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RISK FACTORS FOR CONGENITAL HEART DISEASE AMONG LESS THAN FIVE

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ABSTRACT

Background: Congenital heart disease (CHD) is a reasonably frequent congenital disability affecting the structure, function and location of heart or nearby major vessels with a prevalence of 3.5-17.5 per 1000 live births. It is increasingly responsible for pediatric deaths, particularly in developing countries. CHD has a broad clinical spectrum that varies according on the age at which it manifests. The majority of patients with congenital heart disease exhibit symptoms within the first year of their lives. **Objectives:** To assess the risk factors for congenital heart disease among less than five years children in Mosul-Iraq. **Methods:** A case control study**,** included 100 randomly selected child, of them 50 children had congenital heart disease and matched with 50 children without congenital heart disease. The study conducted from June 1st, 2024, to April 1st, 2025 at Talafar and Mosul general hospitals in Nineveh, Iraq. Patients with syndromes or older than five were excluded from the study. The questionnaire included four parts, part one for socio-demographic information of the study participants and their mothers, part two for the patient's clinical presentation, part three for the diagnosis of CHD and part four for the prenatal risk factors. **Results:** The mean age of the study participants is 2.32 ± 1.47 years. Of them (52%) were males and (48%) were females. It's evidence that the mean weight ± standard deviation of the cases is lesser than the mean weight ± standard deviation of the controls (P value <0.001). Moreover; the presence of positive CHD in family is higher among cases than in controls. The majority of patients (38%) presented with chest infection, while cyanosis, both chest infection and cyanosis and accidental diagnosis were presented among (24%), (8%) and (30%) respectively. Ventricular septal defect was present among 12 (24%) patients, while patent ductus arteriosus, atrial septal defect, tetralogy of Fallot, pulmonary stenosis, coarctation of aorta and complex defect were present among 9 (18%), 8 (16%), 7 (14%), 3 (6%), 3 (6%), 8 (16%) respectively. Lastly; paternal consanguinity was found to be higher among cases (P value < 0.001). **Conclusion:** The study concluded that it is essential to comprehend the risk factors for CHDs in order to prevent them. The majority of cases were under a year old, lived in an urban area, and arrived with a chest infection and VSD. There was also a significant connection between CHDs and family history of CHDs, and the weight was lower in CHD cases than in controls.

KEYWORDS: Congenital heart disease, Prenatal, Consanguinity, Talafar, Iraq.

1. INTRODUCTION

Congenital heart disease (CHD) is a reasonably frequent congenital disability affecting the structure, function and location of heart or nearby major vessels with a prevalence of 3.5-17.5 per 1000 live births.[1] It is increasingly responsible for pediatric deaths, particularly in developing countries.[2-3] CHD has a broad clinical spectrum that varies according on the age at which it manifests. The majority of patients with congenital heart disease exhibit symptoms within the first year of their lives.[4] Asymptomatic cases are often identified during routine checkups, although other symptoms may include poor suckling, cyanosis, shortness of breath, and even heart failure.[5-6]

The majority of these defects are inherited through a combination of genetic and environmental factors, with a small number caused by chromosomal abnormalities.[7] Environmental factors were thought to influence a person's genetic susceptibility to the deformity, and exposure had to take place during the first eight weeks of pregnancy, when the heart is developing.[8] In particular, maternal infection with Rubella (congenital rubella syndrome) causes pulmonic stenosis, patent ductus arteriosus, and, less commonly, tetralogy of Fallot.[9]

First trimester fever in general, especially if caused by viral infection, carries an increased risk of offspring CHDs, primarily coarctation of the aorta, tricuspid atresia, transposition of the great arteries, and ventricular septal defect.[10] Parental consanguinity.[11] Congenital cardiac abnormalities are more common in families where a first-degree relative (parent or sibling) is affected.[12] Low birthweight.[13] Maternal age factors.[14] Maternal Diabetes is linked to atrioventricular septal abnormalities.[15] Cigarette smoking, have been linked to an increased risk of CHDs, particularly septal abnormalities.[16] The teratogenic effects of medications during pregnancy, such as the alteration of folate metabolism in early pregnancy by many of anticonvulsant medications, are linked to congenital heart disorders and neural tube defects.[17]

The aim of study is to assess the risk factors for congenital heart disease among less than five years children.

2-PATIENTS AND METHODS

This is case control study**,** carried out in agreement with the ethical guidelines derived from the Helsinki Declaration. Before a sample was taken, the patients' verbal consent was obtained after an explanation of the study's objectives. The study included 100 randomly selected child, of them 50 children had congenital heart disease and matched with 50 children without congenital heart disease. The study conducted from June 1st, 2024, to April 1st, 2025 at Talafar and Mosul general hospitals in Nineveh, Iraq.

Data was included the mother's and child's sociodemographic data, clinical presentation, and potential risk factors for congenital heart diseases, such as parental consanguinity, pregnancy-related rubella and COVID-19 infections, maternal history of hypertension, diabetes, and abortion, folic acid intake, hormonal medications, aspirin, and family history of congenital heart diseases. The children's BMI was determined by weighing each child in kilograms using a beam balance or an electronic scale, and measuring each child's height/ length in centimeters using a length board full extension for children under two and a fixed board on the wall in a standing position for those over two. Patients with syndromes or older than five were excluded from the study.

Statistically analysis done by using SPSS 30.0 software application. Data was analyzed using both descriptive statistics (frequency distribution and percentage) and inferential statistics (Chi-square test for categorical variables, t-test for quantitative continuous variables). A P-value of <0.05 indicates statistical significance.

3. RESULTS

The mean age of the study participants is 2.32 ± 1.47 years. Of them (52%) were males and (48%) were females. It's evidence that the mean weight ± standard deviation of the cases is statistically significant different (lesser) than the mean weight ± standard deviation of the controls (P value <0.001). Moreover; the presence of positive CHD in family is statistically significant different (higher) among cases than in controls. On the other hand; no statistically significant difference between the two groups regarding the ages, gender, residency, maternal educational level and occupation (P value > 0.05) for all. As shown in figure 3.1.

Table 3.1: Comparison between cases and controls regarding sociodemographic, anthropometric and family history information.

Variable	Case, number and percent	Controls, number and percent	P -Value
Age:			
-Less than 1 year	31	34	
- 1-2 years	11	9	
- 2-3 years	4	3	0.385
- 3-4 years	3	2	
- 4 to less than 5 years	1	2	
Gender:			
Male	25	27	0.729
Female	25	23	
Residency:			
- Urban	31	30	0.822
- Rural	19	20	
Maternal educational level:			
- Illiterate	9	8	
- Primary	13	16	
- Secondary	12	13	0.276
- University	11	9	
- Higher	5	4	
Maternal occupation:			
Employed	5	9	0.158

House wife	45	41	
Weight (Kg), Mean ± standard deviation	16.25 ± 12.12	34.91 ± 9.06	**<0.001**
Presence of positive family history:	21	7	**0.021**

Table 3.2 shows clinical presentation of patients with CHD, the majority of patients (38%) presented with chest infection, while cyanosis, both chest infection and cyanosis and accidental diagnosis were presented among (24%), (8%) and (30%) respectively.

Table 3.2: Patients clinical presentation.

Presentation of patients	Number=50	Percent
Chest infection	19	38 %
Cyanosis	12	24 %
Both chest infection and cyanosis	4	8 %
Accidental	15	30 %

Table 3.3 explores patients' types of congenital heart disease. Ventricular septal defect was present among 12 (24%) patients, while patent ductus arteriosus, atrial septal defect, tetralogy of Fallot, pulmonary stenosis, coarctation of aorta and complex defect were present among 9 (18%), 8 (16%), 7 (14%), 3 (6%), 3 (6%), 8 (16%) respectively.

Table 3.3: Patients cardiac defect.

Types of congenital heart disease	Number=50	Percent
Ventricular septal defect	12	24
Patent ductus arteriosus	9	18
Atrial septal defect	8	16
Tetralogy of Fallot	7	14
Pulmonary stenosis	3	6
Coarctation of the aorta	3	6
Complex	8	16

Table 3.4 illustrates different maternal factors enrolled in the study. Paternal consanguinity was found to be statistically different between cases and controls with higher percent among cases (P value < 0.001). While; history of prenatal rubella infection, presence of gestational diabetes, pregnancy induced hypertension, presence of bad obstetric history, prenatal maternal prenatal exposure to anti-folate medications or receiving hormonal medication, presence of maternal COVID-19 infection and maternal prenatal aspirin intake were found to be statistically not significant (P value > 0.05) for all.

Table 3.4: Comparison between cases and controls regarding their maternal factors.

Variable	Case, number and percent	Controls, number and percent	P -Value
Parental consanguinity:	33	13	< 0.001
History of prenatal rubella infection:	8	11	0.091
Presence of gestational Diabetes	3	2	0.467
Presence of pregnancy induced hypertension:	3	1	0.307
Presence of bad obstetric history:	11	9	0.541
Maternal prenatal exposure to anti-folate medications:	12	11	0.883
Maternal receiving of hormonal medication:	22	24	0.721
Presence of maternal COVID-19 during pregnancy	4	5	0.821
Maternal prenatal aspirin intake:	7	6	0.718

4. DISCUSSION

Regarding sociodemographic information, this study illustrated that the majority of patients with CHD were diagnosed at the first year of their age, moreover; most of CHD patients were reside in urban residence, which comparable to Marwa Moustapha Al-Fahham et al study findings.[4] On the other hand; the study found that the mean weight of cases is significantly lower than those of controls weight, as the cardiac defect can affect the oxygenation of different organs and resulting in poor growth, in same way Moska Aliasi et al found in her meta-analysis that patients with CHD had impaired growth.[18]

Positive family history of congenital heart disease was another factor found to be significant in this study, Nicholas S. Diab et al had comparable results in his study about molecular genetics and complex inheritance pattern of congenital heart disease.[19]

The study found that chest infection is commonest presentation pattern followed accidental diagnosis and cyanosis, which was runs with Rahman K. Al-Jeboori et al study results.[20] Furthermore; VSD was the commonest type of CHD followed by PDA and ASD, anyhow small sample size can lead to these results, which is going with Noor Ibraheem Mohammed et al study findings.[21]

Parental consanguinity found in this study to be significant more among patients with CHD in

comparison to controls, which parallel to Mohammad Abdullah Al Mamun et al study results.[22]

Lastly; the limitation of the study; is the relatively small sample size, and retrospective case control design. Additionally; due to short time of data collection, this study is ineffective for unusual exposures which might be difficult to establish a temporal association between exposure and disease, and is susceptible to selection and recall bias.

5. CONCLUSION

Since congenital heart defects (CHDs) are among the leading causes of fetal mortality, it is essential to comprehend the risk factors for CHDs in order to prevent them. According to this study, the majority of cases were under a year old, lived in an urban area, and arrived with a chest infection and VSD. There was also a significant connection between CHDs and family history of CHDs, and the weight was lower in CHD cases than in controls.

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Conflict of intertest

About this study, the authors disclose no conflicts of interest.

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