ORIGINAL ARTICLE

PREVALENCE OF CONGENITAL AND RHEUMATIC HEART DISEASE IN ANGANWADI AND SCHOOL GOING CHILDREN OF VELLORE, TAMIL NADU, SOUTH INDIA

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Abstract

Background: Congenital heart diseases (CHD) cause significant mortality and morbidity in under-5 children. Most cases remain asymptomatic until late childhood. Untreated throat infections in low socioeconomic/ remote areas may lead to rheumatic heart disease (RHD). Owing to the inaccessibility of health care and pediatricians in remote and rural areas, Rashtriya Bal Swasthya Karyakram medical officers play an important role in prevention and screening of heart disease in children. This study emphasizes the importance of early cardiac screening of apparently normal children to prevent complications of CHD/RHD in later stages of life.

Objective: The aim of this study was to determine the prevalence of CHD and RHD in apparently normal school going and Anganwadi children of age 6 months-18 years in Vellore, South India, in the calendar year June 2016 to May 2017.

Materials and methods: School going and anganwadi children, between the ages of 6 months-18 years were screened at anganwadis, primary and higher secondary schools in and around Vellore district. The children were clinically examined and evaluated by 2 teams consisting of a Rashtriya Bal Swasthya Karyakram medical officer, pediatrician and expert cardiologist. A Mindray DC-N6 Sonography system echocardiogram machine was used.

Results: A total of 3,00,714 children were screened out of which 541 children had murmur on auscultation. Of these, 306 children (57%) were further diagnosed with either CHD/RHD while remaining 235 children (43%) had a normal study which concluded that they presented with an innocent murmur. CHD was present in 241 (44.5%) children. RHD was diagnosed in 56 (10%) patients. Complex/Critical cardiac lesions were diagnosed in 9 children. . Echocardiography prevalence of RHD was 0.2 /100) and prevalence of CHD was 0.5/1000.

Conclusion: It was concluded that careful cardiac auscultation, as a part of compulsory health screening at primary school entry and exit, will help detect asymptomatic children with heart disease and facilitate treatment before the onset of complications.

Keywords

Rashtriya Bal Swasthya Karyakram, CHD, RHD, Innocent murmur, Echocardiogram.

Introduction

Heart disease significantly contributes to the health burden of children in developed as well as developing countries such as India. It has greatest effect on childhood mortality and morbidity among all congenital anomalies. Prevalence of congenital heart disease (CHD) ranges from 1.01 to 17.5 per 1000 live births according to various studies all over the world. (1-3) In India, the prevalence of CHD is 2.25 to 5.2 per 1000 children. (4) Non-detection of rheumatic heart disease (RHD), places a heavy economic burden on the health care system in low and middle income countries, since the cost of heart valve surgery is unaffordable by many. Moreover, it hinders the economic growth and Gross Domestic Product (GDP) of the country, since it affects young adults who are the most economically active group of the population. Due to the limited availability of expert pediatricians in remote areas, Rashtriya Bal Swasthya Karyakram (RBSK) medical officers take part in outreach programmes involved in cardiac screening. This should be effectively incorporated into school health services as a means of early detection of lesions. This can prevent the negative impact of CHD in the form of poor scholastic and athletic performance, absenteeism and mortality. Mortality is mainly because of the high incidence of sudden death observed in school children engaged in competitive sports. A further benefit is the chance of detection of heart disease that might only become symptomatic in adulthood.

We therefore set out to clinically evaluate the prevalence of heart disease (Congenital and Rheumatic) in school children with a view of detecting previously undiagnosed heart disease and offering treatment wherever possible. This may present the opportunity for detecting asymptomatic/subtle lesions, but which have potential for complications or progression if appropriate measures are not taken early enough.

Methods & Materials

This study was a cross sectional survey conducted between June 2016 and May 2017 that included 1406 anganwadis and 1232 schools which included 812 primary schools, 275 middle schools and 107 higher secondary schools in Vellore district in Tamil Nadu covering an area of 87.9 sq km. The sample size was 3,00,714 children in the age group of 6 months-18 years. The anganwadis and schools were visited by a RBSK medical officers team. All established cases of CHD and RHD and operated cases were included to know the true prevalence of the disease. CHD was defined as a malformation in the structure of the heart, aorta or the cardiac vessels that was present from birth. Indian Academy of Pediatrics (IAP) Guidelines (5) was used to diagnose rheumatic fever (RF)/Rheumatic heart disease (RHD). A throat swab was taken from children found to suffering from pharyngitis. Children diagnosed with RHD were started on penicillin prophylaxis.

The teams visited the schools after informing District Educational Officers and Head master of the school. Informed consent was taken from all the students and parents. A record of absentees was maintained and they were examined subsequently. There were two teams. The first team consisted of medical officers in RBSK, who performed clinical examination/auscultation. Children with murmurs of grades 3/6 to 6/6 were further investigated by the second team. The second team consisted of two staff nurses, a pediatrician and an expert cardiologist. The children were first examined by the pediatrician with the help of staff nurses. The expert cardiologist performed echocardiogram using Mindray DC-N6 Sonography device to confirm the diagnosis. Clinically and echocardiographically diagnosed CHD and RHD patients were further evaluated by estimation of

complete blood count, ESR, ASO titres, CRP, Chest radiography and electrocardiography.

Statistical Analysis

For continuous data, mean, standard deviation (SD), median, IQR, Minimum and Maximum were presented. For categorical data, number of participants and percentage was presented. All analyses was done using Statistical package for Social Services (SPSS) Software version 21.0 (Armonk, NY: IBM Corp)

Results

Cardiac murmur was observed in 541 patients out of 3,00,714 patients screened in total. Age distribution is depicted in Table 1. Out of 541 children screened, male: female ratio was 257:284. Of the 541 children with a murmur, 306 (57%) children were further diagnosed with either CHD/RHD of which 142 were boys and 164 were girls. Remaining 235 children (43%) had a normal study which concluded that they presented with an innocent murmur. Ninety-two (29%) cases were newly diagnosed with CHD/RHD, while 214 (71%) cases were old cases which included post-operative cases and previously diagnosed patients. CHD was present in 241 (44.5%) children. RHD was diagnosed in 56 (10%) patients. Echocardiography prevalence of RHD was 0.2/1000 and prevalence of CHD was 0.5/1000.

Based on echocardiographic findings, 232 (42.6%) children had an isolated lesion. Ventricular septal defect (VSD) was the most common congenital cardiac lesion affecting 100 (42%) children. Atrial Septal Defect (ASD) was the second most common lesion affecting 69 (12%) children. Other cardiac lesions seen were mitral regurgitation in 67 (11%) patients, aortic regurgitation in 21 (4%) patients, patent ductus arteriosus in 31 (5.7%) patients, mitral valve prolapse in 9 (1.6%) patients and tetralogy of Fallot in 13 (2.4%) patients. Multi-valvular lesions like mitral regurgitation (MR) with aortic regurgitation (AR) was diagnosed in 7 (1.2%) patients; ASD with VSD was present in 4 (0.7%) patients. Complex cardiac lesions were found in 9 patients of which 2 each had coarctation of aorta, congenitally corrected Transposition of Great Vessels (TGA) and complex cyanotic heart disease whereas 1 each had pulmonary hypertension, TGA with VSD and septal hypertrophy. One hundred eighty five children (34%) required surgery. These children were referred to a tertiary care hospital, with a cardiac centre, for surgery under Comprehensive health insurance scheme.

Table 1: Age Wise Distribution of Congenital Heart Disease (CHD) and Rheumatic Heart Disease (RHD)

Age	No. of patients	CHD (%)	RHD (%)
6mo-5years	170	92 (54%)	6 (3%)
6yrs-10yrs	209	95 (45%)	22 (10%)
11yrs-15yrs	146	51 (34%)	24 (16%)
>15yrs	16	3 (18%)	4 (25%)

Discussion

CHD contributes a major proportion of congenital anomalies at birth in neonates. Since most septal defects remain asymptomatic until early adulthood, early screening plays a vital role in in this spectrum of disease. In our study, the proportion of females with a cardiac murmur was greater than males. This may be due to poor nutrition, neglect of the female child in rural areas and genetic predisposition. Similar ratio was found in the study by Ujuanbi et al (6) where 51.1% were females and 48.9% were males. A study by Shankar et al (7) also showed a ratio of female: male 1.18:1.

Echocardiography is the standard method of investigation and follow-up of patients in pediatric cardiology. Study by Gupta et al (8) revealed that acyanotic defects contributed to 67% cases in the Neonatal Intensive Care Unit (NICU). The prevalence of acyanotic heart disease in school going children in their study was 36%. Since most of cardiac anomalies are corrected before the school entry, prevalence of heart disease was not available on review of literature. In the study by Bahadur et al (9) in school children of Kathmandu, Nepal the incidence of CHD was 1.3/1000 and ASD was the most common lesion. Another study by Shah et al (10) showed that incidence of CHD was 5.8/1000. This differs from our study where the incidence of CHD is 0.5/1000, in Vellore, South India. A study compiled by Urmi et al (11) showed that prevalence of CHD in Dhaka city was 19.98/1000. In the study conducted by Chandha et al (12) , the prevalence of CHD in Delhi children was 4.2/1000. Hence the prevalence rate differs from one region to another.

VSD (ventricular septal defect) was the most common acyanotic CHD in our study. In a study by Bharadwaj et al (13) VSD was the most common CHD in north India, and the study in Assam by Begum et al (14) concluded the same. The study by Smitha et al (15) in Mysore as well as by Khalil et al (16) in New Delhi, showed VSD as the most common lesion. In our study, ASD was the second most common lesion. In a study by Shankar et al (7) in central Nepal, ASD was the most common defect although other studies by Khalil et al (16) concluded ASD as the second most common defect. In a study by Suryakant et al (17), the incidence of VSD and ASD in CHD was 25.2% each. Hence, incidence of septal defects (ASD and VSD) differ from one region to another. ASD tends to be missed in children since it may remain asymptomatic until early adulthood. Patent Ductus Arteriosus (PDA) was the least common among acyanotic CHDs in our study. A study conducted by Gupta et al (4) confirmed that PDA was the least common among shunt lesions. Among cyanotic CHDs, Tetralogy of Fallot (TOF) (2.4%) was the most common in our study. In the study by Bharadwaj et al (13) TOF showed a higher prevalence (16.8%). Though it accounts for a low proportion of congenital defects, TOF was the most frequently diagnosed cyanotic CHD even in Western countries (13) Another study by Smitha et al (15), concluded that TOF affected 13% of the cases in study at Mysore.

Prevalence of RHD in school going children varies in different parts of the world and within the same

country depending upon the socioeconomic status (SES). It is very high in underdeveloped countries like Zambia (12.6/1000) and less in developed countries such as the USA (<0.02/1000) as per the study conducted by Stollerman et al (18) The study conducted by Bahadur et al (9) confirmed that the prevalence of RHD in Central Nepal was 8.8/1000 and on echocardiography was 1.2/1000. The reason behind the high prevalence rate of RHD in low SES zones may be due to poor health, poor awareness, improper sanitation, unavailability of health services or undertreated throat infection. (19) In one study conducted by Jose et al (20) in Vellore, in children aged 6-18 years, initial screening of RHD showed a prevalence of 1.63/1000 and was confirmed by echocardiography showing a prevalence of 0.63/1000. This differs from our study where echocardiography prevalence of RHD was 0.2/1000.

In our study, Mitral Regurgitation (MR) was the most common lesion in RHD. A study by Dipanker et al (21) concluded that the prevalence of RHD was 0.9/1000 in the age group 5-16 years and MR being the most common lesion. Involvement of aortic valve as in Aortic regurgitation (AR) was less common. Mitral Valve Prolapse (MVP) was found in only 1.6% of the patients. This is slightly lesser than the study conducted by Periwal et al (22) in school children of Bikaner, which had an MVP prevalence of 12.3/1000.

Conclusion

Therefore, the findings of the present study suggest the need of large scale screening of apparently healthy school going children for CHD and RHD, irrespective of family status and family history.

Funding: None
Conflict of Interest : None

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DOI : 10.7199/ped.oncall.2017.52