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ORIGINAL ARTICLE

Prevalence of congenital heart disease among newborns with respiratory distress and cyanosis in a tertiary care hospital in Birjand, Iran, during 2016

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Abstract

Introduction: Congenital heart disease (CHD) occurs in about 8 cases per 1,000 live births and is responsible for 30% of all neonatal deaths. The reportedly high prevalence of CHD underscores the necessity of the implementation of local evaluations and screening programs in order to plan for appropriate interventions. Regarding this, the present study was performed to determine the prevalence of CHD and its associated risk factors among the newborns with respiratory distress and cyanosis admitted to Vali-e-Asr Hospital in Birjand, Iran, in 2016.

Methods: This cross-sectional analytical study was conducted on the records of 199 neonates admitted to the Neonatal Unit of Vali-e-Asr Hospital due to respiratory distress and cyanosis in 2016. The data were collected using a predesigned form covering such information as gender, type of delivery, and gestational diabetes. Data analysis was performed in SPSS software (version 22) using the Chi-squared test. P-value less than 5% was considered statistically significant.

Results: Out of the 199 neonates enrolled in this study, 168 (84.4%) cases suffered from CHD. Patent ductus arteriosus (PDA) was the most common anomaly among the neonates (n=85, 50.5%), followed by atrial septal defect (n=41, 24.4%), ventricular septal defect (n=36, 21.4%), transposition of great arteries (n=4, 2.2%), and other complex heart anomalies (e.g., shone complex; n=2, 1.1%), respectively. The results revealed that the presence of CHD, especially PDA, in neonates was associated with their parental interfamily marriage (P=0.024).

Conclusions: The high prevalence and mortality of CHD necessitate the control of premarital and preconception potential risk factors (e.g., inter-family marriage) and preparation for the implementation of effective interventions for the neonates with respiratory distress and cyanosis.

Key words: Congenital, Cyanosis, Heart defects, Newborn, Prevalence, Respiratory distress syndrome

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Introduction

Congenital heart disease (CHD) is the fifth leading cause of neonatal and pediatric mortality that comprises 25% of all congenital malformations. This anomaly is the major cause of cardiovascular disease in children and accounts for 90% of children's deaths (1, 2). The CHD occurs in 5-8 cases per 1,000 live births and has the prevalence rates of 2% and 10-25% in stillbirth cases and aborted fetuses, respectively (3).

There are more than 35 types of known heart defects and several types of impairments that can co-occur in a child. The incidence of most of these conditions in children can greatly reduce the quality of life of their mothers (4). There is a wide range of illness severity among the neonates born with heart defects. Many of these newborns are completely asymptomatic in the neonatal period; accordingly, only 2-3 cases per 1,000 live neonates with CHD are symptomatic. Based on the evidence, 40-50% of these neonates are diagnosed in the first week of their life and 50-60% of them are diagnosed by the end of the first month (5).

The CHD is more common in preterm neonates and very prevalent in the fetuses. Although about half of the congenital heart defects are relatively unimportant, others may lead to disability or death, if not properly managed. Therefore, a thorough examination and paraclinical assessment can be of great importance when facing a neonate with suspected CHD (6).

The available reports are indicative of the high prevalence of CHD in different areas (7-10). Regarding this, it is essential to perform local studies with the aim of achieving enough data to plan for screening, prevention, diagnosis, and treatment of CHD. With this background in mind, the present study was conducted to determine the prevalence of CHD and its associated risk factors among newborns with respiratory distress and cyanosis (as the most important manifestations of CHD) in Vali-e- Asr Hospital, Birjand, Iran, in 2016.

Methods

This cross-sectional analytical study was conducted on neonates admitted to the Neonatal Intensive Care Unit (NICU) of Vali-e-Asr Hospital, Birjand, due to respiratory distress and cyanosis in 2016. This study was confirmed by the Ethics Committee of Birjand University of Medical Sciences, Birjand, under the ethical code of ir.bums.rec.1396.10. The inclusion criterion in this study was the presence of respiratory distress (i.e., tachypnea, grunting, and subcostal, intercostal, and suprasternal retraction) or cyanosis proven by a pulse oximeter with saturation less than 90% in the two extremities 24 h after birth. On the other hand, the exclusion criteria were: 1) parental noncollaboration, 2) instability of vital signs in neonates, and 3) elimination of heart disease in echocardiography.

In this study, the detection of CHD was based on echocardiography. Therefore, the existence of an echocardiography report in the patients' records was also considered an inclusion criterion. Out of 388 patients admitted to the NICU, 199 cases met our criteria and were included in this study. The data were collected using a predesigned form that was confirmed by three expert pediatricians and covered such data as CHD type, gender, maturity (i.e., preterm or term), type of delivery, interfamily marriage, gestational diabetes, and family history of CHD. The CHD type was determined using echocardiography reports based on the opinion of a pediatric cardiologist.

Statistical analysis

The data were analyzed in SPSS software (version 22) using the Chi-squared test. All ethical regulations were considered and followed in this study. P-value less than was considered statistically significant.

Results

The incidence rate of CHD in this study was estimated at 84.4%. Out of 199 patients, 121 (60.8%) cases were male. Regarding the type of delivery, 101 (50.8%) and 98 (49.2%) neonates were delivered through vaginal birth and cesarean section, respectively. In terms of maturity, 123 (66.8%) and 76 (33.2%) subjects were term and preterm, respectively. In addition, interfamily marriage was reported in 61 (30.7%) neonates. Based on the data, 28 (14.07%) cases with gestational diabetes had a complicated pregnancy and 55 (27.6%) neonates had a family history of CHD (Table 1).

As demonstrated in Table 2, 168 (84.4%) cases were found to have CHD, among whom 105 (62.5%), 44 (26.1%), and 19 (11.3%) neonates respectively had 1, 2, and 3 defects, comprising a total of 168 defects in the study population. Among the different types of CHDs, patent ductus arteriosus had the highest prevalence in our patients (42.7%; Table 2).

Based on the results, interfamily marriage was associated with CHD in neonates (P=0.024). Further analysis showed that the presence of atrial septal defect (ASD) in neonates was associated

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Table 1: Frequency distribution of congenital heart disease based on gender, delivery type, maturity, interfamily marriage, and gestational diabetes

Variable		CHD		P-value
		Positive	Negative	
Gender	Male	96 (85.7%)	16 (14.3%)	0.330
	Female	72 (82.8%)	15 (17.2%)	
Type of delivery	NVD	91 (90.4%)	10 (9.6%)	0.893
	C-section	77 (78.5%)	21 (21.5%)	
Maturity	Term	102 (82.9%)	21 (17.1%)	0.328
	Preterm	66 (94.2%)	10 (5.8%)	
CHD family history	Positive	55 (100%)	0 (0%)	0.339
	Negative	113 (79.5%)	31 (21.5%)	
Interfamily marriage	Yes	47 (77%)	14 (23%)	0.024*
	No	121 (87.6%)	17 (12.4%)	
Gestational diabetes	Yes	17 (60.7%)	11 (39.3%)	0.712
	No	151 (88.3%)	20 (11.7%)	

* Statistically significant
CHD: congenital heart disease, NVD: natural vaginal delivery

Table 2: Prevalence of different types of congenital heart diseases

Defect	Number	Percentage
Atrial septal defect	41	24.4
Ventricular septal defect	36	21.4
Dextro-transposition of great arteries	4	2.2
Patent ductus arteriosus	85	50.5
Complex heart anomalies	2	1.1

with gender (P=0.013). In this regard, this defect was more common in male neonates than in their female counterparts. The results also revealed a significant association between ventricular septal defect (VSD) and the type of delivery (P=0.03). In this respect, VSD was more commonly observed in neonates with natural vaginal delivery.

In addition, the dextro-transposition of great arteries (D-TGA) was found to be associated with gender (P=0.04). The results revealed that the mentioned defect was more common in male neonates than in their female peers. There was also a significant relationship between PDA and interfamily marriage (P=0.014). Based on the findings, CHD had a higher prevalence among men (60.8%) than among women (39.2%). Table 1 presents the other demographic and medical findings.

Discussion

In this study, the prevalence of CHD in neonates with cyanosis and respiratory distress was estimated at 84.4%. Based on our results, interfamily marriage can be considered a risk factor for CHD. However, CHD showed no significant association with gender (except for ASD and D-TGA), type of delivery (except for VSD), gestational diabetes, and family history of CHD.

In a study performed by Mohsenzadeh et al., CHD was reported to have a higher prevalence in the male population than in the females (11). Similarly, in a couple of studies performed by Nikiar et al. (12) and Smitha et al. (13), the majority of patients with CHD were male. Nonetheless, in two studies performed in Saudi Arabia (14) and Iceland (15), the prevalence of the CHD was similar in males and females. The results of the present research are consistent with those of the latter studies.

Among 199 patients enrolled in this study, 41 (20.6%), 36 (18.1%), 4 (2%), 85 (42.7%), and 2 (1%) cases had ASD, VSD, D-TGA, PDA, and complex heart lesion, respectively. In the study by Mohsenzadeh et al. (11), VSD (44%) and ASD (21%) were the most common congenital anomalies of the heart. Based on the evidence, VSD is the most common congenital heart defect in the world (2). The VSD is reported to have the prevalence of 94%, 62.7%, 46.6%, 41.8%, 45.7%, 33.9%, 31.41%, 24.9%, and 21.2% in Japan (16), China (17), Nigeria (18), United States (19), Iceland (3), Saudi Arabia (14), Czech Republic (20), Oman (21), and India (22), respectively.

In a study carried out by Nickyar (12), ASD was the most common congenital heart defect with a prevalence of 36.35%. In addition, in a study performed by Hussain (23), the most common congenital heart anomaly was VSD (31.3%), followed by ASD (22.9%), PDA (14.94%), tetralogy

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of fallot (6.89%), pulmonary stenosis (5.79%), D-TGA (4.59%), and atrioventricular canal defects (3.44%). These differences in disease prevalence may be due to the difference among populations in terms of racial and genetic factors (24).

The results of the present study demonstrated no association between CHD and prematurity. However, some studies, such as those conducted by Mohsenzadeh et al. (11), Fakhrzadeh et al. (25), and Tanner (26), showed a higher prevalence of CHD in premature neonates. This could be due to higher mortality among premature infants born with severe cardiovascular defects (26), which eliminates the need for receiving medical facilities or undergoing echocardiography.

Our results revealed a significant association between the presence of PDA in neonates and parental interfamily marriage. Nonetheless, such a relationship was not found between the other neonatal cardiac defects (i.e., ASD, VSD, and D-TGA) and parental interfamily marriage. In the same vein, Movahedian et al. (27) reported that 41.3% of neonates with CHD were born to parents with interfamily marriage. Considering the role of genetic factors in the development of CHD, it seems necessary to inform families regarding the higher risk of CHD for the neonates born as a result of an interfamily marriage (27).

Conclusions

Our results revealed the high prevalence and mortality of CHD, especially in neonates with respiratory distress and cyanosis. This underscores the importance of controlling the potential risk factors (e.g., interfamily marriage) and taking necessary measures to be prepared for the establishment of quick diagnosis and implementation of effective interventions for neonates with respiratory distress and cyanosis.

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Conflict of Interest

The authors have no competing interests.

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