brief report

Symptomatic congenital heart disease in the Saudi Children and Adolescents Project

Mansour Alqurashi,* Mohammad El Mouzan,† Abdullah Al Herbish,† Abdullaha Al Salloum,† Ahmad Al Omer‡

From the *Department of Pediatrics, Al-Yamamah Hospital, Riyadh, Saudi Arabia, †Department of Pediatrics,The College of Medicine, King Saud University, Saudi Arabia, and ‡The Children's Hospital, Riyadh Medical Complex, Saudi Arabia

Correspondence and reprint requests: Mansour Al Qurashi, FRCP · Al-Yamamah Hospital · PO Box 60989 · Riyadh 11555 · Saudi Arabia · T: +966-1-491-4444 Ext: 1147/4030 · F:+966-1-208-3060 · m2_qurashi@hotmail.com · Accepted for publication May 2007

Ann Saudi Med 2007; 27(6): 442-444

The word 'prevalence' of congenital heart disease (CHD) usually means the estimated population of people with CHD at any given time. The term 'incidence' of CHD means the annual diagnosis rate or the number of new cases of CHD diagnosed each year. Most of the recent studies in the Gulf region measured the incidence of CHD in children.[1,2] There are various local studies on the pattern of CHD,[3,4] and these studies are descriptive analyses of a selected sample. Our study is the first community-based national prevalence study of symptomatic CHD in children and adolescents in Saudi Arabia, and includes CHD presenting with symptoms or clinical signs. Excluded are asymptomatic patent ductus arteriosus in the first 3 months of life; simple bicuspid aortic valves; isolated peripheral pulmonary artery stenosis with no clinical significance; and minor atrial shunts across defects measuring less than 5 mm.

METHODS

Our study was part of the Health Profile of the Saudi Children and Adolescents Project. The sample was 45 682 children and adolescents of ages from birth to 19 years selected by multistage probability random sampling of Saudi households from a stratified listing based on the population census of the 13 regions of the country including major cities, small towns and villages. A house-to-house visit by the field team, which included a physician, was made to all the households in the sample. A questionnaire that included age, gender, medical history and physical examination was completed. The results of the interview and clinical examination allowed classification of the children into one of the following categories:

a) Children with a known diagnosis of CHD, confirmed with medical reports and echocardiography results from the concerned hospitals. These children were classified according to diagnosis into 4 groups (Table 1).

b) Children with a known diagnosis of CHD but without supporting medical reports from concerned hospitals. The diagnosis was based on what the families were told about echocardiography results by treating doctors. These children were labeled as unspecified congenital heart disease (Table 1).

c) Children with a history and clinical signs suggesting cardiac disease that were not diagnosed before, who were referred to hospitals. The hospital diagnosis was based on clinical examination and echocardiography. These children were included in the study after the diagnosis was provided by local hospitals and classified as category (A) into 4 groups.

Table 1. Prevalence of congenital heart diseases in Saudi children.

Diseases	Number of cases			Prevalence per 10 000
	Males	Females	Total (%)	
Ventricular septal defect	18	26	44 (46)	10
Atrial septal defect	2	6	8 (8.5)	2
Other non-cyanotic CHD*	3	4	7 (7.5)	2
Cyanotic CHD†	5	5	10 (11)	2
Unspecified CHD	14	12	26 (27)	6
Total CHD	42	53	95 (100)	21

*Patent ductus arteriosus 1, coarctation of the aorta 1, aortic stenosis 2, pulmonary stenosis 2 and Ebstein's anomaly 1. †Tetralogy of Fallot 3, transposition of great arteries 2, complex cyanotic heart disease 5.

RESULTS

During the period 2004-2005, of a total of 45 682 children and adolescents, 95 had CHD for a prevalence of 21 per 10 000. The types of diseases are shown in Table 1. Ventricular septal defect (VSD) was the commonest diagnosis, occurring in 44 of the 95 (46.3%) children with CHD with the highest prevalence of 10 per 10 000.

Table 2. Prevalence of congenital heart disease in children and adolescents worldwide.

Study description	Prevalence per 10 000 population	Children Number	Year	Age	Place Of Study
Community-based study	21	45 682	2005	Birth - 18 yrs	Saudi Arabia (present study)
Population-based study	37	4390	1993	0-1year	USA: Baltimore-Washington Infant Study[7]
Population-based study	47	330 017	2003	Live and still births	Italy: Emilia-Romagna Registry, Calzolari E[6]
Population-based study	61	815 569	1999	0-15 years	Czech Republic: Bohemia Survival Study, Samanek M[5]
School-based study	10	1788	2000	5-15 years	Egypt: Alexandria, Zaki[9]
School-based study	20	13 322	1997	5-15 years	Sudan: Sahafa Town, Khalil[10]
School-based study	13	9420	2003	5-18 years	Nepal: Kathmandu, Bahadur[8]
Community-based study	42	11 833	2001	0-15 years	India: New Delhi, Chadha SL[18]
Community-based study	50	48 638	2005	3-18 years	China: Yunnan Province, Jiang[19]

The next most common group was unspecified CHD in 26 of 95 (27.4%) for a prevalence of 6 per 10 000. The remainder of the cases, such as cyanotic CHD, atrial septal defects (ASD), and other non-cyanotic CHD occurred much less commonly with a prevalence of about 2 per 10 000 each.

The distribution of CHD according to sex of patients showed a slight predominance in females, with 53 girls and 42 boys, for a female to male ratio of 1.3:1 (Table 1). VSD was slightly more common in females with a female to male ratio of 1.4:1. ASD was seen more in girls with a female to male ratio of 3:1. Cyanotic CHD was equal in both sexes.

The regional distribution of CHD showed that the Central Region had the highest prevalence of 27 per 10 000, followed by the Northern and the Eastern Regions, with a prevalence of 25 per 10 000 each and the Southwestern Region prevalence of 21 per 10 000. The prevalence was less common in the northwestern region, with 10 children only (prevalence 9 per 10 000). To assess the prevalence of CHD more accurately, the results were related to sample size in each region: North Western Region (Makkah and Madinah regions)=10 711, Central Region (Riyadh and Qassim regions)=11 194, Eastern Region (Damam region)=4420, Northern Region (Jouf, Northern Border, Hail and Tabuk regions)=8 959, and the Southwestern Region (Assir, Gizan, Najran and Al Baha regions)=10 398.

DISCUSSION

The prevalence of CHD in Saudi children is compared with other studies in Table 2. The prevalence in our study was lower than in hospital-based studies due to variations in methods and age differences,[5-7] whereas the prevalence was higher than in school-based studies due to age differences.[8-10] The prevalence of CHD is related to the relative frequency of VSD,[11] the most common type of CHD.[12-13] The majority of VSD are closed spontaneously in early childhood,[8,9,14] so the prevalence of CHD in this community-based study (which includes a wide age range) was expected to be lower than in hospital-based studies, which are done usually in infants or newborns.[5-7,13] The prevalence of CHD also depends on the diagnosis of minor cardiac defects such as small atrial septal defect, small patent ductus arteriosus, and mild pulmonary valve stenosis.[11,15-17] These minor lesions were not diagnosed in this community study due to subtle clinical signs. Most newborns with severe types of complex cardiac lesions die before 1 year of age, which also reduces the prevalence of CHD in older children.[5,7,9,14] These factors explain the low prevalence of CHD in this study in comparison with hospital-based studies.[6,7]

Our study showed a low prevalence of CHD compared with similar community-based studies in other countries such as China and India, which is either due to actual low prevalence in Saudi Arabia or under-re-

porting of cases during the survey (Table 2). The prevalence was 42 per 10 000 in Indian children younger than 15 years[18] and 50 per 10 000 in Chinese children (aged 3-18 year),[19] which are higher than the prevalence of 21 per 10000 in Saudi Arabia.

According to the KFSH study,[20] the southwestern egion of Saudi Arabia near the border with Yemen and the northern part of the Eastern Region appear to exhibit a higher burden of CHD. Our study demonstrates a Central Region dominance followed by the Eastern Region and the Northern Region, with the last being the Southwestern Region. The KFSH study was hospital-based using data on admitted patients, while our study was community based, which explains the difference between the two studies.

A limitation of our study is that the group of children with unspecified CHD is a large group (27% of total children with CHD). These children were diagnosed as having CHD, but without supporting medical reports from concerned hospitals and thus our diagnosis is based on history and clinical examination only. These children were kept in a separate group to avoid bias and included in the total prevalence of CHD in the Kingdom, but their significance in the prevalence of various types of CHD cannot be ignored.

This nationwide community-based study for CHD has revealed a relatively low frequency of CHD, the commonest being VSD, with the frequency lower than reported from other populations. We still need supportive community-based studies to measure the prevalence of CHD in different regions of the country. In addition, we need a multicentric study on the epidemiology of CHD to assess the pattern of CHD in Saudi Arabia, and the survival and outcome of affected babies.

Acknowledgment:

This study was supported by a research grant from King Abdulaziz City for Science and Technology in Riyadh. (No AR-20-63).

REFERENCES

1. Subramanyan R, Joy J, Venugopalan P, Sapru A, al Khusaiby SM. Incidence and spectrum of congenital heart disease in Oman. Ann Trop Pediatric. 2000 Dec; 20(4): 337-41.
2. Robida A, Folger GM, Hajar HA. Incidence of congenital heart disease in Qatari children.Int J Cardiol. 1997 Jun 27; 60(1): 19-22.
3. Alabdulgader AA. Congenital heart disease in 740 subjects: epidemiological aspects. Ann Trop Pediatric. 2001 Jun; 21(2): 111-8.
4. Fuad Abbag, FRCPC. Pattern of congenital heart disease in the Southwestern region of Saudi Arabia. Ann Saudi Med 1998; 18(5): 393-395.
5. Samanek M, Voriskova M. Congenital heart disease among 815,569 children born between 1980 and 1990 and their 15-year survival: a prospective Bohemia survival study. Pediatr Cardiol. 1999 Nov; 20(6): 411-417.
6. E. Calzolari, G. Garani, G. Cocchi, C. Magnani, et al. Congenital heart defects: 15 years of experience of Emilia-Romagna registry (Italy). Eur J Epidemiol 2003; 18(8): 773-80.
7. Kuehl K, Loffredo CA, Ferencz C.Failure to diagnose congenital heart disease in infancy. Pediatrics, APR 1999; 103:743-7.
8. Bahadur KC, Sharma D, Shrestha MP, Gurung S, Rajbhandari S, Malla R, et al. Prevalence of Rheumatic and Congenital heart disease in Schoolchildren of Kathmandu Valley in Nepal. Indian Heart J2003; 55:615-618.
9. Bassili A, Mokhtar SA, Dabous NI, Zaher SR, Mokhtar MM, Zaki A.Congenital heart disease among school children in Alexandria, Egypt: an overview on prevalence and relative frequencies. J Trop Pediatr. 2000 Dec; 46(6): 357-62.
10. Siddiq I Khalil, Khalid Gharieb, Mohammed El Haj, Mohammed Khalil and Suzan Hakiem Prevalence of congenital heart disease among schoolchildren of Sahafa Town, Sudan Eastern Mediterranean Health J 1997; v 3 (1): 24-28.
11. Hoffmann JIE, Kaplan S .The incidence of congenital heart disease. J Am Coll Cardiol. 2002 Jun 19; 39(12): 1890-900.
12. Miyague NI, Cardoso SM, Meyer F, Araujo FH, Rozkowisk I, Toschi AP. Epidemiological study of congenital heart defects in children and adolescents. Analysis of 4,538 cases Arq Bras Cardiol. 2003 Mar; 80(3): 269-78.
13. Bosi G, Scorrano M, Tosato G, Forini E, Chakrokh R.The Italian Multicentric Study on Epidemiology of congenital heart disease: first step of the analysis. Cardiol Young 1999 May; 9(3): 291-299.
14. Hoffman JI, Kaplan S, Liberthson R. Prevalence of congenital heart disease. AM HEART J MAR 2004; 147:425-39.
15. Bosi G, Garani GP, Scorrano M, Calzolari E. Temporal variability in birth prevalence of congenital heart defects as recorded by a general birth defects registry. J Pediatr 2003; 142:690-8.
16. Wren C, Richmond S, Donaldson L. Temporal variability in birth prevalence of cardiovascular malformations. Heart 2000; 83:414-9.
17. Magnani C, Bussolati G, Gambini L, Garani GP, Bosi G,Cocchi G,et al.Congenital cardiopathy in a databased population.Acta Biomed Ateneo Parmense. 2000; 71 Suppl 1:483-6.
18. Singh N, Shukla DK. Chadha SL. Epidemiological study of congenital heart disease. Indian J Pediatr. 2001 Jun; 68(6): 507-10.
19. Jiang LH. Epidemiological investigation on congenital heart disease in several regions of Yunnan province. Zhonghua Liu Xing Bing Xue Za Zhi. 2005 Mar; 26(3): 182-6.
20. Greer W, Sandridge AL, Al-Menieir M,Al Rowais A Geographical distribution of congenital heart defects in Saudi Arabia. Ann Saudi Med. 2005 Jan-Feb;25(1):63-9.