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Research

Pattern and Frequency of Congenital Heart Disease in Children in Afghanistan

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ABSTRACT

Background: Congenital heart disease is frequent congenital anomaly and is the most significant cause of childhood morbidity and mortality. This study reports the pattern, frequency, age, and gender distribution of congenital heart disease in patients that were examined at the department for congenital heart disease (CHD) of International Red Crescent (IRC) directorate in Kabul.

Methods: This retrospective cross-sectional study based on purposive sampling was conducted in CHD department of IRC Kabul, between 2016 and 2020. 7020 patients younger than 18 years with a confirmed diagnosis based on echocardiography were included. For the comparison of categorical variables Pearson chi-square test and Fisher exact test were used and P value < 0.05 was considered significant. The statistical analysis was performed in SPSS (version 22).

Results: Out of 7020 patients with a congenital heart malformation 3727 (53.1%) were male and 3293 (46.9%) were female (ratio 1.3:1). The majority of these cases were diagnosed in under 5 year of age (58.7%). Out of the whole cohort, 5870 (83.6%) patients had acyanotic while 1150 (16.4%) patients had cyanotic cardiac disease. Ventricular septal defect (VSD), Patent ductus arteriosus (PDA) and atrial septal defect (ASD) were the most common acyanotic congenital heart disease (34.0%, 28.7% and 25.3% respectively). Tetralogy of Fallot (17.7%) was the most common cyanotic congenital heart defect.

Conclusion: CHD is the most common congenital anomaly; it accounts for nearly one third of all inborn malformations. Ventricular septal defect and Tetralogy of Fallot are the most common acyanotic, respectively cyanotic congenital heart diseases. In Afghanistan there is still a lack of nationwide database registry to give a mostly real pattern of congenital heart diseases, including the type, the gender distribution and of course the outcome with and without treatment. Such informations would be helpful for the planning of humanitary missions for helping the development of pediatric cardiovascular medicine and surgery.

Keywords: *Congenital heart disease; Cyanotic and acyanotic heart disease; ventricular septal defect; Patent ductus arteriosus; Tetralogy of Fallot.*

INTRODUCTION

Congenital heart disease describes a gross structural abnormality of the heart or intrathoracic great vessels, that is present at birth even if it is diagnosed later in life.[1] The estimated prevalence of CHD is 8-12/1000 live birth.[2] Congenital heart disease is the most common inborn lesion which represents up to 25% of all anomalies.[3] In developing countries burden of CHD continues to increase due to demographic evolution as well as increment of etiological factors for such defects including infection and older maternal age. On the other hand, better diagnosis and treatment have improved survival and therefore the number of CHD patients that reach adulthood.[4,5] Untreated CHD is considered as a leading cause of the childhood mortality.[6] In developing countries mortality is usually superior to that observed elsewhere in the world and one of the main reasons is that a substantial proportion of patients may not get access to cardiac services before they die.[7-9]

Congenital heart defects may happen as isolated lesions or

may be associated with other defects or syndromes.[10,11] The presentation of congenital heart disease in children may significantly differ from case to case but also from malformation to malformation: some may remain asymptomatic and are diagnosed incidentally during examination for other illness while other may present with symptoms or late complications.

In developed countries early detection and appropriate treatment have significantly improved the outcome of such patients in term of decreased rates of death before treatment as well as decreased perioperative mortality (now close to 1-2%) but also in terms of improved long-term survival; this means that the majority of these children nowadays reach adulthood.[12]

In contrast, in case of inappropriate treatment one of three children will at least not survive the neonatal period, this makes unrepaired congenital heart defect the most significant cause of CHD related complications and death.[13]

Unfortunately, it is actually almost impossible to obtain accurate figures of prevalence and spectrum of CHD in developing countries like Afghanistan, because most deliveries still occur at home and there is not any neonatal screening program even in hospitals. The aim of this study was to collect data of patients suffering from CHD and that presented at a single center (department of IRC, Kabul Afghanistan), which is the biggest referral center for CHD in the country to ascertain pattern and frequency of CHD.

METHODS

This is a retrospective cross-sectional study conducted at the department of CHD of International Red Crescent directorate which is the referral center for congenital heart disease patients from all over the country. A total of 7020 CHD patients aged up to 18 years with a diagnosis of CHD confirmed by echocardiography, were included between 2016 and 2020. Clinical data of CHD patients were collected such as age, sex distribution and types of CHDs. The most common symptoms that led to presentation were cyanosis, dyspnea, loss of appetite, fatigue and limited growth w/wo under-development. Patients with multiple cardiac anomalies or syndromes were also included. Echo studies were performed with Philips HD 15 echo machines, revision 3.0.3 by 4 different cardiologists. The normality of data was verified by Kolmogorov test mean and SD were used for continuous data, while frequencies and percentages were applied for categorical variables. For the comparison of categorical variables Pearson chi-square test and Fisher exact test were used and P value<0.05 was considered significant. The statistical analysis was performed in SPSS (version 22).

RESULTS

Demographic characteristics, type and frequency of the malformations are depicted in Tables 1 and 2. There were 3727 (53%) male and 3293 (47%) were female patients with male to female ratio of 1.3:1. Acyanotic heart defects were more frequent than cyanotic (Figure 1) and present in 5870 (83.6%) patients in which ventricular septal (VSD) defect fol-

Table 1. Patients Demographic Characteristics

Demographic Characteristic		Frequency	Percentage
Sex	Male	3727	53.1%
	Female	26.53±6.65	26.27±5.51
Age Group	Up to 5 years	4120	58.7%
	6-10 years	1704	24.3%
	11-15 years	877	12.5%
	Above 15 years	319	4.5%

Figure I. Relative Percentage of Cyanotic (blue) and Acyanotic (red) CHDs

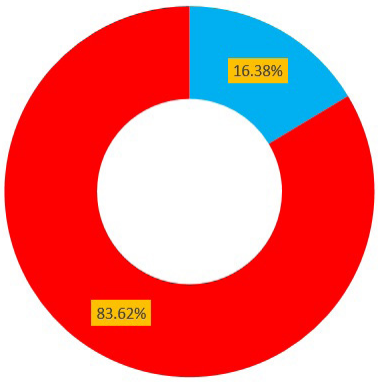


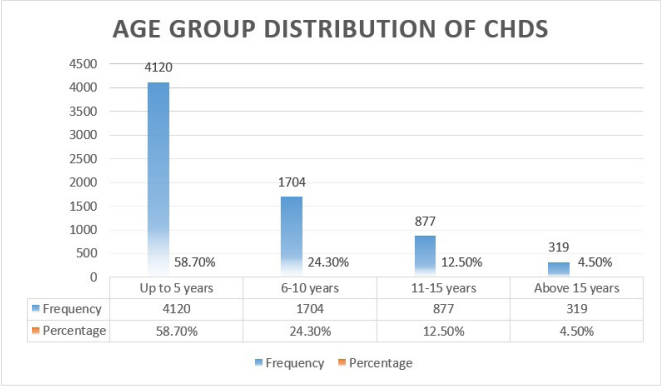
Table 2. Frequency and percentage of different types of CHD across gender

CHD		Total Frequency	Female		Male		*p. Value*
			Count	Percentage	Count	Percentage	
Acyanotic	VSD	2382	1056	44.3	1326	55.7	0.001
	ASD	1657	735	47.5	812	52.5	0.000
	PDA	2014	1157	57.4	857	42.6	.012
	PS	1066	441	41.4	625	58.6	<.001
	AR	215	80	37.2	135	62.8	.290
	AV-canal defect	188	71	37.8	117	62.2	<.001
	Bicuspid AV	151	47	31.1	104	68.9	.541
	AS	133	54	37.8	89	62.2	.002
	RV Hypoplasia	116	45	38.8	71	61.2	.535
	COA	109	47	43.1	62	56.9	.006
	PA	107	44	41.1	63	58.9	.015
	MAPCAs	93	34	36.6	59	63.4	.017
	MR	92	47	51.1	45	48.9	.017
	Dextrocardia	64	30	46.9	34	53.1	<.001
	MS	58	23	47.9	25	52.1	.047
	TR	38	18	47.4	20	52.6	.017
	AVSD	38	22	57.9	16	42.1	.002
	Interrupted IVC	25	12	48.0	13	52.0	.215
	MVP	23	17	73.9	6	26.1	.116
	AV Discordance	21	14	66.7	7	33.3	.017
	Mitral atresia	12	6	50.0	6	50.0	.527
	T Stenosis	2	1	50.0	1	50.0	.055
Cyanotic	TOF	1244	504	40.5	740	59.5	.242
	DORV	234	93	39.7	141	60.3	.501
	TGA	210	83	39.5	127	60.5	.133
	Tricuspid Atresia	90	38	42.2	52	57.8	.027
	TAPVC	88	28	31.8	60	68.2	.549
	Ebstein Anomaly	40	21	52.5	19	47.5	.241

lowed by patent ductus arteriosus (PDA) and atrial septal defect (ASD) were the commonest lesions, 34.0%, 28.7% and 25.3% respectively. Cyanotic heart diseases were diagnosed in 1150 (16.4%) patients in which tetralogy of Fallot (TOF) (17.7%) was the most common cyanotic CHD followed by double outlet right ventricle with pulmonary stenosis (DORV + PS) (3.3%), transposition of the great arteries (TGA) (3.0%), atrio-ventricular canal defect (AVCD) (2.7%) and tricuspid atresia (1.3%). Nearly all CHD had male predominance while PDA, AVSD and Ebstein anomalies were more common in females. In combinations with atrial septal defect, VSD, PS, PDA and TOF were the most prevalent conditions. Majority of CHDs were predominantly (58.7%) diagnosed in patients younger than five years of age. However, dextrocardia was more often seen in children over ten years of age. Mitral stenosis had two peaks of prevalence, one in children under five years and the other in those over ten years.

Congenital aortic stenosis was more prevalent after five years of age (37.8%) than before five years of age (31.5%). Table 2 and Figure 2 summarize the distribution of CHD among different age groups and describe the frequency of the most common CH

Figure 2. Frequency of congenital heart disease in different age groups.



DISCUSSION

CHD is the most common congenital malformation which accounts for up to 25% of all congenital anomalies.[3] As CHDs put significant burden on healthcare system, it also affects quality of life and represents a significant cause of morbidity and mortality. Therefore, early diagnosis and referral to a well-equipped center has positive impact on long term outcome.[3,14] As most cross-sectional CHD related studies are hospital based, the present observation was limited to the patients of CHD department of International Red Crescent directorate Kabul. This makes countrywide estimation from these data and any conclusion about the global incidence of congenital heart disease impossible. The present study revealed that in the majority of CHD, male gender was predominant while PDA, Ebstein anomaly, AVSD, mitral regurgitation, mitral valve prolaps and AV discordance were more prevalent in females. In fact, the male predominance was also observed in studies done in Peshawar by Shahzada Bakhtyar et al,[12] in which male to female ratio was similar 1.3:1. Furthermore in Jordan at department of Pediatrics at Prince Hashim Military Hospital Zarka the ratio was 1.2:1[15] and in Chittagong ratio was 1.7:1.[16] Finally, in a study conducted in Madina, 51.8% of patients were males and 48.2% were females with a male to female ratio of 1.1:1.[17]

Acyanotic CHD accounted for 83.6% of the overall cohort while cyanotic CHD was present in 16.4%. Similar results were reported in a study by Mohammad with 74.6% acyanotic CHD and 25.4% cyanotic,[18] and by Naik with 88.6% acyanotic and 11.4% cyanotic.[19] In the current study VSD was the most common CHD and accounted for 34% of all CHDs which is comparable with the majority of other observations results in comparable geographic regions.[16,19,20]

PDA (28.7%) and ASD (22.1%) were found as second and third most common acyanotic CHD respectively. Again, similar results were reported in several studies of the surrounding countries such as Pakistan, with PDA (23%) and ASD (16.9%) as second and third most common acyanotic CHD as well.[12] In a study conducted in Iran, PDA was 13.1% and ASD was 6.8%, but pulmonary stenosis was superior to them (13.75%).[21]

In the current study, TOF was the most common cyanotic congenital heart defect (17.7%), which is consistent with the finding of the study by Sen who found that TOF was the most common cyanotic CHD (3.2%).[16] In addition, Arshad et al. also reported that TOF was the most common cyanotic type of heart lesion found in 12.2% patients in Multan.[20] Moreover, additional studies conducted in Peshawar, Madina, and Uganda showed even higher TOF prevalence.[12,17,22] We noted that some CHDs were rare in our study population such as total anomalous pulmonary venous connection (TAPVC) (3%) tricuspid stenosis, mitral valve prolaps, mitral atresia, hypoplastic left heart syndrome and bicuspid aortic valve. For some of them, early mortality after delivery or in the early months of life may be the reason for this observation.

Interestingly, we found that 55% of TOF were successfully repaired within our country. In fact, these are complex congenital heart defects and their repair need expert surgeons and well-equipped centers. In contrast, 95% of the Ebstein anomaly cases were referred abroad for their treatment. In addition, majority of the CHD cases were predominantly prevalent in age lower than 5-years (58.7%). However, dextrocardia was more prevalent in children over ten years which may be due to the absence of symptoms. Mitral stenosis showed an interesting prevalence with two peaks, one in children under five years and the other in those over ten years.

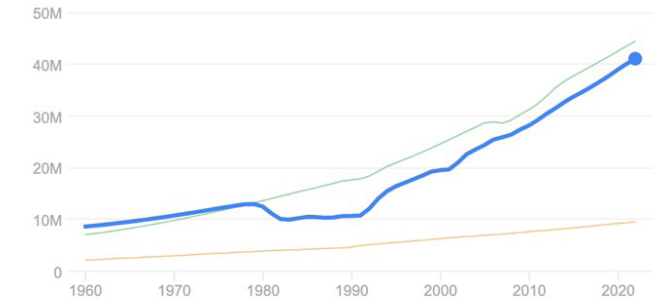
In conclusion, this study provides an overview of patterns of CHD seen at a specialized department of the International Red Crescent directorate. VSD, PDA and ASD are the most common acyanotic malformations while TOF is the most frequent cyanotic lesion. Most of CHD cases were found under five years of age. In developing countries like Afghanistan there is still a lack of exact and nationwide data registry system of CHD patients to catch real prevalence, pattern and frequency of each separate CHD, therefore further comprehensive and nationwide studies are required.

For institutions planning humanitary missions and help campaigns in the field of pediatric cardiology and cardiac surgery, these numbers have to be brought in relationship with more global observations on the development of the population in this country. The overall population of Afghanistan was reported to be 41.2 mio inhabitants in 2022 with a birth rate being around 29 births per 1000 people (Figure 3).

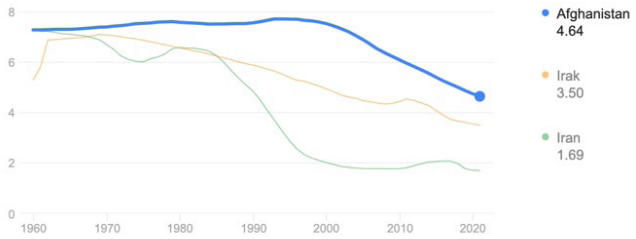
The expenditures on healthcare raised in Afghanistan from $21 per capita in 2004 (which corresponded to 9.8% of the gross domestic product) to $81 per capita in 2021 (16.8% of the GDP). Estimates of current health expenditures include healthcare goods and services consumed during each year. The increase per year has not been constant

but varied between 1 and 9% per year.

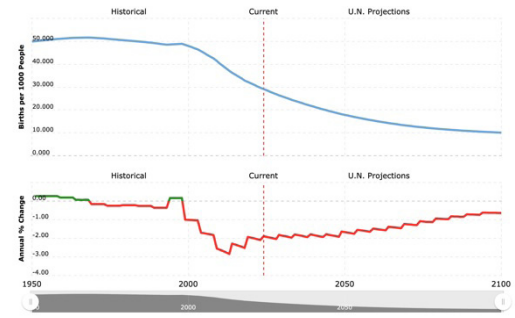
Figure 3. Some demographic and economic details for Afghanistan.



A. Evolution of the population in Afghanistan between 1960 and 2022.



B. The current birthrate in Afghanistan is 29.12 birth per 1000 people. In the last 5 years, a yearly decline between 1.89 and 2.09% was observed. The actual number of births per woman is around 4.6 (significantly higher, compared with Iran and Irak).



C. Historical observation and projection of births per 1000 people with expected annual change in percent until 2100. (statistical analysis from UN available on internet (www.macrotrends.net/global-metrics/countries/AFG/afghanistan)

LIMITATIONS

This is a retrospective cross-sectional study with all limitations of such a design, but it was performed to get a first impression on the needs for CHD treatment in Afghanistan.

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CONFLICTS OF INTEREST

None.

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