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Research Article

Frequency and Diversity of Congenital Heart Disease in Children in Northern Iran

Mohsen Ebrahimi [1]*, Hassan Esmaeili [2]

1. Department of Pediatrics, School of Medicine, Neonatal and Children's Health Research Center, Golestan University of Medical Sciences, Gorgan, Iran.
2. Department of Pediatrics, School of Medicine, Gorgan congenital malformations Research Center, Golestan University of Medical Sciences, Gorgan, Iran.

*Correspondence: Mohsen Ebrahem, Department of Pediatrics, School of Medicine, Gorgan Congenital Malformations Research Center, Golestan University of Medical Sciences, Gorgan, Iran.
Email: m1355ebrahimi@gmail.com

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ABSTRACT

Background and objectives: One of the leading causes of neonatal death is congenital abnormalities. The most prevalent congenital condition in the world is congenital heart disease (CHD), which affects around one-quarter of all live newborns. Given the significance of CHD, this study aimed to evaluate the prevalence of pediatric congenital heart disease and its variants in Gorgan, northern Iran.

Methods: This descriptive cross-sectional survey examined 1,416 patients suspected of having CHD who had been referred to the Taleghani Hospital in Gorgan from 2014 to 2016.

Results: The most common CHDs were ventricular septal defect (44.92%), atrial septal defect (23.73%), and patent ductus arteriosus (18.63%). Males had a higher rate of transposition of great arteries.

Conclusion: The present study expands our knowledge of the regional frequency of CHD types in children with no acquired heart diseases in Gorgan, Iran. Moreover, ventricular septal defect is the most common type of CHD among patients, mainly males.

Keywords: Cardiac anomalies; Ventricular septal defect; Atrial septal defect; Congenital heart disease

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Introduction

Congenital malformations are a major cause of child mortality (1,2). Congenital heart disease (CHD) is the most prevalent congenital anomaly globally, affecting millions of babies per year (3). Previous research on CHD documented congenital abnormalities of 6 to 8 per 1000 live births (4,5), while recent studies reported around 1% of live births. As a result, CHD is the most common congenital disability worldwide (6,7).

Mitchell et al. described CHD as a macroscopic structural abnormality of the heart or large vessels within the chest with severe or possible functional implications (8). While genetic syndromes, teratogenic toxicity, or maternal diabetes may be accounted for around 20% of CHD, there is uncertainty about risk factors for the remaining 80% (9). Various parts of the fetus's heart and other organs are formed from the second to the tenth week of pregnancy. The above factors can cause anatomical disorders in the heart and other organs of the body during this time, disrupting fetal heart function (10).

Valvular heart disease, interventricular septal defect, foramen ovale retention, ductus arteriosus retention, myocardial infarction abnormality, aortic coarctation, Epstein's anomaly, pulmonary artery stenosis, and Tetralogy of Fallot (ToF) are the most common forms of CHD (3,11,12). Since CHD frequently worsens rapidly in infants and children, early detection is critical for a better prognosis following therapy or surgery (8). This study aimed to examine the demographic and clinical characteristics of children with congenital heart anomalies referred to Taleghani Hospital in Gorgan (Iran) between 2014 and 2016.

Materials And Methods

Study sample size and data gathering

From 2014 to 2016, all children referred to Taleghani Hospital in Gorgan were studied in this cross-sectional descriptive study. Census sampling was used. All children were examined by a pediatrician, and those suspected of having CHD were referred to a cardiologist for echocardiography. Children who had an echocardiogram and were found to have congenital heart defects were studied.

Demographic and medical information including gender, gestational age, parent-child relationship, family history of congenital diseases, ethnicity, and any congenital heart defect were retrieved from the patients' records. A VIVID3 echocardiograph (GE, USA) with 3s and 7s probes was used as a measuring device. Furthermore, all children with acquired (non-congenital) heart disease were excluded from the study.

Ethical considerations

Written informed consent was obtained from legally authorized representatives/parents/guardians. All private information of the patients remained confidential during the study. The study received approval from the Ethics Committee of Golestan University of Medical Sciences (approval code: IR.GOUMS.REC.1395.263).

Statistical analysis

The collected data were entered into the SPSS16 software. The Chi-square test was used for comparing the prevalence of CHD types among patients. A p-value less than 0.05 was considered significant

Results

A total of 1,416 patients (572 males and 844 females) were enrolled in the study. At the time of the first echocardiogram, the average age of the subjects was 28.54±13.43 months. Of 1,416 patients, 1272 (89.83%) were at gestational age, while 384 (27.12%) were preterm. Among children at the gestational age, 408 cases (32.1%) had a positive family history of CHD and 864 cases (67.9%) had no family relationship.

The majority of cases (44.7%) were Fars (Figure 1). Transposition of the great

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arteries (TGA) was significantly more prevalent in male children than in female counterparts (p=0.028) (Table 1). There was no significant difference in the prevalence of other CHDs between male and female subjects.

Table 1. Frequency of CHD among children with CHD based on gender

Types of CHD	No. cases (%)	Gender (Male/Female)	p-value
VSD	636 (44.92)	280/356	0.73
ASD	336 (23.73)	144/192	0.65
PDA	264 (18.63)	132/132	0.36
PAS	60 (4.24)	24/36	0.69
TA	60 (4.24)	36/24	0.231
AC	32 (2.26)	24/8	0.084
TGA	28 (1.98)	24/4	0.028
Total	**1416 (100%)**	-	-

VSD: Ventricular septal defect; ASD: Atrial septal defect; PDA: Patent arterial duct; PAS: Pulmonary artery stenosis; TA: Tetralogy of Fallot; AC: Aortic coarctation; TGA: Transposition of the great arteries

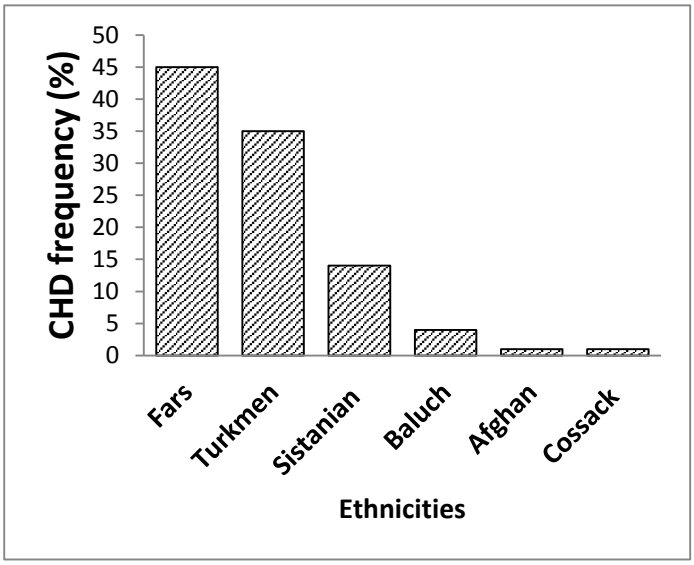

Figure 1. Frequency of racial variables among children with CHD

Discussion

The study aimed to assess the prevalence of CHDs in children referred to the Taleghani Hospital in Gorgan (Iran) and to update previous studies by Nikyar et al. (13,14). According to the present study, VSD, ASD, and PDA were the most common types of CHD. In a previous study by Nikyar et al. (2011), ASD was identified as the most common form of heart disorder (13). Other studies in Iran reported similar results. However, in the present study, newer diagnostic tools were utilized to report the prevalence of CHD types among children. Hematyar et al. reported VSD, ASD, and PDA as the most common CHDs in Tehran (15). However, studies in other parts of Iran reported ASD, ToF, and PDA as the most prevalent types of CHD (16,18). Globally, VSD is the most common CHD, with a prevalence of 22% in Japan (19),

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7.62% in China (20), 6.46% in Nigeria (21), 8.41% in the United States (22), 7.45% in Iceland (23), and 9.33% in Saudi Arabia (24). The research population, method of classification, and selection of different criteria, such as live birth and stillbirth, age of diagnosis, diagnostic procedures, and racial and ethnic differences may all contribute to the difference in the prevalence of CHDs around the world.

In this report, female children made up 55% of the patients. The prevalence of TGA was higher in male patients, but the prevalence of other CHDs did not differ significantly between the sexes. Previous studies have also demonstrated that male children are more likely to develop TGA (14, 17, 25). In Saudi Arabia (24) and Iceland (23), however, the prevalence of TGA disorder was similar in both sexes. Since the study's target population was children between the age of 1 and 2 years, cases that died at a younger age could have been excluded, making the study's findings inconsistent with previous research.

Preterm birth was found in 17.7% of children with CHD, which is consistent with the findings of a previous study (26, 27). The difference between the findings of the present study and previous studies may be related to the increased mortality rate among preterm infants born with cardiovascular abnormalities and the severity of their defects, which resulted in death before accessing medical facilities and undergoing echocardiography.

Several critically ill children died during the early stages of resuscitation and before echocardiography, and some minor abnormalities were not detectable in infancy, which could be a limitation of this study. Furthermore, we could not conduct a more in-depth analysis of the prevalence of CHD risk factors among patients due to the paucity of clinical data from patients of different ethnicities. More extensive studies on larger populations are recommended to clarify the impact of other variables, such as geographical area, culture, and socioeconomic status on CHD incidence.

Conclusion

The present study expands our knowledge of the regional frequency of CHD types in children with no acquired heart diseases in Gorgan, Iran. Moreover, VSD is the most common type of CHD among patients, mainly males, followed by ASD and PDA. The highest rate of CHD was observed among Fars patients, which was due to the unmatched numbers in different ethnic groups.

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Declarations:

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Not applicable.

Ethics approvals and consent to participate

The Ethical committee also approves the study of Golestan University of Medical Sciences, Gorgan, Iran, with the approval code of IR.GOUMS.REC.1395.263.

Conflict of interest

The authors declare that they have no competing interests.

Authors' contributions

ME gathered, analyzed, and interpreted the patient data regarding the CHD in children. ME and HE both prepared and revised the final manuscript.

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