Prevalence of congenital heart defects and their non-inherited risk factors among children through the period 2019-2023: A retrospective comparative study

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Prevalence of congenital heart defects and their non-inherited risk factors among children through the period 2019-2023: A retrospective comparative study

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ABSTRACT

Background. Congenital heart defects (CHD) are the most common types of birth defects. the frequency of CHD among their patient populations. The study aimed to identify the prevalence and Non-inherited risk factors among children with cardiac defects as well as compare between prevalence of congenital heart defects among children in different governorates included in Iraq related to non-inherited risk factors.

Materials and methods. A retrospective study design was used for this study of congenital heart defects children in Babylon Centre for Catheterization and Cardiac Surgery in Al-Imam Sadiq Hospital Babylon province / Iraq (4/10/2023 to 1/7/2024). A nonprobability convenience sample of (542) patients aged 0-18 years with CHD was collected by administering a constructed tool for the study purposes.

Results. The study shows the mean age of children was 2.2 ±9.2years, The majority of children included were within infant age groups, almost equal in their sexes giving girl to boy1.04:1. The age at screening and diagnosis of Echo was more than half in the first month, and of type of defect was VSD and TOF. The study findings that there is a statistically significant relationship between risk factors related to gestational maternal practices (exposure to smoke) and maternal medication history including (Folic acid Supplements and antibiotics). Maternal diseases (Diabetes, Anxiety, Rubella) with CHD and the highest recorded governorates for congenital heart defects are Baghdad, Mosul, and Diyala.

Conclusions. The study concludes the majority of children included were within infant age groups, almost equal in their sexes, and the highest recorded governorates for congenital heart defects are Baghdad, Mosul, and Diyala. also most frequent CHD is VSD and TOF, and there are relationship between congenital heart defect risk factors.

Key-words: Prevalence, Heart Defects, Congenital

Text

INTRODUCTION

Congenital heart defects (CHD) are the most common types of major birth defects (BD) reported in the literature. CHD is the cause of birth defect-related infant mortality and illness [1]. It is one of the main concerns in pediatric healthcare, has serious consequences on infant mortality rates worldwide, and impacts both patients and families [2]. The patterns and prevalence of CHD vary between studies [1]. In Asia countries, the total reported CHD prevalence has increased with nearly 20 /1000 live births affected in China and 3.9 per 1,000 live births in India in addition Iran is 8.2 /per 1000 live- births[3]study in Iraq - Sulaimaniya city, the prevalence of all types of congenital heart diseases was estimated to be (1.7 per 1000) in 2015 but in 2016 was decreased to be (1.6/per 1000) live births[4]. And other studies in western Iraq the overall prevalence of CHD during these 5 years was 19.7 /1000 live births [5]. The frequency of CHD amongst Egyptian Children has been estimated to be 5-6/1000 live births [6]. A retrospective review, Al Ammouri published an approximate prevalence of 12,3/1000 live births from Jordan University, a large educational referral institution in Amman [7]. CHD can be either genetics or non-genetics. In addition to infectious pathogens, (C.H.D) that have been associated with environmental teratogens such as fever, and the use of medication such as antibiotics during first-trimester pregnancy, non-genetic reasons are still on the rise even with international efforts to combat them. Additionally, (CHD) is connected to the rise in diabetes, obesity, and antiviral medicine [8]. CHDs classify the different heart defects into two subtypes: cyanotic CHD and a cyanotic CHD with variations in their severities which can range from simple to complex or critical CHDs. Simple defects, such as small ventricular-septal defects, may have no signs or symptoms and may not need any treatment. Complex or critical CHDs such as complete transposition of the great arteries may present severe or life-threatening symptoms, such as cyanosis and shortness of breath, and this is in need, of surgical correction or other treatments early in life [9]. The most common interventional treatment, to CHD modalities include surgery (corrective or palliative) and interventional catheterization. Approximately fifteen percent of patients with (CHD) who undergo corrective require re-operation. Cyanotic conditions such as tetralogy of Fallot (T.o.F), dextro transpositions of the great-arteries (D-T.G.A), also single-ventricle have great variation in complexity and severity and hold different approaches to surgical intervention [10].

METHODS

Study design, setting, and sample

Currently, a retrospective study was conducted in Babylon Centre for Catheterization and Cardiac Surgery in Al-Imam Sadiq Hospital Babylon province / Iraq during the period (4, October 2023 to 1, July 2024). A nonprobability convenience-sampling method was used to collect (542) children with CHD who were diagnosed by a physician This study was conducted.

Ethical considerations

The study was approved by the ethics committee College of Nursing, University of Babylon on January 4, 2024, and code 4 Informed consent was obtained from all, participants in this study.

Study instrument

Part I: Socio-Demographic Characteristics of Children including age, sex, child weight at birth, current weight**,** parents or relative from first degree have CHD, age at screening, diagnosis of echo, condition on discharge. Part II Parents' Socio-Demographic Characteristics. This part consists of (8) items related to Parents' which include Parents' age and occupation parents' education additionally residence economic status of the family, and residency. Part IV Maternal Exposure to Teratogenic Risk Factors Teratogenic risk factors which concerned with factors associated with the defect. It consists of 3 items including (4 sections) asking about maternal practices, exposure to smoke, x-rays, and consumption of beverages Another 7 items related to gestational medication History also 7 items into maternal diseases associated with anemia, anorexia, asthma, clotting disorder, diabetes, epilepsy, heart disease (acquired in adulthood) hypertension, anxiety/stress, rubble, flue. The validity of the study instrument was determined by 21 panel experts.

Data collection

After acquiring official permissions, the data were collected in Al-Hilla City at Babylon Centre for Catheterization and Cardiac Surgery in Al-Imam Sadiq Hospital Babylon province / Iraq (15 January 2024 to 15 March 2024), data were collected by using a medical records method with the questionnaire, using the English version

Statistical analysis

To formulate. We managed the data using Microsoft Excel 2013. An analysis was made using the electronic via (SPSS) program version 27 (Statistical Package for the Social Sciences). the descriptive and inferential statistics such as frequencies, percentages, and valid percentages. Chi-Square was used for inferential statistics. The outcomes have been considered statistically significant when the P-value = 0.05. variables and by entering data in order the results were put in tables and Figures as the numbers (n) and percentages (%) and valid percentages (%) to achieve the objectives of the study.

Inclusion criteria and exclusion criteria

Patients who were clinically diagnosed with congenital heart defects underwent surgery at Babylon Centre for Catheterization and Cardiac Surgery in Al-Imam Sadiq Hospital Babylon. All the samples that were present at the center were taken in the study and there were no excluded from the study.

RESULTS

The existing chapter related to specified statistical approaches directed toward the objectives settled for study achievement Table 1 presents the statistical distribution of Sociodemographic characteristics of children with congenital heart defects A total of 542 patients were recruited for this study. They were previously diagnosed as having CHD. Two hundred seventy-three were girls (50.4%) and 269 were boys (49.6) giving girl to boy1.04:1. The range of age was from 1 day to 18 years. The mean age was (22.2±29.0months). Most of the patients presented in infancy 321 (59.2%) beyond the neonatal period up to 1 year. One hundred and twenty-eight were (23.6) toddlers, 35 (6.5%) were in preschool, and fifty-three patients (9.8%) were of school age, while the remaining 1 (0.2 %) were adolescents as shown in Table 1.

As shown in Table 2. More than half of patients had more than 2500g 141 (50.4%), while eighty-three had normal birth weight g >2500 (29.6%), (20.0%) Low birth weight g<1500 at current weight Mean ± SD 7.745 ± 5.91 (1-48). Parents or relatives have CHD one hundred and thirty-one (46.8%) answer yes, but 149 (53.2%) of them answer no. condition on discharge Four hundred and eighty-nine (90.2%) recovered, but died during surgery 20 (3.7%) while the remaining thirty-three (6.1%) died after surgery.

Result of children diagnosed by Echo was found VSD to be the commonest defect in more than half of 318 cases (58.7 %), followed by tetralogy of Fallot 161(29.7%), pulmonary stenosis (PS)140 (25.8%) atrial septal defect (ASD) 84(15.5%) pulmonary arterial hypertension(PAH), (13.7%), Patent ductus arteriosus (PDA) 36 (6.6%), Atrioventricular septal defect (AVSD)(5.2%), Pulmonary atresia(PA) (5%), Double-outlet right ventricle(4.1%) Left ventricular outflow tract obstruction (1.8%), dextro-Transposition of the great(1.7%), Tricuspid atresia(1.3%), Mitral regurgitation(1.1%), others defects(4.4). (Figure1)

Figure 2 reveals statistics of CHD were somewhat low during the year 2019 at 82 patients and then became lower during the years 2020 and 2021 (36,37) during the period of quarantine and the Covid-19 pandemic, but after that, there was a high increase in the incidence. during 2022 about 300 patients and return to lower in 2023.

Many items were included in this study about teratogenic risk factors. Table 3 summarizes the possible risk factors associated with occur of CHD such as (Exposure to smoke, folic acid, history of medications antibiotics, Hypertension, infection during pregnancy, and Stress during pregnancy) A significant relationship was observed between CHD and these risk factors.

Respectively sample of CHD according to governorate. Baghdad 124 followed by Mousal Eighty-five and eleven (20.5%) and Forty-two (7.7%) Diayla. Salahaddin, Babil, and Alanbar at (5.6%, 5.3%) while other governorates seen in Table (4).

DISCUSSION

In this study,321 causes (59.2%) of CHD presented within (0-12) months of age, and the sex was a girl. This was near to previous study results in Pakistan on (123) children with (CHD) and DS showed a high percentage prevalence [12]. In addition, a retrospective descriptive study in west Iraq, among (262) patients with CHD found that more than half the age of the children was infants [5]. Which is compatible with study in Turkey. Which found that the prevalence of CHD was more than half in females than males [13]. Some cases of congenital heart defect remain undiscovered until the disease advances to a severe stage, which could affect on early detection of diagnosis of CHD [14]. In this study age of screening was in the first month, this indicates that there are many factors, including family awareness, as well as medical competencies and electrocardiogram (ECG) devices, that helped in early detection

Table2

Findings of the current study in Table (2) show that the child's weight at birth, Parents or relative has CHD) was more than half (50.4%,53.20%). This result was agreed with another study done in a city in China from 2015 to 2019 on the birth defect, they found more than three-quarters of the same items [15]. A prospective study was conducted in Sulaimaniya on (400) children with CHD resulted in to child's weight at birth being more than two-thirds [11]. From the researcher's point of view, many of the complications that occur in children with CHD are due to several reasons related to the mother, such as lack of awareness about taking medications that may not be permitted or cautioned during pregnancy, and she may not be regular in taking the prescribed treatment. which is an important factor in reducing the incidence of congenital malformations.

Figure (1)

Figure (1) showed a diagnosis of Echo, which was more than half in VSD. In a certain study sample of (110) children with CHD one-third of them have VSD with the highest percentage prevalence [16]. While a descriptive and prospective study done in Bangladesh showed one-third of them were VSD [17].

Figure (2)

The current study shows in figure (2) the CHD highest in 2022 and lowest in 2023, in all governorates of Iraq that were included in the study from the Babylon Centre for Catheterization and Cardiac Surgery at Imam Sadiq Hospital which can be interpreted as prevalence-raising of CHD due to several non-hereditary factors such as exposure to teratogenic risk factors [18].

Table (3)

Table (3), found a relationship between exposure to smoking was significant with CHD at (p-value= .04). This is similar to the study in China that resulted was a significant relationship between paternal smoking before and during pregnancy and CHD in (p-value 0,004) [19]. As well as results show that folic acid Supplement, Antibiotic) was significantly associated with increased risk for born infants with CHD, these findings agree with a retrospective design directed at (91) medical records of infants with CHD (47 boys and 44 girls) in Ukrainians, and revealed the intake of folic acid during the first trimester was significant association to prevent CHD development (OR 2.33; 95% CI 1.31–4.13, $P < 0.05$) [20]. A study in China found the chance of congenital heart disease (CHD) was nearly two times higher in kids of pregnant women who did not take folic acid supplements and consumed less dietary folate at ($P = 0.004$, $P = 0.025$) [21]. Moreover, the result found a significant

relationship between (Hypertension, viral infection (Rubella), Anxiety/Stress) during pregnancy, and CHD. Another study also showed (gestational-hypertension, and presentational hypertension) had (increased risks of early-onset CHD in off-spring, at P< (0.001) [22]. Another study in China demonstrated that infections during pregnancy were significant with an increased risk of CHD. at p-value (<0.001) [23]. Also, a retrospective study shows a positive correlation between early pregnancy mental stress and a higher incidence of fetal CHD. at (P = 0.020) [23]. The researchers found many reasons that may be related to the family history, such as if they have chronic diseases or a lack of information about chronic diseases that may affect the mother during her pregnancy. its distance from health centers, or not making regular visits to know her condition. during pregnancy, which negatively affects the growth and development of the fetus and exposes it to risk factors during pregnancy

Conclusion: The study reaches the following conclusions based on the interpretation and studies related to the present findings. The majority of children included were within infant age groups, almost equal in their sexes, and the highest recorded governorates for congenital heart defects are Baghdad, Mosul, and Diyala. also most frequent CHD is VSD, TOF, and PS. It is expected that periodic reviews and the mother's prenatal care and taking folic acid supplements as directed also abstaining from medications without consultation with a doctor. Additionally, keeping up a healthy lifestyle, and improving parental education, may reduce the incidence of CHD. Every health institution, hospital, and even a private clinic should insist on improving the awareness of the families about the importance of pre-marital examination to detect if there are any familiar tendencies of hereditary diseases enhanced during consanguineous marriage. risk factors, prevention strategies, and how to acquire home care for children with the disease. and, television, and radio, as well as lectures at various community associations or health centers, all provide information about risk factors and CHD prevention.

Table Distribution of Sociodemographic characteristics of children with congenital heart Defects

Items		Frequency	Percent
Child age	Neonate	4	0.7
Mean ± SD 22.282-29.0153	Infant	321	59.2
	Toddler	128	23.6
	Preschool	35	6.5
	School-age	53	9.8
	Adolescent	1	0.2
	Total	542	100.0
Sex	Boy	269	49.6
	Girl	273	50.4

	Total	542	100.0

Items		Frequency	Percent	Valid Percent
Child weight at birth	Low birth weight g<1500	56	10.3	20.0
	Normal birth weight g >2500	83	15.3	29.6
	More than 2500g	141	26.1	50.4
	Total	280	51.7	100.0
	Missing data	262	48.3	
	Total	542	100.0	

Current weight	Mean ± SD (Min-Max)	**7.745 ± 5.91 (1-48)**		
Parents or relative has CHD	Yes	131	24.2	46.8
	No	149	27.5	53.2

Types of defect / Teratogenic risk factors		**Frequency**	**Percent**	**Chi-Square Tests (p-value)**
Exposed to smoke? during the first three months of	Yes	181	33.4	
	No	99	18.3	
	Total	542	100.0	

Table 2:Distribution of clinical data of children with congenital heart defects

Tabel3:Relationship between types of defect and teratogenic risk factor

pregnancy	Total	280	51.7	**.04**
Missing	data	262	48.3	
Total		542	100.0	
Folic acid Supplement Intake during pregnancy	Started before pregnancy	134	24.7	**.013**
	Did not take in first trimester	135	24.9	
	Started after 6 month of pregnancy	9	1.7	
	Started between6–12 month	2	0.4	
	Total	280	51.7	
Missing	Data	262	48.3	
Total		542	100.0	
Take any Antibiotic during the first three months of your pregnancy	Yes	158	29.2	**.009**
	No	122	22.5	
	Total	280	51.3	
Missing	Data	262	48.3	
Total		542	100.0	
Hypertension	During this Pregnancy	104	19.2	**.02**
	During a previous pregnancy	28	5.2	
	When I Was born	9	1.7	
	No	139	25.6	
	Total	280	51.7	
Missing	Data	262	48.3	
Total		542	100.0	
Anxiety/Stress	During this Pregnancy	156	28.8	**.001**
	During a previous pregnancy	2	.4	
	No	122	22.5	
	Total	280	51.7	
Missing	Data	262	48.3	
Total		542	100.0	
Rubella	During this Pregnancy	3	.7	**.007**
	No	277	51	
	Total	280	51.7	

Missing	Data	262	48.3	
Total		542	100.0	

Table 4As a sample of CHD according to the governorate.

Government	2019	2020	2021	2022	2023
Alanbar	4	2	1	22	7
Albasra	2	2	3	8	1
Alkut	7	4	2	14	4
Alnajaf	7	5	2	12	7
Alsamawa	5	0	0	10	3
Babil	4	2	3	21	1
Baghdad	23	9	10	60	22
Dhiqar	0	1	2	10	2
Diwaniyah	3	0	0	7	1
Dohuk	1	0	0	9	1
karbla	2	0	2	9	4
Kirkuk	3	2	1	9	5
Maisyan	1	0	0	5	1
Mousal	12	2	6	51	14
Nasiriyah	1	1	1	11	2
Salahaddin	1	2	3	12	2
Sulaymaniyah	0	0	0	4	1
Erbial	0	0	0	4	0
Diayla	6	4	0	22	3
Total	**82**	**36**	**37**	**300**	**87**

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