

Rheumatic heart disease screening by “point-of-care” echocardiography: an acceptable alternative in resource limited settings?

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Abstract: Rheumatic heart disease (RHD) is estimated to affect over 20 million people worldwide, the vast majority being in developing countries. Screening for RHD has been recommended by World Health Organization (WHO) since 2004. Conventionally, auscultation has been used for diagnosing RHD. Auscultation has its limitations and may not detect mild cases. With the evolution of portable echocardiographic systems, mass screening for subclinical RHD has become possible. Portable echo has the advantage of rapid access and hence screening in schools or communities is possible. Its cost is lower than that of standard echo equipment. A large number of studies have reported echocardiographic screening for RHD over the last decade or so. A 3-10 fold increase in prevalence of RHD has been detected by using portable echo when compared with conventional method of auscultation. More recently, a small, compact, easy to carry in a pocket, hand held system has been introduced which is much cheaper than the conventional portable system. A few previous reports have shown the feasibility of using hand held echo system for diagnosis of various cardiac diseases. A recently published article has shown that the hand held system can be used to screen for RHD. It is more sensitive than the conventional auscultation for RHD. Authors of this report have concluded that screening with the hand held device may be a more cost effective strategy for screening for RHD in resource limited settings, since it is much cheaper than the portable echocardiography equipment.

Keywords: Rheumatic heart disease (RHD); echocardiography; screening

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Rheumatic heart disease (RHD) results from valvular damage caused by acute rheumatic fever (ARF) which is an autoimmune response to group A beta hemolytic streptococci. RHD has virtually disappeared from the western world except in some indigenous population. In most developing countries RHD remains a public health problem resulting in significant cardiovascular morbidity and mortality (1,2). It is estimated that 20 million people suffer from RHD worldwide, majority being children and adolescents who live in low and middle income countries.

Secondary prophylaxis with 3-4 weekly injections of long acting penicillin has been found to be a cost effective approach for preventing further damage to heart valve by further attacks of rheumatic fever (3). Patients with milder form of the valvular lesion are likely to benefit most from secondary prophylaxis. Several studies have shown that in the absence of ARF recurrence, the majority of mild cases will have no detectable disease within 5-10 years. RHD fits the list of diseases that should be considered suitable for screening as per the recommendations of Council of Europe

Committee of Ministers defined in the report published in 1994 (4). Screening for detecting early cases of RHD in asymptomatic persons is therefore, an attractive strategy and has been recommended by World Health Organization (WHO) as early as in 1984. Screening of over 1.4 million children in 16 countries by clinical auscultation resulted in diagnosing more than 3,000 children who were previously undiagnosed. The overall prevalence was 2.2/1,000 children (5).

Auscultation using stethoscope has been shown to have poor sensitivity and specificity as compared to echocardiography. With advent of portable echocardiography equipments, it became easier to screen for RHD using these. Portable echocardiography is not only more sensitive to diagnose RHD, but is also more specific and is able to rule out RHD as the underlying cause of a murmur in many children. A large number of studies reported prevalence of RHD in community or schools using a 2-step approach, clinical examination followed by echocardiography for suspected cases. However, milder cases of RHD which produce soft or no murmur could not be diagnosed using this strategy. Last decade has seen a plethora of reports where portable echocardiography has been used as the primary tool for diagnosing RHD in asymptomatic children and adults in community settings (6-10). This modality can potentially detect early RHD valvular lesions enabling timely initiation of secondary prophylaxis to halt disease progression. Several studies have shown that the diagnostic accuracy of portable echo systems is comparable to that of conventional echocardiography equipments (11,12).

More recently, a small, compact, easy to carry in a pocket, hand held echocardiography system has become available. This ultraportable system is much cheaper than the conventional portable system. Several reports have been published on the use of this “point-of-care” ultrasound system for detecting cardiovascular abnormalities (13-15). The article by Godown *et al.* published recently has discussed the use of hand held device for RHD screening in a cross sectional study conducted in five schools in Gulu, Uganda (16). The children screened were between the ages of 5-17 years. All 4,773 children first underwent screening echo using the conventional portable echo machine. A random, preselected subset of 1,317 children underwent auscultation and echo screening using the hand held system, VScan (General Electric, Milwaukee, WI, USA) using the same echo protocol except for continuous wave Doppler since this function is not available in hand

held echo. RHD was diagnosed using the 2012 World Heart Federation (WHF) echocardiographic criteria (15). These criteria had to be slightly modified for hand held echo interpretation since hand held system lacks spectral Doppler capability. Conventional portable echo diagnosed definite RHD in 52 children (1.1%) and borderline RHD in 140 children (2.9%). Using hand held device, definite RHD was diagnosed in 45 children (3.4%) and borderline RHD in as many as 126 (9.6%). Overall hand held device overestimated the prevalence of RHD in their cohort. It was interesting to note that 44 of 45 definite RHD cases were labeled as “definite” by hand held device also. But in cases with borderline RHD only 90 of 126 could be diagnosed by hand held device. However, hand held device was way better than auscultation. In this study, hand held echo was performed and interpreted by experts which may not be feasible with wide spread use of this tool in real world setting. Authors have concluded that more studies are required to examine the sensitivity and specificity of hand held device in the hands of non experts.

One previous study has also used hand held system for screening for subclinical RHD (17). In this study, a hand held system was used in 125 Ugandan children. Echocardiographic images of these 125 children (84 healthy controls and 41 borderline RHD as per WHF criteria), were blindly reviewed. Hand held echocardiography was found to be very sensitive (90.9%) for diagnosing RHD. However mitral valve morphologic abnormalities were over estimated by the hand held system. Hand held studies were false negative in four children due to underestimation of mitral regurgitation jet length.

More studies are required to validate these results before recommending the hand held system for community screening of RHD.

Moreover, real benefit of screening echo on disease outcome is yet to be proven. Questions remain regarding the natural history of the valve lesions diagnosed by screening echocardiography. Whether the abnormalities detected on portable echo will reverse over time, spontaneously or with secondary prophylaxis, is also unclear. Follow up data is reported in three observational studies (8,10,18). Regression of morphological abnormalities and/or decrease in the degree of valve regurgitation due to RHD was seen in 28-33% of children over a follow up period of 6-24 months. Valvular lesions remain the same in majority of children (47-68%). Only a small minority (8% or less) showed progression of the valvular abnormalities. More long term studies are underway. The result of such

studies will determine the role of secondary prophylaxis. The impact of secondary prophylaxis on patients with subclinical RHD also needs to be defined in prospective clinical trials.

The most important offshoot of screening studies has been renewal of interest amongst various groups involved in research or in the care of such patients. RHD has long been considered a neglected or orphan disease. Echocardiographic screening studies have really helped to raise awareness about this disease. Screening helps to measure the burden of the disease in different regions; an important data that can be used for advocacy with the local ministries and world health bodies. The question of cost effectiveness of the RHD screening programs using echocardiography remains elusive as of now. Studies are underway to address this issue.

Echocardiographic screening for RHD has come a long way and has brought back this disease into focus. Experts worldwide, including those from non endemic areas are showing interest in RHD, the number of publications has also risen. High prevalence reported from some regions on echocardiographic screening has attracted attention of policy makers and other health care experts. Screening programs are also aiding in the awareness of this disease. It is likely that timely interventions in those with mild, subclinical form of valvular abnormalities secondary to RHD will help to reduce burden of this disease. Feasibility of screening programs may be an issue due to high cost and non availability of experts, especially in regions where it is required most. The relatively newer “point-of-care” hand held echo equipment may be the answer as it is much cheaper and ultraportable. However more studies are required to test the sensitivity and specificity of hand held ultrasound for diagnosis of RHD when performed by non experts.

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Footnote

Conflicts of Interest: The author has no conflicts of interest to declare.

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