Prevalence of Rheumatic Heart Disease in School Children in Bikaner: An Echocardiographic Study

KL Periwal*, BK Gupta**, RB Panwar***, PC Khatri*, S Raja***, R Gupta****

Abstract

Objective: To determine prevalence of rheumatic heart disease (RHD) using clinical and echocardiographic criteria and to study influence of socioeconomic status (SES) we studied school children in a north-western Indian town.

Methods: 3292 school children, age range 5-14 years, in two private schools, ten middle SES government schools and six low SES government schools were invited to participate in the study. 3002 (1837 boys, 1165 girls) were clinically examined (response 91%) of which 1042 were in private schools, 1002 in middle SES schools and 958 in low SES schools. Prevalence of cardiac murmurs and RHD based on clinical diagnosis was determined in school by a trained team of physicians. Those with a murmur were further evaluated by Doppler-echocardiography in the hospital. Group-specific and age-specific rates (prevalence/thousand) of murmurs and cardiac lesions were determined.

Results: A significant cardiac murmur was observed in 55 subjects (18.3/1000) with similar prevalence in boys (20.7) and girls (14.6). The prevalence of murmur was significantly greater in children belonging to low SES schools (29.2/1000) as compared to middle SES (18.9) and higher SES schools (7.6). RHD prevalence based on clinical diagnosis was observed in 50 children (16.7/1000) and was similar in boys (19.1) and girls (12.9). Clinical RHD was more in the low SES school children (28.2/1000) as compared to middle (17.0) and high SES schools (5.8). RHD was demonstrated on echocardiography in 2 children (0.67/1000). Other prevalent cardiac lesions were congenital heart disease in 5 (1.66/1000) and mitral valve prolapse in 37 (12.3/1000).

Conclusions: There is a low prevalence of RHD in school children in this region compared to previous Indian studies. Cardiac murmurs are more prevalent among low SES children.

INTRODUCTION

Rheumatic heart disease (RHD) is a major cardiac problem in India and many developing countries. In previous studies of prevalence of RHD in India diagnostic criteria have been based on clinical examination and cardiac auscultation. The prevalence rate reported has been 1.3-4.5 per 1000 population among children in age group 5-15 years. Reliance on diagnosis using clinical criteria alone may be a reason this high prevalence of RHD in many of these studies. Echocardiographic validation of clinical diagnosis could provide a more definite evidence of its prevalence. We used clinical as well as echocardiographic criteria to determine the prevalence of RHD in school children in a north-west Indian town.

METHODS

This study was a cross sectional survey that focused on urban school children in the town of Bikaner in northwest Rajasthan. Randomly selected schools using stratified cluster sampling technique were included in the study. An effort was made to enroll students from schools that catered to children from different socioeconomic status (SES) in age range 5-14 years. We selected two private schools, 10 middle SES government schools and 6 low SES government schools spread all over the town. The target sample size in various schools was 1072 children in private schools, 1108 in middle SES government schools and 1112 in low SES government schools (total n=3292). Seriously ill children, those with mental retardation due to unknown cause, epilepsy or extra-cardiac malformation were excluded from the study.

A field team consisting of doctor and one social worker visited the school for screening program after informing the head-master of the school about the survey and to obtain consent from the parents. Two field teams
participated in the study after proper training and standardization of methodological issues. The schools were visited repeatedly to cover maximum numbers of the enrolled students. A record of absentees was maintained and they were examined subsequently. We could examine 3002 students (response rate 91.2%). A detailed clinical examination was done on each child including cardiac auscultation specifically to look for murmur by trained physicians. Complete details of all students having murmur were taken down. Clinical RHD was diagnosed when significant cardiac murmurs along with past history of joint pains or any other manifestation of rheumatic fever was present. All the students with a significant murmur were advised to visit the hospital and evaluated by routine echocardiography and colour flow mapping studies at the echocardiographic laboratory. The echocardiography was performed using Hewlett-Packard Sonos 100 model using a 2.5 MHz or 5.0 MHz transducer as appropriate. Selected students were evaluated by estimation of complete blood cell count, erythrocyte sedimentation rate, anti-streptolysin-O titre, qualitative C-reactive protein, chest radiography and electrocardiography. Revised Jones criteria were utilized for the diagnosis of rheumatic fever (RF) and clinical and echocardiographic criteria for diagnosis of chronic RHD.

**Statistical Analysis** : All the data were computerized. Prevalence rates are reported as per thousand. Significance of inter-group differences was estimated by chi-square test. P value <0.05 was considered significant.

**RESULTS**

Of the 3292 eligible children, we could examine 3002 (response rate 91.2%). This included 1837 boys and 1165 girls. Of these, 1555 children (872 boys, 683 girls) were in age-group 5-9 years and 1447 (965 boys, 482 girls) in age-group 10-14 years. A significant cardiac murmur was observed in 55 subjects (prevalence rate 18.3/1000) with similar prevalence in boys (20.7/1000) and girls (14.6/1000) (Table 1). The prevalence of murmur was significantly greater in children belonging to low SES schools (29.2/1000) as compared to middle SES (18.9/1000) and private schools (7.6/1000) ($\chi^2$ 154.4, p<0.0001) (Fig. 1).

RHD prevalence based on clinical diagnosis was observed in 50 children (16.7/1000) and was similar in boys (19.1/1000) and girls (12.9/1000). Clinical RHD was more in the low SES school children (28.2/1000) as compared to middle (17.0/1000) and high SES schools (5.8/1000) ($\chi^2$ 175.2, p<0.0001, Fig. 1). RHD was demonstrated on echocardiography in 2 children in age-group 10-14 years belonging to low SES schools (0.67/1000). One case had isolated rheumatic mitral regurgitation and the second has combined rheumatic mitral and aortic regurgitation. Other prevalent cardiac lesions were congenital heart disease in 5 (1.66/1000) that included 4 children with ventricular septal defects and one with isolated pulmonary stenosis. Mitral valve prolapse diagnosed according to revised criteria was observed in 37 children (12.3/1000) (Table 2).

**DISCUSSION**

The prevalence of RHD in school children varies considerably throughout the world. It is the least in the developed countries such as the USA (<0.02 / 1000) and very high in underdeveloped countries such as Zambal (12.6 / 1000). In different parts of India the prevalence of RHD was more in the low SES school children (28.2 / 1000) as compared to middle (17.0 / 1000) and high SES schools (5.8 / 1000) ($\chi^2$ 175.2, p<0.0001, Fig. 1). RHD was demonstrated on echocardiography in 2 children in age-group 10-14 years belonging to low SES schools (0.67/1000). One case had isolated rheumatic mitral regurgitation and the second has combined rheumatic mitral and aortic regurgitation. Other prevalent cardiac lesions were congenital heart disease in 5 (1.66/1000) that included 4 children with ventricular septal defects and one with isolated pulmonary stenosis. Mitral valve prolapse diagnosed according to revised criteria was observed in 37 children (12.3/1000) (Table 2).

### Table 1 : Prevalence of a murmur among 3002 school children

<table>
<thead>
<tr>
<th>Age group (yrs)</th>
<th>Boys No.</th>
<th>Per 1000</th>
<th>Girls No.</th>
<th>Per 1000</th>
<th>Total No.</th>
<th>Per 1000</th>
</tr>
</thead>
<tbody>
<tr>
<td>5-9</td>
<td>15</td>
<td>17.2</td>
<td>12</td>
<td>17.6</td>
<td>27</td>
<td>17.4</td>
</tr>
<tr>
<td>10-14</td>
<td>23</td>
<td>23.8</td>
<td>5</td>
<td>10.4</td>
<td>28</td>
<td>19.4</td>
</tr>
<tr>
<td>Total</td>
<td>38</td>
<td>20.7</td>
<td>17</td>
<td>14.5</td>
<td>55</td>
<td>18.3</td>
</tr>
</tbody>
</table>

Numbers in parentheses is prevalence rate/1000.

### Table 2 : Echocardiographic prevalence of various heart diseases

<table>
<thead>
<tr>
<th></th>
<th>Boys 5-9 years</th>
<th>Girls 5-9 years</th>
<th>Total 5-9 years</th>
<th>Boys 10-14 years</th>
<th>Girls 10-14 years</th>
<th>Total 10-14 years</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mitral valve prolapse</td>
<td>13</td>
<td>10</td>
<td>23 (14.9)</td>
<td>12</td>
<td>2</td>
<td>14 (9.7)</td>
<td>37 (12.3)</td>
</tr>
<tr>
<td>Rheumatic heart disease</td>
<td>0</td>
<td>0</td>
<td>0 (0.0)</td>
<td>2</td>
<td>0</td>
<td>2 (1.4)</td>
<td>2 (0.7)</td>
</tr>
<tr>
<td>Congenital heart disease</td>
<td>1</td>
<td>2</td>
<td>3 (1.9)</td>
<td>2</td>
<td>0</td>
<td>2 (1.4)</td>
<td>5 (1.7)</td>
</tr>
<tr>
<td>Total</td>
<td>14</td>
<td>12</td>
<td>26 (16.7)</td>
<td>16</td>
<td>2</td>
<td>18 (12.4)</td>
<td>44 (14.7)</td>
</tr>
</tbody>
</table>

Numbers in parentheses is prevalence rate/1000.
has been reported to vary between 1.0-5.4/1000 children. Studies by the Indian Council of Medical Research in school children in late 1980’s reported RHD prevalence of 1.0/1000 in Delhi, 2.9/1000 in Vellore and 5.4/1000 in Varanasi. All these studies were based on clinical criteria alone. In the present study the prevalence of RHD diagnosed clinically is 16.7/1000 which is significantly greater than the earlier reported studies but the echocardiographic prevalence of RHD is 0.67/1000 which is considerably lower. The high prevalence of clinical RHD could be due to greater prevalence of innocent murmurs in these children. Echocardiography fails to confirm the presence of RHD in majority of these children.

In one of the largest study of prevalence of RHD in school children in India, Jose et al from Vellore screened 229,829 school children aged 6-18 years. Initial screening revealed 374 children with suspected rheumatic heart disease (1.63/1000). Other significant diseases included mitral valve prolapse in 57 (0.25/1000). Prevalence of congenital heart disease was not reported. Bahadur et al revealed 374 children with suspected rheumatic heart disease occurring in 2 to 6% of children. It is not clear whether nutritional deficiency and other socioeconomic factors play a role in the pathophysiology of this condition although our study found a greater prevalence of mitral valve prolapse in low SES schools as compared to middle and high SES schools. More studies are required in this direction. The limitations of this study include a smaller sample size than some of the recent large studies and failure to perform echocardiography in all the children thus missing those who have silent RHD. The sample size is larger than most of the previous studies and a lower prevalence of RHD in the present study has vitiated the calculated sample size estimates.

Rheumatic fever and rheumatic heart disease are preventable conditions and continuing studies among not only school children but also among school dropouts belonging to low socioeconomic strata are urgently needed to focus attention of the general public, physicians and health administrators regarding extent of the problem and to develop population based prevention policies for its prevention.

**References**


---

**Announcement**

**ICCD-WCCN - 2006**

International College of Cardiology and World College of Nutrition are organizing their 4th International Congress on Cardiovascular Disease (ICCD 2006) and XI World Congress on Clinical Nutrition (WCCN 2006) - an Unique Joint Congress - ICCD - WCCN - 2006 at Hotel Renaissance, Mumbai from 17th to 19th November 2006.

For further details, please contact: **Dr. SB Gupta**, Organizing Secretary, 18, Greylands, Railway Officers’ Flats New Marine Lines, Mumbai 400 020.

Ph : 022-23717246 (Hosp) 022-22624556 © 022-22651044 (Telefax)

Cell : 09821364565/09821638617 E-mail : sbgupta@vsnl.net

**Dr. Shashank Joshi**, Organizing Secretary, B/23, Kamal Pushpa, 6, Bandra Reclamation, Mumbai 400 050.

Ph : 022-26402769 © 022-26420107 © Cell : 09820186302

E-mail : srjoshi@bom5.vsnl.net.in

Visit the website: [www.iccd2006.org](http://www.iccd2006.org)