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Evaluation of the Prevalence of Congenital Heart Diseases in neonates of Ilam province of Iran, in 2019-2020

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Abstract

Background: Congenital heart diseases (CHDs) can cause death and severe disorders in the developmental process of children and, in most cases, are associated with other congenital defects. The current study investigates the prevalence of such defects among infants born in 2019 and 2020.

Materials and Methods: This analytical cross-sectional study was conducted in Ilam province on 91 referred neonates, with the possibility of heart diseases, who were diagnosed with CHDs. Demographic, clinical, and definitive diagnoses of cardiologists were recorded and analyzed in these infants, followed by a 6-month follow-up. Data were analyzed using SPSS software with descriptive statistics, Chi-square test, and correlation coefficients.

Results: A total of 91 infants out of 16,064 newborns were diagnosed with CHDs, and the prevalence of heart diseases was 5.9 in every 1000 live births. The most frequent defects were ventricular septal defects (VSDs) and PDA, with prevalence rates of 59.3% and 14.2%, respectively. Among 54 VSDs, mus VSD (n = 39) was the most common form of this disorder.

Conclusion: The incidence of CHDs in Ilam province was lower than the global average, which may be attributed to the easier access of several cities to the health centers of the bordering provinces. The highlighted results of this study were the frequency of VSDs and the high rates of muscular VSD compared to membranous VSD.

Key Words: Cardiac malformation, Congenital heart diseases (CHD), Consanguineous marriage, Muscular VSD (mus VSD), Prevalence, Ventricular septal defects (VSD).

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1- INTRODUCTION

Congenital heart diseases (CHDs) refer to specific types of congenital diseases with a frequency of 8 cases in every 1000 live births, which may cause death or severe disorders in the developmental processes of infants (1). CHDs are one the most frequent causes of death of the patient in the first year, and they are mainly associated with the abnormal development of the related structures or not naturally developed parts in certain stages of gestation. Such defects are usually tolerated in the uterus; however, a certain number of defects (i.e., in the anomalies of the right heart) lead to abortion. In multiple patients, anomalies were revealed after birth with the closure of the ductus arteriosus or the elimination of fetal circulation. CHDs may include a vast range of abnormalities, from mild (such as a small hole between the heart chambers) to severe (such as imperfection or weakness in the shape of the heart). Based on the type and the severity, the symptoms of the diseases may vary. They may be without symptoms or show severe symptoms including the clubbing of fingernails, cyanosis of the lips, rapid breathing, and respiratory distress. Multiple advances have been made concerning cardiovascular diagnostic methods and surgical treatments for CHDs. CHD patients can reach adulthood; however, one should note that a group of patients never fully recover and require medical attention (2).

CHDs are among the common anomalies in newborns. Studies indicate that newborns with CHDs occupy 25-30% of the pediatric intensive care units (3).

About 20-30% of the patients with CHDs may also present other physical disabilities (4), and as mentioned before, they require constant medical care. Therefore, they impose high costs on the healthcare system.

The cause of congenital defects is not identifiable in every newborn. However, the general causes contributing to congenital fetal defects may include alcohol and drug abuse by the mother, underlying genetic factors, chromosomal abnormalities, mothers' nutrition, and exposure to drugs and other environmental risk factors (5-8).

The statistics related to risk factors and the prevalence of CHDs in Iran are based on studies conducted in other countries. These studies suggest genetics and environmental factors as the significant causes of such anomalies. However, we predict that factors including consanguineous marriage, which is frequent in Iran, may also affect the incidence of such abnormalities. The lack of understanding of the epidemiology of the disease may deteriorate the progress of diseases with unknown prevalence, which hinders the healthcare system from preventive and therapeutic planning. The present study investigates the prevalence of CHDs among newborns in Ilam province. We hope that this research can elaborate the understanding of CHDs epidemiology and help the progress of preventive and therapeutic plans for the health system.

2- MATERIALS AND METHODS

The current analytical study investigated the term infants born with a heart murmur, the presence of cyanosis, persistent hypoxemia, cardiomegaly and cardiac silhouette abnormality in CXR, and maternal complication such as gestational diabetes, SLE, and any suspicious clinical finding. These infants were referred to private clinics and hospitals and state hospitals affiliated with the Ministry of Health and Medical Education in Ilam province, during 2019 and 2020.

Three types of information were obtained for each patient: 1) demographic information (i.e., gender, parents'

consanguineous marriage, and ages of the mother and father), 2) past history and clinical information (i.e., mothers' disease history during the pregnancy, history of drugs and multivitamin usage by the mother during and before the pregnancy, and birth weight of the baby), and 3) the diagnosed defect.

2-1. Inclusion and Exclusion Criteria

The inclusion criterion for the study was the possibility of CHDs based on the physician's diagnosis. The type of heart disease was determined according to the pediatric cardiologist's diagnosis. Preterm infants with PDA were excluded from the study because they are usually not categorized as CHDs in epidemiologic studies.

2-2. Data analysis

We used descriptive (mean, median, and standard deviation) and inferential (Chi-square test and t-test) statistics for analyzing the data to investigate the research hypothesis.

3- RESULTS

This study investigated 91 infants with CHDs among 16,064 newborns of Ilam province in 2019 and 2020. Among these newborns, 91 cases were diagnosed with CHDs, and the frequency of CHDs was 5.9 per 1000 live births. The most common disease was ventricular septal defect (VSD) (59.3%, n=54). The muscular VSD (mus VSD) was the most frequent form of this defect (n=39) (**Fig. 1**).

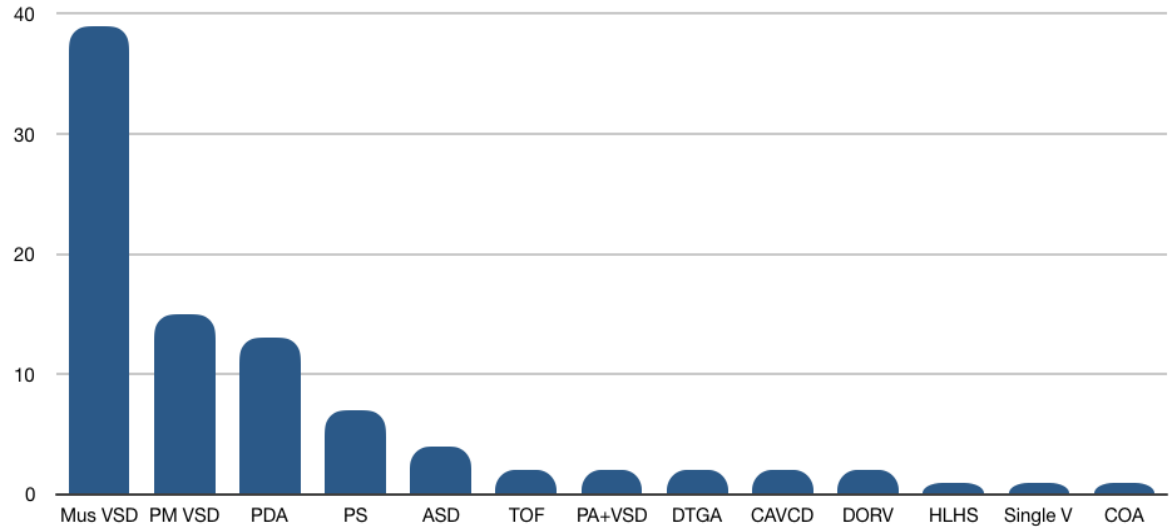

Fig. 1: Distribution of 91 infants with congenital diseases categorized by the type

The identified sex of 71 cases indicated the presence of 33 males and 38 females. Fifteen PM VSD cases were reported among ten male and five female infants. Mus VSD was observed in 39 infants. The difference between the genders was not significant (14 males and 15 females).

Consanguineous marriages were found between the parents of 19 patients (20.9%). The highest rates of consanguineous marriage were respectively observed in infants with VSD (26.3%) And PDA (21.1%). Two mothers of infants with CHDs had underlying diseases (2.2%). Out of 91 infants with heart disease, seven cases (7.7%) had mothers that used drugs, including antibiotics, antihypertensives, and antihyperlipidemic, during pregnancy.

A six-month follow-up indicated that seven cases of Mus VSD were closed, and other patients were monitored without any recorded increased pulmonary arterial pressure or other complications. The defect remained in perimembranous VSD patients. One PDA was closed and the others were referred for cardiac catheterization and closure. All seven PS cases were mild and are still under follow-up. Balloon angioplasty was performed for one reported CoA. Various ASDs are under follow-up and await surgery. Two DTGA cases were admitted for surgery. One of the patients expired due to postoperative complications. Two infants with CAVCD were admitted for surgery and are under follow-up. The infant with HLHS expired. The patient with Single V is ready for operation. Two cases with TOF were referred for surgery. Two DORV patients await surgery.

4- DISCUSSION

Various international studies reported a prevalence of eight CHDs in every 1000 live births (1), and VSDs were the most common CHDs (9). Despite our expectations, the prevalence of CHDs was 5.9 in every 1000 live births in this study, which may be attributed to the easier access of several cities to the health centers of the bordering provinces.

The most frequent CHD was VSDs (59.3%), among which muscular forms were the most common cases (almost 67.8% of the VSDs). This finding contrasts previous studies in which membranous VSD was the most reported type (9), which is a significant finding. Another important finding was the closure of a large portion of Mus VSDs (17.5%) within 6 months after birth. This number was 0.0% for membranous VSDs.

In a study by Nikyar et al. on CHD prevalence in Gorgan, ASD was reported as the most common defect (10). Additionally, males were more likely to develop VSDs. In the present study, VSD was the most common defect. The incidence of Mus VSDs was not significantly different between the sexes; however, the incidence of PM VSD was twice as high in males.

It should be noted that VSD was reported as the most common type of CHDs in a similar study in southwestern Iran (11), reporting that the percentage of consanguineous marriages in VSD (59.6%) was higher than that in other defects, similar to the current study. However, the obtained percentage was small compared to that (20.9%) expressed by Nazari et al. Aside from confirming the prevalence of VSDs, our study shows Mus VSD to be the most common CHD. The lower percentage of Mus VSD reported in previous studies may be due to the spontaneous closure of these VSDs by the time a person is 6 years old, and the fact that many of these Mus VSDs are small defects that might have been undetected in the past (prior to the routine use of color doppler echocardiography) (12). Studies have also shown that the reported percentage for the prevalence of VSDs will be higher if echocardiography is performed universally and not merely on infants suspected to have CHDs (12).

According to the guidelines, "Ventricular septal defect is the most common cardiac malformation and accounts for 25% of CHDs. Defects may occur in any portion of the ventricle septum, but the most common are of the membranous type". We, however, found that the opposite is true. It should be noted that these results are consistent with studies performed in Atlanta Metropolitan (12). Consequently, this statement needs to be revised in future publications.

4-1 Limitations of the study

The lack of clinical manifestations of cardiac defects in neonates is a limitation of this study. It is also possible for some

defects to progress to severe forms; for example, TOF can progress to PA+VSD.

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