Results of the RHEUMATIC (Rheumatic Heart Echo Utilization and Monitoring Actuarial Trends in Indian Children) Study

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On Behalf of United Kingdom-India Education and Research Initiative
Rheumatic Fever

- RF results from an autoimmune response to infection with group A streptococcus
- It is a multi system disease
- Major effect on health is due to damage to heart valves
- Incidence of RF has declined in industrialized nations
- RF continues unabated in developing countries
Global Burden of Disease

- Total no of cases with RHD: 20 millions
- Congestive heart failure: 3 millions
- Valve surgery required in: 1 million
- Annual Incidence of RF: 0.5 million
- Number of RHD cases added: 300,000/yr
- Estimated deaths from RHD: 200,000/yr

Most patients are children and young adults

Estimates from developing countries are often hospital based and therefore tend to be incomplete

WHO Tech Series No 923, 2004
RF and RHD in India: Current Scenario

- Incidence of RF in India: 0.2–0.75/1000/year
- Estimated number with RHD: 1,600,000
- New cases added every year: 50,000
- Patients with valve lesions requiring surgery: >90,000

Why screen for RHD by echocardiography?

Early detection of milder lesions in asymptomatic children may prevent progression to severe valvular lesions by instituting secondary prophylaxis.

Aim of the study

To diagnose rheumatic heart disease in asymptomatic children aged 5-15 years, living in rural and crowded urban areas, using portable echocardiography: A cross sectional study.
Material and Methods

- Ethical clearance obtained from IRB
- Consent obtained from principals and parents
- Children, aged 5-15 years recruited from government and private schools in rural areas and from a crowded urban area.
- A focused history and examination performed.
- Echo-Doppler performed using a bedside portable echocardiography machine.
Children of 7th standard in a rural private school
Bedside echocardiography in a crowded urban area
A diagnosis of RHD was made by echo-Doppler if one or more of the following were present:

- Mitral stenosis;
- Mitral regurgitation (MR) and / or aortic regurgitation (AR) with regurgitant jet length of more than 2 cm in at least two echo planes, along with abnormal valve morphology (a bicuspid aortic valve to be excluded);
- MR and / or AR with regurgitant jet length of 1-2 cm, and abnormal valve morphology, in the presence of a history suggestive of rheumatic fever.
## Results: Baseline Characteristics (n=5000)

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Proportion/ Mean± SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (years)</td>
<td>10.8±2.6</td>
</tr>
<tr>
<td>Males/ Females</td>
<td>52.8% / 47.2%</td>
</tr>
<tr>
<td>Number of family members</td>
<td>6.4±2.3</td>
</tr>
<tr>
<td>Number of rooms</td>
<td>3.8±1.8</td>
</tr>
<tr>
<td>Government school/Private school</td>
<td>26% / 74%</td>
</tr>
<tr>
<td>Body mass index (kg/m²)</td>
<td>14.8±2.3</td>
</tr>
<tr>
<td>Katcha house (Bamboo/ mud)</td>
<td>19%</td>
</tr>
</tbody>
</table>
Results: Clinical Data

- All children were asymptomatic.
- History suggestive of rheumatic fever was obtained in 167 children.
- MR could be diagnosed clinically in 3 children, giving a clinical prevalence of RHD as 0.6/1000 cases.
Echo-Doppler diagnosed RHD in 101 cases.

Thickening of the valve was present in all.

Doppler revealed mild MR in 80 and moderate MR in 7 cases, 2 of these had mild MS.

Mild AR was seen in 5 and MR + AR in 9 cases.

13 of these 101 cases had a history suggestive of rheumatic fever.

Prevalence of RHD by echo-Doppler: 20/1000 children
55 of 101 cases with RHD were confirmed by repeat echo on standard state of the art echo machine in the hospital setting.

The severity of valvular lesion was changed in only one case, from mild MR to trivial MR.

Other lesions detected: 23, Moderate ASD (10), bicuspid AoV (3, one with AR), VSD (2), PDA (4), TOF (2), others (2)
Data from other studies on RHD prevalence by echo-Doppler (per 1000 children)

Marijon et al, 2007
Carapetis et al, 2008
Bhaya et al, 2010
Sadiq et al, 2009
Steer et al, 2009
## Comparison of RHD vs. no RHD group: Multivariate analysis

<table>
<thead>
<tr>
<th></th>
<th>Odds ratio</th>
<th>P value</th>
<th>95% CI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Female sex</td>
<td>1.63</td>
<td><strong>0.007</strong></td>
<td>1.2-2.4</td>
</tr>
<tr>
<td>Age</td>
<td>1.07</td>
<td><strong>0.012</strong></td>
<td>1.0-1.2</td>
</tr>
<tr>
<td>Government school</td>
<td>1.39</td>
<td><strong>0.040</strong></td>
<td>1.0-2.2</td>
</tr>
<tr>
<td>Kutcha type house</td>
<td>1.30</td>
<td>0.30</td>
<td>0.8-2.1</td>
</tr>
<tr>
<td>Any murmur</td>
<td>2.19</td>
<td>0.12</td>
<td>0.80-6.2</td>
</tr>
</tbody>
</table>
Echo-Doppler screening to diagnose RHD in asymptomatic children is feasible.

In our study, the prevalence of RHD was 20/1000 children screened using preset criteria.

Higher age, female gender and studying in a government school were predictive of higher prevalence.
Unanswered questions!

- Optimal criteria for diagnosing sub-clinical RHD by Echo-Doppler?
- Cost-effectiveness of screening programs, especially in high prevalence settings?
- Natural history of such valve lesions?
- Can further progression of valve lesions be prevented by penicillin prophylaxis?
- The risk/benefit ratio of using penicillin?
Greetings from AIIMS, New Delhi....
Information for the Parents

Rheumatic Heart disease is an acquired valvular heart disease that results from untreated rheumatic fever that usually affects the children. The disease follows a type of sore throat called streptococcal sore throat. Untreated or incompletely treated streptococcal sore throat may result in a disease called Rheumatic fever. Rheumatic fever if not treated properly, especially after repeated attacks, may cause damage of the heart valves. This condition is called Rheumatic Heart Disease (RHD). It is very important that the disease is identified and preventive measures taken at an early stage in order to prevent RHD.

The department of cardiology, AIIMS along with CRHSP, Ballabhgarh is conducting a survey to detect rheumatic fever/rheumatic heart disease in School children between 5 to 15 years of age. For this purpose, 20,000 school age children are to be screened.

In connection with this, we have selected your child and we seek your kind permission to examine the child and perform an ultrasound examination of the heart.

- **What are the methods employed in this study?**

The methods used in this study are harmless for the child and are noninvasive. After a routine thorough clinical examination, a bedside ultrasound machine will be used to study the heart for any disease by keeping an ultrasound probe with jelly on the chest wall. No blood samples will be required for the study.
What happens if an abnormality is detected?

If an abnormality is detected in the heart of the child, a cardiologist from the department of cardiology, AIIMS will provide you with all the information for the treatment and prognosis of the defect. If necessary the child will be referred to the cardiology department of AIIMS for further management.

Is my child’s participation in the study compulsory and if I refuse, will it affect his future treatment at CRHSP?

It is not at all mandatory for your child to participate in the study, it is totally. However, since the methods used in this project are totally harmless, do not involve any injection or blood drawing, it may be beneficial for your child. In case an abnormality of heart is present, we will not only be able to diagnose it, but also guide you for further management.

Whom should I contact if I have some query / emergency?

You can reach one of us any time of the day, the list of address and phone numbers will be provided to you at the time of recruitment of your baby into the study. In case of any query regarding the study, you are free to contact Dr. Anita Saxena or Dr. S Ramakrishnan, department of Cardiology, AIIMS (Ph No. 26593464, 26594861 and 9818186179). You may also contact Dr. Puneet Misra or Dr. K. Anand at Ballabghar hospital (phone 2211227).
Confidentiality
All your medical information will be kept confidential and only authorized persons who are involved in your care and those involved in this study will have access to it.

Questions/Patient Rights
You will be completely free to make inquiries during all of the stages of this study, raise any issues, and question any or all of your rights and obligations as a research subject, at any time during the course of this study. If you have any other questions about the study you should contact any one of the investigators.

New information
In case of any new information regarding issues related to this study become available in the medical literature during the course of this study, it will be shared with you and the merits of continuing this study will be reconsidered in the light of the new information.

Date: ___________________________ Signature: ___________________________
Place: __________________________ Name of the Doctor: __________________________
I have gone through the above mentioned details of the project on screening for rheumatic heart disease in school children. I understand the details of the project. I hereby provide free and voluntary consent for my child to participate in the above study and undergo screening for heart disease as per the protocol of the project.

Date: ........................................................ Signature/Thumb impression

Place: ......................................................... Name

Father/mother

Address

Name of the individual obtaining consent

______________________________
(Signature of Individual Obtaining Consent) Date and time
Performa for Echocardiographic Screening of school children for rheumatic heart disease

<table>
<thead>
<tr>
<th>Demographic data</th>
<th></th>
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</thead>
<tbody>
<tr>
<td>Study code number</td>
<td></td>
</tr>
<tr>
<td>Date of examination</td>
<td></td>
</tr>
<tr>
<td>Name of student</td>
<td>Age</td>
</tr>
<tr>
<td>Father’s name</td>
<td></td>
</tr>
<tr>
<td>Name of school</td>
<td></td>
</tr>
<tr>
<td>Class and section</td>
<td></td>
</tr>
<tr>
<td>Permanent address</td>
<td></td>
</tr>
<tr>
<td>Religion</td>
<td></td>
</tr>
<tr>
<td>Monthly family income</td>
<td></td>
</tr>
<tr>
<td>Number of family members</td>
<td></td>
</tr>
<tr>
<td>Type of house, no. of rooms</td>
<td></td>
</tr>
</tbody>
</table>

### II History

- Breathlessness
- Chest pain
- Cyanosis
- Joint pains: Yes/ No (present or in the past)
  - Associated with fever: Yes/ No

### III Physical Examination

<table>
<thead>
<tr>
<th>Feature</th>
<th>Location</th>
<th>Intensity</th>
<th>Timing</th>
</tr>
</thead>
<tbody>
<tr>
<td>Weight</td>
<td></td>
<td>height</td>
<td></td>
</tr>
<tr>
<td>JVP</td>
<td></td>
<td>Edema feet</td>
<td></td>
</tr>
<tr>
<td>Pulse</td>
<td></td>
<td>Femoral pulses</td>
<td></td>
</tr>
<tr>
<td>BP</td>
<td></td>
<td>Pallor</td>
<td></td>
</tr>
<tr>
<td>Cyanosis</td>
<td></td>
<td>Cardiomegaly</td>
<td></td>
</tr>
<tr>
<td>Heart sounds</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Systolic murmur</td>
<td>Location</td>
<td>Intensity</td>
<td>Timing</td>
</tr>
<tr>
<td>Diastolic murmur</td>
<td>Location</td>
<td>Intensity</td>
<td>Timing</td>
</tr>
<tr>
<td>Lungs</td>
<td></td>
<td>Liver</td>
<td>Spleen</td>
</tr>
</tbody>
</table>
IV Clinical impression
   Rheumatic heart disease present: Yes/No
   Likely diagnosis

V Echocardiography
   Date and time
   Interpretation: Normal/abnormal
   Details of abnormality
   Mitral stenosis
   Mitral regurgitation
   Mitral stenosis and regurgitation
   Mitral and aortic valve lesion
   Aortic valve lesion
   Others: Mitral valve thickening, leaflet prolapse, restricted mobility

Likely diagnosis:
Evaluation of echo by cardiologist
Referral to Cardiology AIIMS needed: yes/no
Follow up planned: Yes/ No
Prevalence of abnormalities detected by echo-Doppler

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Number (per 1000 children)</th>
<th>95% CI (per 1000 children)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rheumatic heart disease</td>
<td>101 (20/1000)</td>
<td>19.8 – 28.05</td>
</tr>
<tr>
<td>Congenital heart disease</td>
<td>23 (4.6/1000)</td>
<td>5.15 – 9.88</td>
</tr>
<tr>
<td>Any heart disease</td>
<td>124 (25/1000)</td>
<td>27.12 – 36.04</td>
</tr>
<tr>
<td>Any MR on echo</td>
<td>396 (63.2/1000)</td>
<td>56.89 – 68.70</td>
</tr>
</tbody>
</table>