

# The epidemiological aspects of congenital heart disease in central and southern district of Iran

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## Abstract

**Background:** Congenital heart disease (CHD) is a major health problem and its prevalence is different around the world. The aim of study was determination of the epidemiological aspects of CHD in central and southern district of Iran.

**Materials and Methods:** In this descriptive and analytical study, 3714 medical records were evaluated from March 21, 2001 to December 18, 2011. Medical records of inpatients from angiography and outpatients in the Heart Clinic of Afshar hospital (a referral hospital in center and south of Iran) were the source of information. Types of CHD and demographic data including age, sex and residential location are collected. The data were analyzed by SPSS (version 17) software. Chi-square and Fisher's exact tests were used to compare variables between groups.

**Results:** At the study, the mean age of the patients at diagnosis time was  $8.8 \pm 11.6$  year (at the range of one day to 76 years with median of 4 years). The percentage of females and males was 54.2 (n: 2014) and 43.8 (n: 1627), respectively. The chi-square test showed that there was significant difference in frequency of CHDs between females and males ( $P$  value  $< 0.0001$ ). Ventricular septal defect (VSD) was found to be the most frequent of CHDs (27%). Patent ductus arteriosus (PDA) (16.8%), atrial septal defect (ASD) (15.8%), pulmonary stenosis (PS) (11%) and Tetralogy of Fallot (TOF) (8.9%) were more prevalent in CHDs after VSD.

**Conclusions:** The frequency of CHDs in female was more than male and VSD, PDA, ASD, PS, and TOF were most common in CHDs, respectively.

**Key Words:** Congenital heart disease, epidemiological aspect, frequency

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## INTRODUCTION

Congenital heart disease (CHD) is one of the most common congenital diseases in newborns and cause of death in 1% of life births.<sup>[1]</sup> CHD is a socio-economic problem, because the cost of medical treatments for parents and governments is high. Prevalence of CHD has been reported to be different around the world. An epidemiological study has shown that the prevalence of CHD is 4.6 to 12.2 per 1000 live births.<sup>[2]</sup> Another study has shown that the range of CHD is 7.93 to 17.51 per 1000 live

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births in Iran.<sup>[3]</sup> The prevalence of CHDs in Egypt (2000) and Central Australia (2004) was 1.01% and 17.5%, respectively.<sup>[4,5]</sup> However, pattern of CHDs is different in various geographic locations.<sup>[4]</sup> The majority (85% of all) of CHDs are ventricular septal defect (VSD), atrial septal defect (ASD), Tetralogy of Fallot (TOF), patent ductus arteriosus (PDA), pulmonary stenosis (PS), aortic stenosis (AS), coarctation of aorta (COA) and atrioventricular septal defect (AVSD) which accounts for CHDs. The minority (15%) of CHDs are persistent truncus arteriosus (PTA), tricuspid atresia (TA), total anomalous pulmonary venous connection (TAPVC), hypoplastic left heart syndrome (HLHS), double outlet right ventricle (DORV), single ventricle (SV), Ebstein anomaly (EA) and dextrocardia.<sup>[6]</sup> In Iran few studies on prevalence of CHDs were done, therefore we are going to report the epidemiological aspects of CHDs in central and southern district of Iran from March 21, 2001 to December 18, 2011.

## MATERIALS AND METHODS

In this descriptive and analytical study, 3714 medical records were evaluated from March 21, 2001 to December 18, 2011. The source of data was medical records of admitted inpatients at angiography ward and outpatients in the Heart Clinic of Afshar Hospital (a referral hospital in center and south of Iran for CHDs management). This hospital admit majority of children with CHDs from Province of Yazd and patients referred from other hospitals in southern district of Iran. Demographic data including age, sex, residential location and type of CHDs are collected. Residential location of the patient was divided into two groups, central district was the province of Yazd and southern provinces included Fars, Kerman, Hormozgan, Sistan and Baluchistan. The different types of CHDs considered for the study were VSD, ASD, PDA, PS, TOF, AS, COA, SV, D-transposition of great artery (D-TGA), HLHS, truncus arteriosus, TAPVC, DORV, TA, hypoplastic left ventricle, hypoplastic right ventricle, pulmonary atresia with ventricular septal defect (PA-VSD), complex heart problems, EA and AVSD. The data were analyzed by SPSS (version 17) software. Chi-square test and Fisher's exact test were used to compare sex and age between groups.

## RESULTS

In this investigation 3714 patients and their medical records were included. The mean age of the patients at diagnosis time was  $8.8 \pm 11.6$  year (at the range of 1 day to 76 year). Table 1 showed that the mean age of the patients according to the types of CHDs.

Others: SV, HLHS, truncus arteriosus, total anomalous pulmonary venous return (TAPVR), DORV, TA, hypoplastic left ventricle, hypoplastic right ventricle, PA-VSD, complex heart problems, EA, single atrium and dextrocardia.

The percentage of females and males was 54.2 (n: 2014) and 43.8 (n: 1627), respectively. The sex of 2% (n: 73) of patients in the medical records was unknown [Table 1].

VSD was found the most frequent of CHDs. Table 2 depicted the others.

CHDs was more frequent in female and the chi-square test showed that there was significant difference in CHDs between males and females ( $P$  value < 0.0001).

**Table 1: Distribution of mean age in patients with congenital heart disease**

Congenital heart disease	Mean age (year) with std. deviation
Ventricular septal defect	5.07±7.46
Pulmonary stenosis	7.33±9.22
Patent ductus arteriosus	5.73±8.05
Atrial septal defect	19.78±16.97
Tetralogy of Fallot	7.11±8.10
Aortic stenosis	10.13±8.44
Coarctation of aorta	10.41±9.77
D-transposition of great artery	4.62±8.76
Others	7.97±9.59
Total	8.80±11.60

**Table 2: Frequency and percentage of congenital heart disease**

Congenital heart disease	Frequency	Percent (%)
Ventricular septal defect	1002	27.0
Pulmonary stenosis	409	11.0
Patent ductus arteriosus	625	16.8
Atrial septal defect	585	15.8
Tetralogy of fallot	329	8.9
Aortic stenosis	102	2.7
Coarctation of aorta	173	4.7
D-transposition of great artery	61	1.6
Single ventricle	12	.3
Hypoplastic left heart syndrome	1	.0
Truncus arteriosus	5	.1
Total anomalous pulmonary venous return	5	.1
Double outlet right ventricle	7	.2
Tricuspid atresia	10	.3
Hypoplastic left ventricle	1	.0
hypoplastic right ventricle	5	.1
Pulmonary atresia with ventricular septal defect	26	.7
complex heart problems	1	.0
Ebstein anomaly	8	.2
Atrioventricular septal defect	34	.9
Other	113	3.1
Total	3514	94.6
Unknown	200	5.4
Total	3714	100.0

Also, the study disclosed that there were significant differences in PDA ( $P$  value  $< 0.0001$ ), ASD ( $P$  value  $< 0.0001$ ), TOF ( $P$  value  $< 0.001$ ), AS ( $P$  value  $< 0.004$ ), COA ( $P$  value  $< 0.0001$ ) and D-TGA ( $P$  value  $< 0.0001$ ) between males and females [Table 3].

VSD, PS, PDA, ASD, TOF, AS, COA, D-TGA.

Others: SV, HLHS, truncus arteriosus, TAPVC, DORV, TA, hypoplastic left ventricle, hypoplastic right ventricle, PA-VSD, complex heart problems, EA, single atrium and dextrocardia.

## DISCUSSION

Our study showed that VSD was the most frequent (27%) of CHDs. Smitha *et al.* reported that VSD had 31.82% (in the year 2000), 38.19% (2001), 38.06% (2002), 22.88% (2003) and 26.37% (2004) of prevalence among the all of CHDs in Mysore hospitals. Also, the frequency of VSD in Saudi Arabia (2001) was 39.5%, New Dehli (2001) 46%, Oman<sup>[7]</sup> and Egypt (2000) 24.9% and 35.3% respectively, Japan (1990) 60%, Qatar (1997) 40.65 and USA (1990) 32.1% (6). Other studies showed these similarities.<sup>[8-16]</sup> In the study the mean age of VSD was  $5.07 \pm 7.46$ . About 85% to 90% of VSDs close spontaneously by 1 year of age. So, the incidence of VSDs at first year of age is higher than other stages of life.<sup>[17-19]</sup> The other more frequent of CHDs in the study were PDA (16.8%), ASD (15.8%), PS (11%) and TOF (8.9%). Also, other studies reported that ASD, PDA, PS and TOF are more frequent after VSD.<sup>[2,9,13,16]</sup> PDA is another common CHD, incidence of which is higher in preterm than term infants. So, at the period of time that we have large numbers of preterm, the incidence of PDA will inflated.<sup>[20]</sup> The third common CHD in the study was ASD 15.8%. Because ASDs are usually asymptomatic, the incidence of these CHDs at the birth time is lower than adult life. ASD in which infants have a patent foramen ovale with a tiny left-to-right shunt will increase the incidence of it.<sup>[21]</sup> The mean age of the patients at diagnosis time was  $8.8 \pm 11.6$  years (the range was one day to 76 years). In Sani's study the range of CHDs was 9 days to 35 years.<sup>[16]</sup> In Marelli's study and *et al.* demonstrated that in 1985 and 2000, the mean age of all patients with severe CHDs was

11 and 17 years, respectively. In 2000, the mean age of patients with CHDs was 40 years.<sup>[22]</sup> However, the range and the mean age of CHDs will vary according to the time of diagnosis in different studies.<sup>[16,22]</sup> The percentage of females and males was 54.2 (n: 2014) and 43.8 (n: 1627) respectively and we found that there was significant difference in prevalence of CHDs between males and females ( $P$  value  $< 0.0001$ ). Also, Begic *et al.* in their study showed that 54.3% of CHDs were boys and 45.7% were girls.<sup>[2]</sup> Marelli *et al.* reported that in 2000, 57% of adult with CHDs were female and there was significantly different in prevalence of all CHDs in adults between females and males (4.55 per 1000 females versus 3.61 per 1000 males;  $P$  value  $< 0.0001$ ). Also, in population of children with CHDs 52% of them were females.<sup>[22]</sup> Other studies showed that the prevalence of CHDs in female is more than male.<sup>[8,13]</sup> But, Nikyar *et al.* recorded that the risk of CHDs in males is (1.35 times) more than in females ( $P$  value  $> 0.05$ ) in northern district of Iran.<sup>[1]</sup> In the study the percentage of females with VSD, PDA ( $P$  value  $< 0.0001$ ), ASD ( $P$  value  $< 0.0001$ ) and PS was higher than females. Also, another research showed that ASD, VSD, PDA and AVCD in females were higher than males. Research data in 1985 were similar with data in 2000.<sup>[22]</sup> In our study we found that the number of male patients with COA was higher than females and there was significant difference in COA ( $P$  value  $< 0.0001$ ) between male and female. In 2000, Marelli *et al.* also disclosed that transposition complexes and coarctation were more common in male adults (22). However, types of CHDs are different around the world and some researchers have reported different data for prevalence of CHDs.

## SUMMARY

The study findings indicate that the frequency of CHDs in central and southern district of Iran is a major health problem. CHDs were more common in females than males at all. In the details the frequency of females other than males was more in VSD, PS, PDA and ASD. But, the frequency of males other than females was more in TOF, AS, COA and D-TGA. VSD was the most frequent of CHDs.

Also, PDA, ASD, PS and TOF were frequent after VSD.

**Table 3: Frequency of congenital heart diseases based on sex**

Congenital heart disease	Total		Others		D-TGA		COA		AS		TOF		ASD		PDA		PS		VSD		
	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	
Sex																					
Female	527	53.4	223	55.2	403	65.6	378	65.4	152	46.9	42	42	67	39.2	17	27.9	117	52	1926	55.6	
Male	460	46.6	181	44.8	211	34.4	200	34.6	172	53.1	58	58	104	60.8	44	72.1	108	48	1538	44.4	
Total	987	100	404	100	614	100	578	100	578	100	100	100	171	100	61	100	225	100	3464	100	
P value	0.052		0.44		<0.0001		<0.0001		<0.001		0.004		<0.0001		<0.0001		0.16		<0.0001		

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