Congenital Heart Disease in Local and Migrant Elementary Schoolchildren in Dongguan, China

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The aim of this study was to determine the prevalence and treated status of congenital heart disease (CHD) in elementary schoolchildren and facilitate the long-term planning of health care, resource allocation, and development of targeted primary prevention strategies. From November 2011 to November 2012, 540,574 schoolchildren from 449 elementary schools were screened for CHD by trained doctors in Dongguan City. The schoolchildren who were suspected to have CHD were referred to a pediatric cardiologist and/or an echocardiographist for complete evaluation. Of them, 214,634 (39.7%) were local children and 325,940 (60.3%) were migrant children. The total prevalence of CHD was 2.14‰, and there was a significant difference ($p < 0.05$) of the CHD prevalence between local (1.97‰) and migrant children (2.26‰). The treatment rates of CHD in local children and in migrant children were 63.51% and 47.21%, respectively ($p < 0.01$). The commonest CHD was ventricular septal defect (43.13%), followed by atrial septal defect (25.84%) and patent ductus arteriosus (12.79%). With respect to gender, CHD was equally distributed between men and women. In conclusion, social, economic, and environmental risk factors that affect health of migrant children with CHD call for more attention from health policy makers and researchers in contemporary China. Efforts should be made to increase public health investment, establish health care manage system for children from migrant families, and increase the parents' awareness of preventing the CHD. **(Am J Cardiol 2016;117:461−464)**

Dongguan, one of the largest economic centers in southern China, has attracted 6.5 million migrants, and currently, these migrants account for about 4/5 of the total population of Dongguan. The Dongguan Bureau of Statistics estimates that 80% of migrant children's parents have not completed high school. Most of them live in rented accommodation and work overtime daily or frequently. Less than 50% of the migrant children's parents have employee's insurance or New Cooperative Medical Scheme.[1,2] Despite many health policy advances in supporting rural-urban migrants and their families, China has a long way to go in terms of understanding the health status of this substantial subpopulation, providing them with more accessible health services and promoting health through meaningful initiatives and solutions.[3−6] The purpose of this study was to investigate the prevalence and treated status of congenital heart disease (CHD) in elementary schoolchildren, especially those from rural-to-urban migrant families and to help facilitate the long-term planning of health care, resource allocation, and development of targeted primary prevention strategies.

Methods

This was a cross-sectional survey of Dongguan primary school-aged children conducted from November 2011 to November 2012. This study was approved by the Ethics Committees of the Fifth People's Hospital of Dongguan. Written informed consent was obtained from the parents or guardians of all participants before screening was performed. We aimed to survey all students attending every elementary school in Dongguan City, which is located in southern China; 20 cardiologists and 5 echocardiographists with skillful experience were recruited from the Fifth People's Hospital of Dongguan to carry out this investigation. All of them had completed subspecialty training in cardiology or echocardiography with 5-year clinical experience at least.

Our screening methods have been described previously.[7] Briefly, all the students were given a questionnaire to be completed at home by their parents or guardians. The questionnaire included questions on cardiovascular and valvular disease risk factors and any previous cardiovascular symptoms. All the students underwent a detailed cardiovascular examination performed by a cardiologist as previously described.[7] Children with a definite or possible cardiac

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This work was supported by grant 2011105102001 by the Science and Technology Bureau of Dongguan, Guandong, China and the grant 81470447 by the National Natural Science Foundation of China, Beijing, China.

See page 463 for disclosure information.

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0002-9149/15/$ - see front matter
http://dx.doi.org/10.1016/j.amjcard.2015.10.061

Table 1
Congenital heart disease prevalence in local children and migrant children

Children	Number screened	Number of CHD cases	CHD prevalence per 1000*	95% CI
Local	214634	422	1.97	1.78 to 2.16
Migrant	325940	735	2.26	2.10 to 2.42
Total	540574	1157	2.14	2.02 to 2.26

CHD = congenital heart disease; CI = confidence interval.
* The CHD prevalence of migrant children compared with local children: chi-square = 5.06, p <0.05.

Table 2
Treatment rate of congenital heart disease in local children and migrant children

Children	CHD cases	Treated cases	Treatment rate (%)*	95% CI
Local	422	268	63.51	58.92 to 68.10
Migrant	735	347	47.21	43.60 to 50.82
Total	1157	615	53.15	50.27 to 56.03

CHD = congenital heart disease; CI = confidence interval.
* The treatment rate of CHD of local children compared with migrant children: chi-square = 28.59, p <0.01.

Table 3
Congenital heart disease and its distribution according to gender

Congenital heart disease	Female (n=264091)	Male (n=276483)	Total (n=540574)
Ventricular septal defect	233	266	499
Atrial septal defect	145	154	299
Patent ductus arteriosus	69	79	148
Pulmonary valve stenosis	25	33	58
Tetralogy of Fallot	14	18	32
Others	55	66	121
Total	541	616	1157

murmur were re-examined by a cardiologist who performed an echocardiogram. A GE Vivid i portable ultrasound machine (General Electric, Fairfield, Connecticut) was used, with either a 3.5 or 5.0 MHz phased array transducer. In children who needed, a catheter angiography was performed.

The characteristics of the murmurs were classified at the point of maximal intensity. Four principal areas (tricuspid area, pulmonary area, mitral area, and aortic area) were auscultated with both the bell and diaphragm of the stethoscope with the children in the supine, sitting, and standing positions. However, we are not constrained by these areas, we also listened between and beyond these 4 areas. Loudness of the cardiac murmurs was graded from 1 to 6 according to Levine.[8] Timings of murmurs were classified as systolic murmurs, diastolic murmurs, and continuous murmurs. The systolic murmurs may be classified as holosystolic murmurs, ejection murmurs, early systolic murmurs, and mid-to-late systolic murmurs. Changes with the Valsalva maneuver and respiration were recorded.

Treatment was defined as the techniques including surgical and interventional, whereas the treatment rate was defined as (children who have been treated/all the screened children) × 100%. Except where otherwise stated, data are presented as percentages. The statistical analysis was performed using SPSS 17.0 (SPSS Inc., Armonk, New York) for Windows. Comparison between groups was performed using the chi-square test with a significance level of p <0.05.

Results

Our study included 540,574 of 559,022 schoolchildren (96.70%) enrolled in 449 different elementary schools over a 1-year period in Dongguan City, which is located in southern China. In total, 264,091 (48.85%) were women and 276,483 (51.15%) were men with the age range between 6 and 13 years (median age 9 years); 214,634 (39.7%) schoolchildren are local and 325,940 (60.3%) are migrant.

Of the 540,574 schoolchildren who underwent cardiac examination, 14,325 (2.65%) were found to have a murmur, which was consistent with our previous result.[7] All the schoolchildren (14,828) who were suspected to have CHD according to the questionnaire or detailed cardiovascular examination underwent echocardiography, which confirmed a CHD in 1,157 (2.14‰).

There was significant difference (p <0.05) of the CHD prevalence between local children (1.97‰) and migrant children (2.26‰) (see Table 1). The treatment rate of CHD in local children and migrant children were 63.51% and 47.21%, respectively (p <0.01) (see Table 2). The commonest CHD was ventricular septal defect (43.13%), followed by atrial septal defect (25.84%) and patent ductus arteriosus (12.79%). With respect to gender, CHD was equally distributed between men and women (see Table 3). There were 5 migrant schoolchildren who had cyanotic CHD (3 schoolchildren with large ventricular septal defect and 2 schoolchildren with large atrial septal defect). Cardiac catheterization was performed to confirm that they were too late to receive treatment because of irreversible pulmonary vascular disease with severe pulmonary hypertension.

Discussion

This is the largest epidemiologic survey of the prevalence and treatment status of CHD in schoolchildren in China. How best to serve the needs of such children is a challenge. The overall burden of CHD in schoolchildren, especially those from rural-to-urban migrant families, is estimated to be extremely large; however, there is no reliable data from China. The number of rural-to-urban migrant children has been increasing rapidly in China over recent decades. The health status of migrant children is an increasingly recognized public health concern in China, but there is a scarcity of data on public health service utilization among migrant children in comparison with local children. We focus on this substantial subpopulation that have been largely overlooked and should be remedied. The data from our study can be used for planning health care programs to improve current services, leading to a reduction in morbidity and mortality from CHD and improve the reasonable allocation of medical sources.