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The association between maternal age and the incidence of congenital heart disease

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Abstract

Aim: To discuss the association between maternal age and the incidence of congenital heart disease in Diyala governorate, Iraq.

Patients and methods: A cross sectional study of 80 with congenital heart diseases in Al-batool teaching hospital during the period from July 2022 to January 2023. A questionnaire of personal information was prepared for this purpose, which include the data of patients and ages, genders, weight, the existence of other comorbidities, the birth order, socioeconomic state, etc. we collected the data by direct face to face interview with the mothers. the privacy of the patients' identities was preserved.

Results: Eighty children with congenital heart diseases were enrolled in this cross-sectional study. 46 (57.5%) were males and 34 (42.5%) were females. 87.5% of the mothers underwent C/S and 12.5 had normal vaginal delivery, 74% of them live in urban areas and 26% lives in rural areas. We found no significant difference between the maternal age and the incidence of CHD.

Conclusion: We found no significant difference between the maternal age and the risk of CHD so it cannot be considered as isolated risk factor.

Keywords: congenital heart disease, maternal age.

Introduction

Congenital heart defects (CHDs) are the most common type of birth defects, occurring in approximately 3–9 of every 1,000 live births, and account for a significant proportion of infant mortality due to birth defects [1]. Most CHDs have a multifactorial etiology, involving interactions between genetic and nongenetic factors [2]. Previous studies have identified possible risk factors, including maternal pregestational diabetes and rubella, gestational age and intrauterine growth restriction, infant sex and maternal race [3]. In addition some investigators have shown an increased prevalence of CHD among children born to women 35 years and older [4].

The diagnosis of congenital heart disease is made by physical examination, echocardiography, magnetic resonance imaging, cardiac computed tomography, cardiac catheterization, and open-heart surgery [5]. Distinguishing among the various congenital heart defects can be difficult, and accurate diagnosis can require special expertise and training. Surgical intervention for congenital heart disease began in the mid-1960s and was first applied to infants in the mid-1970s. [5].

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The association between CHD and maternal age is not confirmed. However, CHD is hypothesized to have genetic and environmental etiology, with several single gene mutations being linked to CHD. Gene mutations are likely to occur more frequently as maternal age increases. Some of the alleged association between maternal age and CHD could be confounded by assisted reproductive technology or maternal obesity, which increase the risk of CHD and are more common with increasing maternal age [6].

The basis of the maternal age effect could reside in either the mother or oocyte. To determine which, a study performed reciprocal ovarian transplants between young and old mothers that were first generation (F1) hybrids of the

inbred strains. F1 parents were bred to produce F2 offspring. The incidence of VSD was significantly greater among the offspring of older mothers bearing young ovaries [7].

Many studies around the world suggest an association between different maternal age groups and CHD. While some studies have illustrated the U-shaped association, others have reported a linear relationship with the increased strength of association with advanced maternal age [9]. For example, research in Hawaii proved the association between advanced maternal age ≥35 and ventricular septal defect, atrial septal defect, endocardial cushion defect, hypoplastic left heart syndrome [10]. However, a study conducted in the United Kingdom reported little evidence of the association between advanced maternal age, ≥35 at delivery, and the incidence of CHD [11].

Aim of study

To find out any association between maternal age and the incidence of Congenital heart disease in Diyala governorate, Iraq.

Patients and methods

Type of study: cross sectional study on the in Al-batool teaching hospital in the period from July 2022 to January 2023.

A questionnaire of personal information was prepared for this purpose, The questions include the data of patients and ages, baby genders, weight, the existence of other comorbidities, the birth order, socioeconomic state, etc. we collected the data by direct face to face interview with the mothers. We classified the maternal age into five categories in order to study the association

The other questions in our questionnaire were answered directly by mothers and they were as the following:

- Mode of delivery.
- Onset of symptoms.
- Residency.
- Any other anomalies.
- Severity of symptoms
- Accessibility to the health care providers
- Socioeconomic state
- Body mass index of the mother which we calculated by the formula (weight in kg/length^2 in meters).
- History of maternal smoking

All data were statistically analyzed depending on SPSS (Statistical Package for Social Science) version 18 (2009). Chi–square was used to compare between the variable in this study. Statistical results were considered significant when being under or equal to the 0.05. we included any women had offspring of CHD and

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Also add ethical consent

excluded the dead fetuses with CHD. the privacy of the patients identities was preserved and their consent for ethical uses of their information was assured.

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Results

Eighty cases were enrolled in this cross-sectional study. 46 (57.5%) were males and 34 (42.5%) were females.

Their weight is demonstrated in table 1.

Table 1. weight

Weight	Frequency	Percent
More than 2500 grams	27	33.8
2000- 2500 grams	28	35.0
1000- 2000 grams	19	23.8
Less than 1000 grams	6	7.5
Total	80	100.0

The maternal age groups are demonstrated in table 2.

Table 2. maternal age groups

Age groups	Frequency	Percent
Less than 20 years	5	6.3
[20-24] years	13	16.3
[25-29] years	24	30.0
[30-34] years	27	33.8
More than 35 years	11	13.8
Total	80	100.0

The onset of the symptoms is demonstrated in table 3.

Table 3. onset of symptoms

Onset	Frequency	Percent
After birth	24	30.0
Within the first month	42	52.5
During the first 6 months	12	15.0
During the first year	2	2.5
Total	80	100.0

87.5% of the mothers underwent C/S and 12.5 had normal vaginal delivery, 74% of them live in urban areas and 26% lives in rural areas.

The types and the severity of the CHD is demonstrated in table 4.

Table 4. types and severity of CHD in this study

	Severity		
Type of CHD	Moderate	Severe	Total
Ventricular septal defect	21	3	24
Atrial septal defect	20	0	20
Patent ductus arteriosus	10	6	16
Transposition of great arteries	0	14	14
Tetralogy of fallot	1	5	6
Total	52	28	80

26% of the mothers are employed and 74% were housewives. Their socioeconomic state is demonstrated in table 5.

Table 5. socioeconomic state

State	Frequency	Percent
Poor	15	18.8
Middle	61	76.3
Good	4	5.0
Total	80	100.0

We found that CHD is more common in older age groups but with no significant difference as in table 6.

Table 6.

	Type of CHD						
Maternal age	VSD	ASD	PDA	TGA	TOF	**Total**	P value
Less than 20 years	2	1	2	0	0	5	0.280
[20-24] years	4	3	2	4	0	13	
[25-29] years	8	6	4	3	3	24	
[30-34] years	8	8	5	5	1	27	
More than 35 years	2	2	3	2	2	11	
Total	24	20	16	14	6	80	

And we also found that the mothers tend to over weight with BMI of more than 26 as in table 7.

Table 7. BMI of the mothers

BMI	Frequency	Percent
Within normal (21-24)	24	30.0
Low (less than 20)	9	11.3
High (25-30)	36	45.0
Obese (more than 30)	11	13.8
Total	80	100.0

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Discussion

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This is one of the first population-based studies to examine the association between maternal age and CHD prevalence in the Iraq.

Our findings suggest that the birth prevalence of isolated CHDs in the aggregate might be associated with advanced maternal age, especially 35 years of age or older. Infants born to mothers older than 35 years of age seemed to be at 20% increased risk of CHDs, while infants born to younger mothers tended to be at decreased risk of CHDs. Our results also suggest an effect of advanced maternal age on the prevalence of specific groups of CHDs, such as ASD and VSDs. Which is consistent with findings of Miller et al [8].

Although we observed a significantly stronger maternal BMI association among preterm infants for several groups of CHD among offspring of women in the 30–34 years and in the 35 years of age or older categories, we did not identify a consistent pattern in the estimates of associations.

In the United Kingdom, CHD is more prevalent in the offspring of mothers who live in more deprived areas [12]. In our study, we found that mothers aged 35 were less likely to live in areas associated with socioeconomic deprivation. Therefore, the effect of deprivation on CHD prevalence may be counteracting the impact of maternal age. If the impact of deprivation on the live birth prevalence of CHD is different in our population than in the populations of the previous studies, this may explain why we observe conflicting findings. Unfortunately, we did not have access to denominator data according to IMD quintiles, so it was not possible to adjust our regression to examine this further.

We found no evidence that advanced maternal age is a risk factor for CHD and this is consistent with findings of Best et al [13], Cedergren et al [14] and Long et al [15] which they found no association between the maternal age and the CHD incidence but they found that CHD is more common among older mothers.

Our findings disagree with findings of Agha et al [16] and Wu et al [17] which they found increased risk of CHD incidence among older mothers.

Conclusion

We found no significant difference between the maternal age and the risk of CHD so it cannot be considered as isolated risk factor.

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