

*Full Length Research Paper*

# An evaluation of the incidence of rheumatic and congenital heart disease among school children in central Nepal

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To determine the prevalence of rheumatic heart disease (RHD) and congenital heart disease (CHD) among school children in Chitwan district using clinical and echocardiographic criteria. This is a cross-sectional study involving 7650 school children from general schools (4100) and private boarding schools (3550). The selected students were clinically examined in the school and those having cardiac murmurs were assessed in the hospital (College of Medical Sciences-Teaching Hospital, Bharatpur) by trained cardiologists with transthoracic two dimensional echocardiography along with colour doppler. Age-specific rates (prevalence/thousand) of murmurs and structural heart disease (RHD and CHD) were determined. The age of the students ranged from 4 to 15 years with girls preponderance (Girl: Boy = 1.18:1). A significant cardiac murmur was observed in 345 students (45.00/1000) with similar prevalence in boys (45.71) and girls (44.58). Definite RHD was detected in 12 students (1.57/1000) and CHD in 30 patients (3.92/1000). The dominant rheumatic cardiac lesions were mitral regurgitation (3 in number) followed by mitral stenosis (2 in number) and aortic regurgitation (2 in number). Commonest CHD demonstrated were mitral valve prolapse (14 in number) followed by bicuspid aortic valve (9 in number), a trial septum defect-ostium secundum (3 in number), ventricular septal defect (2 in number) and severe pulmonary stenosis (2 in number). There is a low prevalence of RHD and CHD in school children in this region of central Nepal compared to previous Nepalese studies. Cardiac murmurs and RHD are more prevalent among low SES children in general school.

**Key words:** Rheumatic heart disease, congenital heart disease, prevalence

## INTRODUCTION

Rheumatic heart disease (RHD) is a major cardiac

problem in developing countries like Nepal (Stollerman, 1997; Grover et al., 2002). Congenital heart diseases (CHD) are also not uncommon in this part of the world.

The prevalence rate of RHD has been reported to be 1.3-4.5 per 1000 population among school children in

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## SEX DISTRIBUTION

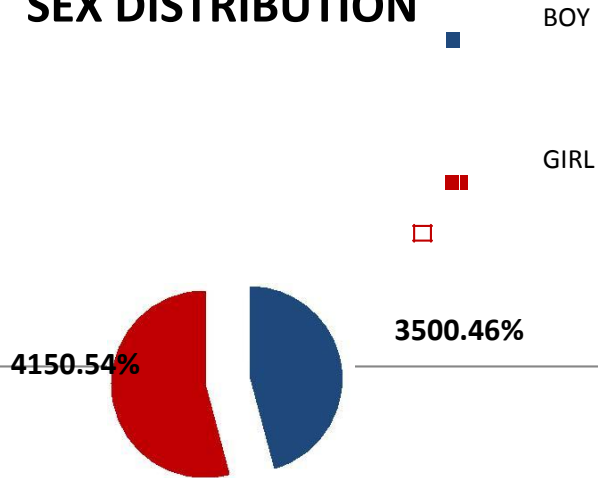


Figure 1. Sex distribution of the screened school students (n-7650)

Hospital, Bharatpur) . They were evaluated by routine 2D TTE and colour flow study. The echocardiography used was Siemens Acuzon 300 model using a 2.5 MHz or 5.0 MHz transducer as appropriate.

### Statistical analysis

All the relevant data were entered into SPSS 15 software and computed. Prevalence rates were reported as per thousand. Significance of inter-school and age range group differences was estimated by chi-square test. P value <0.05 was considered significant.

age group 5-15 years (Berry, 1972; Shrestha and Padmavati, 1979; Mathur and Wahal, 1982; Grover et al., 1993; Vijaykumar et al., 1994; Thakur et al., 1996; Jose and Gomathi, 2003; Bahadur et al., 2003). Transthoracic 2D Echocardiography (TTE) with colour Doppler has validated the precise diagnosis and has provided more definite evidence of its prevalence (Jose and Gomathi, 2003; Bahadur et al., 2003).

In this study, we used clinical and echocardiographic criteria to determine the prevalence of RHD and CHD in school children in chitwan district of central Nepal.

## MATERIALS AND METHODS

This is a cross sectional study involving 7650 school children from different parts of chitwan district. Randomly selected schools (general government and private) using stratified cluster sampling technique were included in the study. Total 10 schools were enrolled out of whom 6 were government schools and 4 were private schools each having 4100 and 3550 students respectively. Seriously ill children or those with extra-cardiac manifestations were excluded from the study.

A field team consisting of cardiologists, physicians and social workers from Nepal Heart Foundation (Chitwan branch) visited the school for screening program after getting consent from the principal of the school and guardians of the students. We could examine 7650 students out of 8000 estimated number (response rate 95.63%). A thorough clinical examination was done on each child including cardiac auscultation specifically to look for murmur by cardiologists and trained physicians. Required relevant details of all students having murmur were collected.

All the students with significant murmur were advised to visit the hospital ( College of Medical Sciences-Teaching

## Observations and results

Total 7650 students were included in this cross-sectional study. The age of the students ranged from 4 to 15 years with girls preponderance (Girl: Boy = 1.18:1) as shown in Figure 1.

The majority of the students 3950(51.63%) in our study belonged to 10-15 years of age group and the rest 3700(48.37%) belonged to 4-9 years as shown in Figure 2.

Out of total 7650 patients who were carefully auscultated by experienced cardiologists and physicians, 345 students (4.5%) were found to have murmurs over the auscultatory areas of the heart as shown in Table 1. They have been subsequently evaluated with 2-dimensional transthoracic echocardiography by cardiologists at College of Medical Sciences-Teaching Hospital, Bharatpur, Nepal.

Out of those 345 students, 12 had definite rheumatic heart disease (RHD), 16 had possible or borderline RHD and 30 students had congenital heart disease (CHD) as illustrated in the Figure 3. The detail analysis is shown below in Table 2.

Out of 12 students with diagnosed definite RHD, 8 students belonged to low socioeconomic status (SES) and the rest having middle SES. History of acute rheumatic fever was elicited only in 6 patients but almost all the students had recurrent sore throat. Overcrowding (family members>6) was noticed in 7 patients.

## DISCUSSION

The prevalence of RHD in school children varies in different parts of the world and within the same country with different economic and ethnic groups. It is the least in the developed countries such as the USA (<0.02 / 1000) and very high in underdeveloped countries such as Zambia (12.6 / 1000) ( Stollerman, 1997 ). In different

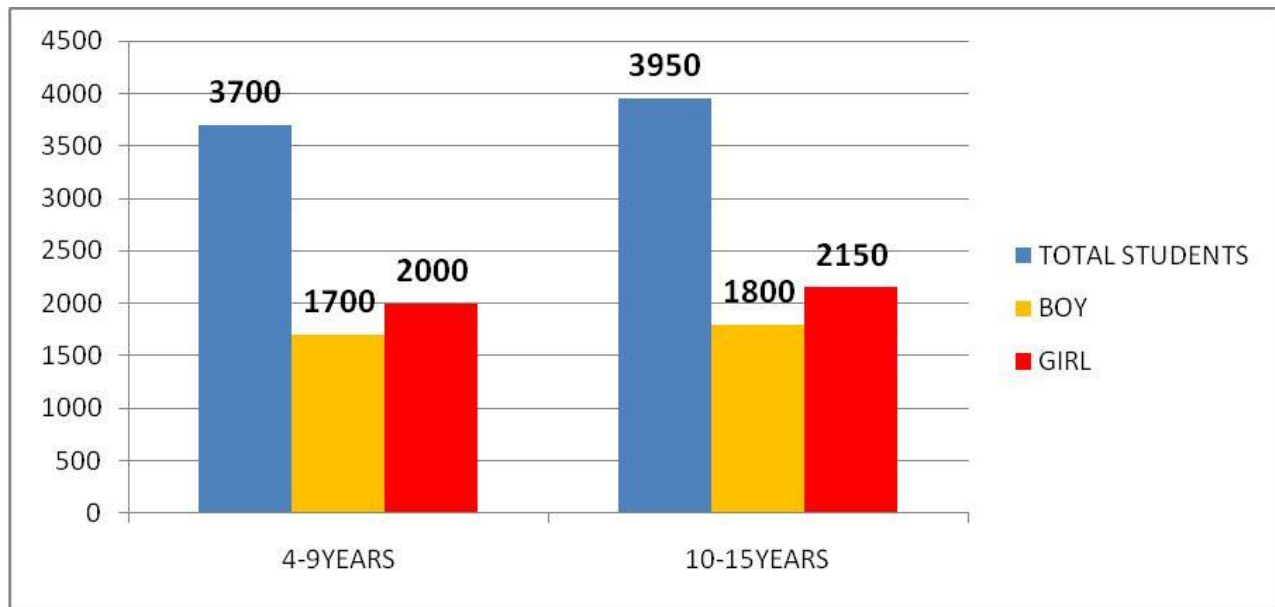


Figure 2. Bar diagram showing age and sex distribution of the students (n=7650).

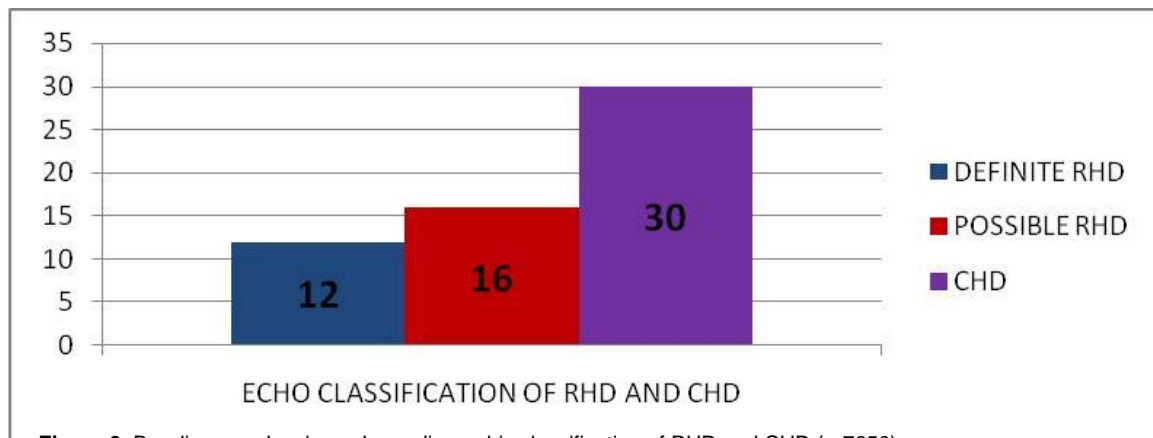


Figure 3. Bar diagram showing echocardiographic classification of RHD and CHD (n=7650)

Table 1. Prevalence of murmur among school students in Chitwan district.

Age range (in yrs)	Boys(n=3500)		Girls(n=4150)		Total(n=7650)	
	No.	Per 1000	No.	Per 1000	No.	Per thousand
4-9years	88	25.14	102	24.58	190	24.84
10-15years	72	20.57	83	20.00	155	20.26
Total	160	45.71	185	44.58	345	45.00

parts of Nepal, the prevalence has been reported to vary between 1.2-5.4/1000 children (Bahadur et al., 2003). Bahadur et al. (2012) studied 9420 students aged 5-18 years in Kathmandu valley (Bahadur et al., 2003). 83

children were suspected to have heart disease on clinical examination (8.8/1000) and echocardiography confirmed RHD in 11 (1.2/1000). Similarly, Dipankar et al. (2013) reported cardiac screening of 34,876 school children from

**Table 2.** Echocardiographic prevalence of definite RHD and CHD(n-7650).

Parameter	4-9years:n-3700			10-15years:n-3950			Total
	Boys	Girls	Total	Boys	Girls	Total	
Definite RHD							
-Severe MS	1	0	1	1	0	1	2
-Moderate MR	0	1	1	1	1	2	3
-Severe MS/moderate MR	1	0	1	0	1	1	2
-Mild AR	0	1	1	1	0	1	2
-Undergone MVR	1	0	1	1	1	2	3
Total	3	2	5(1.35)	4	3	7(1.77)	12(1.57)
CHD							
-ASD(OS)	1	1	2	0	1	1	3
-VSD	1	0	1	1	0	1	2
-Severe PS	1	1	2	0	0	0	2
-BAV	1	3	4	3	2	5	9
-MVP	2	4	6	5	3	8	14
Total	6	9	15(4.05)	9	6	15(4.05)	30(3.92)

Note: MS-mitral stenosis, MR-mitral regurgitation, AR-aortic regurgitation, MVR-mitral valve replacement, ASD(OS)-atrial septum defect(ostium secundum), VSD-ventricular septal defect, PS-pulmonary stenosis, BAV-bicuspid aortic valve, MVP-mitral valve prolapsed, Note: Numbers in parentheses is prevalence rate/1000.

115 randomly selected public schools from two cities of Kathmandu Valley (Kathmandu and Lalitpur). The prevalence of Rheumatic Heart Disease was found to be 0.90 per thousand (in the age group 5-16 years) with the most common lesion being mitral regurgitation (Dipankar et al., 2013).

In the present study, the echocardiographic prevalence of RHD is 1.57/1000 which is relatively lower. In one of the largest study of prevalence of RHD in school children in India, Jose et al. (2003) from Vellore screened 229,829 school children aged 6-18 years. Initial screening revealed 374 children with suspected rheumatic heart disease (1.63/1000). RHD was confirmed in 157 children (0.67/1000). Other significant diseases included mitral valve prolapse in 57 (0.25/1000). In the present study 345 students had cardiac murmur suggestive of RHD (4.5/1000). The prevalence was the least in the good SES private schools (12.42/1000) as compared to low (32.68/1000) SES government schools. Thus, within a region there are wide differences in the prevalence of children with suspected rheumatic heart disease and confirmed RHD by TTE. The greater prevalence of clinical RHD in low SES government schools may be due to decreased health awareness of parents/students/teachers, overcrowding, poor sanitation intercurrent throat infection, under treatment or no treatment and poor socioeconomic conditions leading to malnutrition (Padmavati, 2001; Kumar and Reddy, 1991).

The prevalence of RHD appears to be declining in

Nepal and India as suggested by studies of Bahadur et al. (2003) and Jose et al. (2003) and the present study. The reasons could be (i). Effective conduction of primary and secondary preventive programs (ii). Health awareness and easy availability of expertise and medical facilities in the study area along with their improved living standards.

Reporting of high prevalence in previous studies is probably because (i) these studies were based exclusively on clinical criteria in contrast to the present study based on echocardiography, (ii) increased health awareness among parents, teachers and the public, and (iii) early recognition and treatment of rheumatic fever.

Our study also shows a high prevalence of congenital heart disease (3.92/1000). Mitral valve prolapse was detected in 14 students followed by bicuspid aortic valve in 9 and atrial septal defect-ostium secundum in 3. Mitral valve prolapse is now becoming most common form of heart disease occurring in 2 to 6% of children (Gupta et al., 1992). Dipankar et al. (2014) from Shahid Ganga Lal National Heart Center noted the prevalence of CHD to be 1 per thousand.<sup>11</sup> Atrial Septal Defect (ASD-OS) was the most common CHD followed by Ventricular Septal Defect (VSD). Two cases of Persistent Ductus Arteriosus (PDA) were detected.

In a study by Bahadur et al. (2003) in school children of Kathmandu valley, the incidence of CHD was 1.3 per thousand and ASD was the most common lesion. Similarly, in an observational hospital based study during

2006 by Shah et al. (2008), the incidence was reported to be 5.8 per thousand. Among acyanotic heart disease, ventricular septal defect (VSD) was found in 49 (58.3%), atrial septal defect (ASD) in 4 patients (4.8%), endocardial cushion defect (ECD) in 2 patients (2.4%) and dextrocardia was found in 3 patients (3.6%). Among cyanotic heart disease, Tetralogy of Fallot (TOF) accounted for 13.1%, total anomalous pulmonary venous connection (TAPVC) 3.6%, transposition of great arteries (TGA) with VSD 1.2% and unspecified cases of heart disease was found in 13.1%. VSD and TOF were the most common lesions while other CHD like ASD, dextrocardia, TAPVC, ECD, TGA with VSD were encountered less frequently (Shah et al., 2008).

## CONCLUSION

There is a low prevalence of RHD and CHD in school children in this region of central Nepal compared to previous Nepalese studies. Cardiac murmurs and RHD are more prevalent among low SES children in general schools. Considering the progressive natural course of RHD and CHD with risk of mortalities/ morbidities and even requirement of definitive surgical therapies including valve replacement and closure in the long term, there is urgent need to create awareness among the public and conduction of regular cardiac screening programmes to detect the disease at its onset. The government and non-governmental local bodies should plan and implement the strategies to make the screening programme successful.

## LIMITATIONS

The limitations of this study include a relatively 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 without clinical murmur. The sample size is larger than most of the previous studies.

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