

WORLD CONGRESS ON RHEUMATIC HEART DISEASE

2-4 November 2023 • Abu Dhabi



Submission Id: 268

Title: A PILOT RHEUMATIC HEART DISEASE SCREENING PROGRAM USING PORTABLE, HANDHELD ECHOCARDIOGRAPHY IN RIVAS, NICARAGUA

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Background & Aims: Portable, handheld echocardiography offers several advantages for rheumatic heart disease (RHD) screening in low-resource settings. Analyses of focused cardiac ultrasound protocols using handheld echocardiography have yielded acceptable sensitivity and specificity for diagnosis of RHD, including in those performed by non-expert sonographers. Previous studies estimate high burden of RHD in Nicaragua using a now superseded case definition of RHD. We conducted a pilot community-based RHD screening program using hand-held echocardiography in Rivas Department, Nicaragua using contemporary RHD diagnostic criteria.

Methods: Non-expert sonographers were trained using GE Vscan Extend™ device and a simplified version of the 2012 World Heart Federation criteria for diagnosis of RHD. Referral criteria for complete echocardiography included the presence of a mitral regurgitant jet of >2.0cm, aortic regurgitant jet >1.0cm or any morphologic abnormality of the mitral or aortic valve, as well as left ventricular dysfunction or significant congenital heart disease. Participants were recruited by convenience-based sampling in communities throughout Rivas Department, Nicaragua. Participants underwent basic questionnaires including demographic information to facilitate future contact for follow-up. Participants were notified at the point-of-care of need for repeat study. In addition, all studies were overread asynchronously by expert readers for diagnostic accuracy.

Results: Between March 2022 and April 2023, 494 screening echocardiographic studies were performed and evaluated for diagnostic accuracy. The median age was 36.3 years (IQR 19.2, 56.2), 22% of participants were <18 years of age, and 60% percent of participants were female. There were 17.6% of participants referred for complete echocardiography at the point-of-care compared with 13.0% meeting referral criteria on expert review. Negative and positive predictive values for non-expert vs. expert assessment were 92.4% and 62.1%, respectively. Cohen's kappa for inter-rater reliability was 0.338, suggesting fair agreement.

Conclusions: This pilot program demonstrated the feasibility of a screening program for RHD in rural Nicaragua with non-expert sonographers. Lessons from this program are intended to inform future epidemiological studies to determine the population prevalence and longitudinal outcomes of RHD in Rivas, Nicaragua.