CASE REPORT

BEGINNER

GLOBAL HEALTH REPORT

Rheumatic Heart Disease Screening Among School Children in Central Nepal

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ABSTRACT

Rheumatic heart disease is the most common heart disease in developing countries. This Global Health Report uses the results of screening 28,050 school children clinically with 2-dimensional echocardiography. A total of 1,739 students had cardiac murmur, with the most dominant lesion being rheumatic mitral regurgitation. This report concluded that the burden of rheumatic heart disease is decreasing, but it is still significant in Nepal. That is why echocardiographic screening is important in early diagnosis and management. (**Level of Difficulty: Beginner.**) (J Am Coll Cardiol Case Rep 2019;1:218–20) © 2019 The Authors. Published by Elsevier on behalf of the American College of Cardiology Foundation. This is an open access article under the CC BY-NC-ND license (http://creativecommons.org/licenses/by-nc-nd/4.0/).

Rheumatic heart disease (RHD) is one of the most common valvular heart diseases in developing countries such as Nepal, and its toll is thousands of deaths (1). The prevalence of RHD has been reported to be 1.3 to 4.5 per 1,000 population among school children 5 to 16 years of age (2). Two-dimensional (2D) transthoracic echocardiography (TTE) is the first-line bedside imaging tool for the diagnosis of RHD (3).

This study aimed to report the clinical and echocardiographic characteristics of RHD in school children in central Nepal.

MATERIAL AND METHODS

This demographic study involved 28,050 school children from different parts of Chitwan and Nawalparasi districts of Nepal. In total, 38 schools were enrolled in the study: 18 were government schools and 20 private schools each having 13,150 and 14,900 students, respectively. A team consisting of cardiologists, internists, and social workers from the College of Medical Sciences in Bharatpur, the Nepal Heart Foundation (Chitwan branch), the National Heart and Lung Society, and volunteer qualified cardiologists from the Czech Republic and Saudi Arabia visited the schools for screening programs after obtaining consent from the school principals and students' guardians. We examined 28,050 of 29,080 students (response rate, 96.45%). The first stage of screening included a thorough clinical examination, performed by trained cardiologists with >5 years of experience, on each child including cardiac auscultation specifically looking for murmur. If there was any doubt, a senior cardiologist would also perform a physical examination. All the students with murmurs were evaluated by portable 2D TTE (GE Vivid-I, GE Healthcare, Chicago, Illinois) and by color flow study at the school site itself, with a 2.5- to 5.0-MHz transducer probe.

DEMOGRAPHIC ANALYSIS. All the relevant data were entered using SPSS 16 software (IBM Corp., Armonk, New York) and computed. Prevalence rates

of murmurs and RHD were reported as per thousand. Significance of interschool and age range group differences was estimated by chi-square test. A p value <0.05 was considered significant.

RESULTS

A total of 28,050 students were included in this study. Students from preschool to 10th grade were included. The majority of the students (55.40%) were between 10 and 16 years of age.

Of the total 28,050 students who were carefully auscultated by experienced cardiologists, 1,739 students (6.2%) were found to have cardiac murmurs, as demonstrated in **Figure 1**. They were subsequently evaluated with 2D TTE by cardiologists; 29 children had hemodynamically significant valvular lesions.

Of those 1,739 students who underwent echocardiography, 29 (1.66%) had definite RHD, and 16 had borderline RHD according to the World Heart Federation criteria for RHD diagnosis (4). Of the 29 students with definite RHD, 22 students had low socioeconomic status (SES), and the rest had middle SES. A total of 18 patients had families with more than 6 members. History of acute rheumatic fever was elicited in only 10 patients, but almost all the students had symptoms of recurrent sore throat.

DISCUSSION

In different parts of Nepal, RHD prevalence has been reported to vary between 1.2 and 5.4/1,000. Laudari et al. (5) reported RHD prevalence to be 1.57/1,000 students. Similarly, Prajapati et al. (3) reported on cardiac screening of 34,876 school children from 115 randomly selected public schools from Kathmandu. The prevalence of RHD was found to be 0.90/1,000 (age group 5 to 16 years), with the most common lesion being mitral regurgitation (3). Interestingly, mitral stenosis is predominant in symptomatic RHD patients, but we also found mitral regurgitation as a predominant lesion. It may be because we detected RHD at an early stage in asymptomatic children, when mitral regurgitation is prevalent.

In the present study, the echocardiographic prevalence of RHD was 0.1%, which is relatively low. In 1 of the largest studies of prevalence of RHD in school children in India, Jose et al. (2) screened 229,829 school children 6 to 18 years of age. Initial screening revealed 374 children with suspected RHD; RHD was confirmed in 157 children (2).

In the present study, 1,739 students had cardiac murmurs suggestive of RHD. Within a region, there are wide differences in the prevalence of children with suspected RHD and confirmed RHD by TTE. The greater prevalence of clinical RHD in low SES government schools may reflect late diagnosis, lack of awareness among parents, students, and teachers, overcrowding, poor sanitation, intercurrent throat infection, undertreatment or no treatment, and poor socioeconomic conditions leading to malnutrition.

In **Figure 2**, we summarize the socioeconomic reasons responsible for the decrease of RHD in low-income countries such as Nepal. The reported high prevalence of RHD in other studies is most likely because they were based exclusively on clinical criteria, without echocardiographic evidence.

STUDY LIMITATIONS. This study failed to perform echocardiography in all the enrolled children and thus missed those who had silent RHD without clinical murmur.
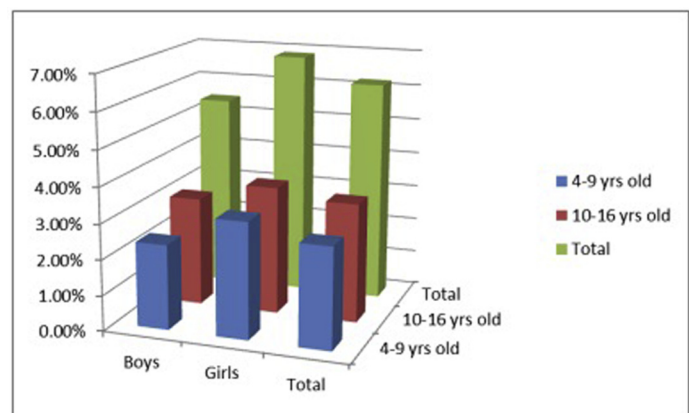
CONCLUSIONS

RHD prevalence is decreasing in school children in this region of central Nepal. RHD is still more prevalent among low SES children in general schools. Considering the progressive natural course of RHD, with its risk of mortality and morbidity, and even requiring definitive surgical therapies including valve replacement in the long term, there is an urgent need to create awareness among the public and to conduct
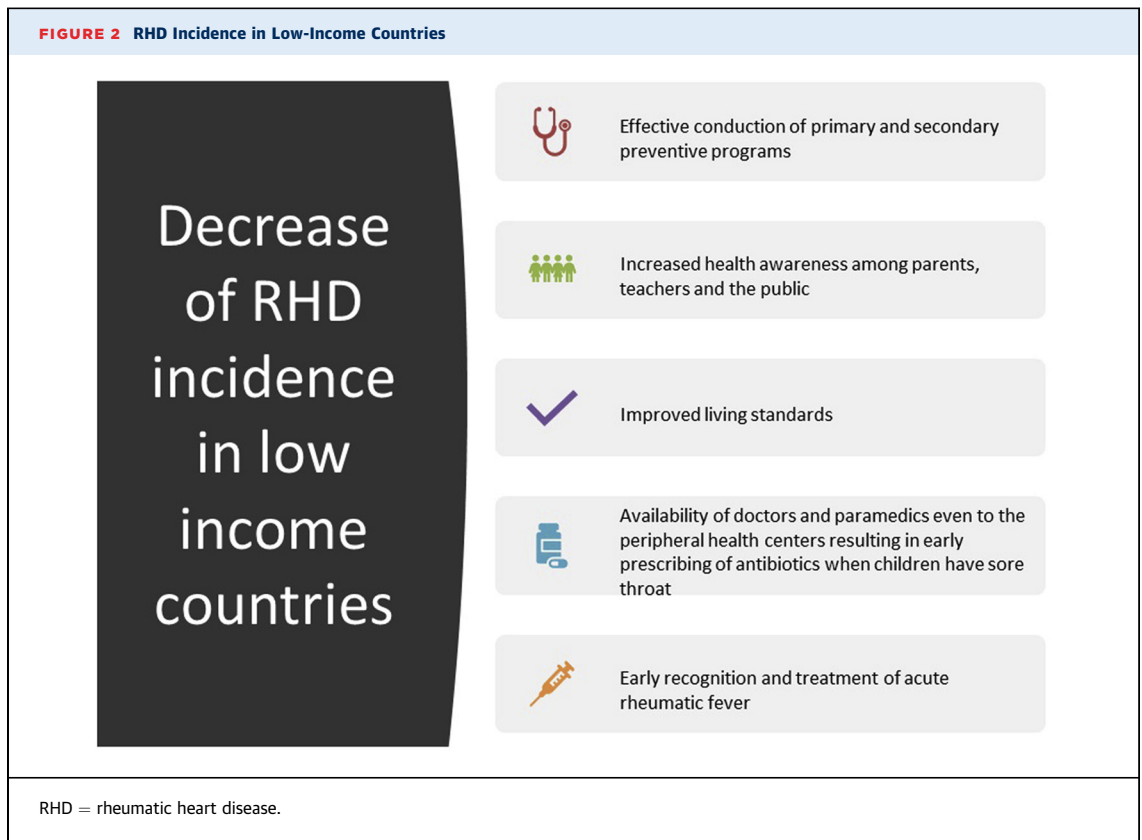
ABBREVIATIONS AND ACRONYMS

AR = aortic regurgitation

AS = aortic stenosis

AVR = aortic valve replacement

MR = mitral regurgitation

MS = mitral stenosis

MVR = mitral valve replacement

RHD = rheumatic heart disease

TTE = transthoracic echocardiography

FIGURE 1 Prevalence of Murmur Among School Students (n = 28,050)

Age	Boys	Girls	Total
4-9 yrs old	2.39%	3.26%	2.84%
10-16 yrs old	3.07%	3.60%	3.35%
Total	5.46%	6.86%	6.20%

FIGURE 2 RHD Incidence in Low-Income Countries

Decrease of RHD incidence in low income countries

- Effective conduction of primary and secondary preventive programs
- Increased health awareness among parents, teachers and the public
- Improved living standards
- Availability of doctors and paramedics even to the peripheral health centers resulting in early prescribing of antibiotics when children have sore throat
- Early recognition and treatment of acute rheumatic fever

RHD = rheumatic heart disease.

regular cardiac screening programs to detect the disease at its onset. More focus must be considered in primordial and primary prevention of RHD. The government and nongovernmental local bodies should plan and implement strategies to make the screening program successful and establish an RHD-free society.

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KEY WORDS prevalence, rheumatic heart disease, screening, treatment, valvular involvement