. Data from India showed that the prevalence of RHD among school children is 20 per 1000 which included individual who have probable or definite evidence of RHD by portable echo, this result displayed the fact that the prevalence of RHD among our community is higher than that of India in which RHD is known to be very prevalent.

**Conclusion:** We concluded that the use of portable Echo, is a useful technique for early detection of RHD and the prevalence of RHD in our population is moderately high compared with other studies. The application of secondary antibiotic prophylaxis (SAP), is highly recommended to reduce the incidence of RHD.

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#### **Ethical Considerations:**

This study was conducted in accordance with the ethical standards of research involving human participants. Ethical approval was obtained from the State Ministry of Health and the research ethics committee of The University of Kordofan. A permission was taken accordingly from the State administration of high Secondary Schools Education Department. Informed consent was obtained from each participating student. Confidentiality and privacy were strictly maintained. Participants who were found to have abnormal echocardiographic findings or suspected rheumatic heart disease were referred to cardiologist opinion for free. The study involved minimal risk to the participants, and all procedures were non-invasive and performed by trained professionals. Screening was done in accordance with current World Heart Federation recommendations.

### Conflict of Interest

The investigators declare no conflict of interest related to this study. The research was carried out independently, without any financial or institutional influence that could have biased the conduct, interpretation, or reporting of the findings.

### References:

1. Rheumatic fever and rheumatic heart disease. World Health Organ Tech Rep Ser. 2004;923:1-122, back cover. PMID: 15382606.
2. Watkins, David A., et al. "Global, regional, and national burden of rheumatic heart disease, 1990–2015." *New england journal of medicine* 377.8 (2017): 713-722.
3. Car Carapetis JR, Steer AC, Mulholland EK, Weber M. The global burden of group A streptococcal diseases. *The Lancet infectious diseases*. 2005 Nov 1;5(11):685-94.
4. Beaton, A. et al. Secondary antibiotic prophylaxis for latent rheumatic heart disease. *N. Engl. J. Med.* 386, 230–240 (2022).
5. Watkins, D. A. et al. Rheumatic heart disease worldwide: JACC scientific expert panel. *J. Am. Coll. Cardio.* 72, 1397–1416 (2018).
6. Khalid E, El Banna H, Mahmoud R, Hassan H, El Mahdi L, Ali S. Clinical and echocardiographic features of 370 children with rheumatic heart disease seen in Khartoum. *Sudan Med J.* 2014; 50:151-4.
7. Reményi B, Wilson N, Steer A, et al. World Heart Federation criteria for echocardiographic diagnosis of rheumatic heart disease--an evidence-based guideline. *Nat Rev Cardiol.* 2012;9:297- 309
8. Sulafa Ali, Sara B Domi, Abdelsalam MH Alfaki, Khalid Al Talib, MD , Mohammed H Abdelrahman, , Mohamed S Adam, Mugahid MA Ahmdia, MBBS. The echocardiographic prevalence of rheumatic heart disease in North Kordofan and initiation of a control program. *Sudan Med J* 2017 August;53(2):63-68.
9. Marijon E, Ou P, Celermajer DS, et al. Prevalence of rheumatic heart disease detected by echocardiographic screening. *N Engl J Med.* 2007;357(5):470-476
10. Elfaki MH. Rheumatic heart disease: a major health problem in Elobeid Hospital, West Sudan. *Sudan JMS.* 2007;2:189-91.
11. Marijon E, Ou P, Celermajer DS, et al. Prevalence of rheumatic heart disease detected by echocardiographic screening. *N Engl J Med* 2007; 357:470–6.
12. Saxena A, Ramakrishnan S, Roy A, et al. Prevalence and outcome of subclinical rheumatic heart disease in India: the RHEUMATIC (Rheumatic Heart Echo Utilisation and Monitoring Actuarial Trends in Indian Children) study. *Heart* 2011;97:2018–22.