Frequency of Cyanotic Heart Disease in Infants of Diabetic Mothers

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ABSTRACT

Aim: To determine the frequency of cyanotic heart disease in infants born to diabetic mothers referred to Tertiary Care Hospital.

Materials: This Cross-Sectional Study was conducted in the Pediatrics Department of Hayatabad Medical Complex, Peshawar from July 2021 to July 2022. In this study, a total of 262 patients were referred to the Pediatrics Department of Hayatabad Medical Complex, Peshawar. The sampling technique was non-probability consecutive sampling.

Results: The age of the participants among 262 patients was analyzed as n= 1-15 Days was 170(64.9%) 16-28 Days was 92(35.1%). The mean age was 9±1.87 days. The distribution of gender among 262 patients was analyzed as n= Male was 142(54.2%) and Female was 120(45.8%). The distribution of weight among 262 patients was calculated as n= Less than or Equal to 4.5 kg was 126(48.1%) and More than 4.5 kg was 136(51.9%). Mean weight 5.1±1.87kg. Distribution of Duration of diabetes in mothers (years) among 262 patients was analyzed as n= 1-5 Years was 135(51.5%) and More than 6 Years was 127(48.5%). Mean duration was 7.1±1.12 years. The distribution of Cyanotic Heart Disease among 262 patients was analyzed as n= Yes was 48(18.3%) and No was 214(81.7%).

Practical implication: To determine the frequency of cyanotic heart diseases in children born of a diabetic mother, its prompt diagnosis and management to reduce neonatal morbidity and mortality.

Keywords: Gestational diabetes mellitus, Congenital heart diseases, pre-gestational diabetes mellitus, Diabetic mothers

INTRODUCTION

Chromosomal abnormalities (trisomies 21,18,13), microdeletions of chromosome 22q11.2, untreated maternal diabetes, maternal consumption of retinoic acid, phenylketonuria, and Alagille syndrome with JAG1/NOTCH2 mutations have all been linked to the development of cyanotic heart disease.1 Mutations in the transcription factor NKX2.5, polymorphisms of the enzyme methylenetetrahydrofolatereductase, and mutations in the genes TBX1 and ZFPM2 are some further genetic anomalies associated with a tendency to cyanotic cardiac disease.2-3

Patients with cyanotic heart illness frequently have ventricular septal abnormalities that are perimembranous and can extend into the muscular septum.4 Numerous factors, such as the pulmonary valve, which is typically bicuspid and stenotic, the hypoplastic pulmonary valve annulus, the deviation of the infundibular septum, which results in a subvalvular obstruction, and the hypertrophy of the muscular bands in this area, can all contribute to the right ventricular outflow obstruction. Both ventricles provide blood to the overriding aorta, which often differs in degree. A right-to-left shunt across the ventricular septal defect, resulting in marked desaturation, is the physiological process underlying the hyper cyanotic episodes or “Tet spells” in cyanotic heart disease.4

Despite improvements in our knowledge of the genetic causes of congenital heart disease (CHD) over the past ten years,5 since many years ago, it has been known that maternal diabetes mellitus developing in the early stages of pregnancy increases the chance of developing certain diseases.6 Recent population-based observations have shown links between various maternal metabolic diseases, such as obesity, and the risk of CHD in the childrens.6 It is complicated to determine which of the numerous phenotypic overlaps between diabetes mellitus, obesity, and cardiometabolic risk is responsible for the danger to the foetus when present in the mother during the early stages of pregnancy.11
heart disease will be identified. A specifically created proforma will record the presence of cyanotic heart disease.

A post-stratification chi-square test will be used, and statistical significance will be determined by $p=0.05$.

**RESULTS**

Age of the participants among 262 patients were analyzed as $n=1\text{-}15$ Days was 170(64.9%) 16-28 Days was 92(35.1%) Mean age was 9±1.87 days. Distribution of gender among 262 patients were analyzed as $n=\text{Male}$ was 142(54.2%) and Female was 120(45.8%). Distribution of weight among 262 patients were analyzed as $n=\text{less than or Equal to 4.5 kg}$ was 126(48.1%) and more than 4.5kg was 136(51.9%). Mean weight 5±1.7kgk.

Distribution of Duration of diabetes in mothers (years) among 262 patients were analyzed as $n=\text{1-5 Years}$ was 135(51.5%) and More than 6 Years was 127(48.5%). Mean duration was 7±1.12 years.

Distribution of Cyanotic Heart Disease among 262 patients were analyzed as $n=\text{Yes}$ was 48(18.3%) and No was 214(81.7%) (Table 2).

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<th>Age of the participants</th>
<th>Frequency</th>
<th>Percentages</th>
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<tbody>
<tr>
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<td>64.9</td>
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<td>16-28 Days</td>
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<td>Female</td>
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<td>48.1</td>
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<tr>
<td>More than 4.5 kg</td>
<td>136</td>
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<table>
<thead>
<tr>
<th>Duration of diabetes in mothers(years)</th>
<th>Frequency</th>
<th>Percentages</th>
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<tbody>
<tr>
<td>1-5 Years</td>
<td>135</td>
<td>51.5</td>
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<tr>
<td>More than 6 Years</td>
<td>127</td>
<td>48.5</td>
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**DISCUSSION**

If diabetes mellitus is present in a pregnant woman, it poses a serious risk to the fetus. Up to this point, reports have primarily highlighted the population of mothers with type 1 diabetes. There is mounting evidence that type 2 diabetes-suffering women's fetuses may be predisposed to a comparable condition that causes issues with a variety of the fetus and placenta's organ systems. Congenital cardiac abnormalities were only found in 2(4.7%) of the 42 children of diabetes mothers in local research conducted at this facility. Results of a study revealed that, after PDA and hypertrophic cardiomyopathy (HCM) patients were excluded, the total incidence of congenital cardiac disorders was 9.3%. According to the findings of a local study carried out in Lahore, 1530 full-term neonates were registered, of which 84(6%) were children of diabetes mothers (IDMs). In contrast, we discovered that a significant portion of IDMs (52.5%) had diverse congenital cardiac disorders. The fact that we had a relatively limited sample size for this hospital-based investigation may be the cause of the increased prevalence of congenital cardiac disease in the IDM group of our study.

The second explanation could be because the majority of these infants were born in this hospital, and the gynecologists and obstetricians immediately sent them to the NICU for the early identification and diagnosis of CHD. A local study conducted at this facility found that 13(31%) and 29(69%) of the newborn babies of diabetes mothers were females. 9614 children were admitted in total to pediatric wards throughout the research period, according to another local study. 96 of them had congenital cardiac disease, according to documented cases. 64 male and 32 female patients made up the 2:1 ratio. Similar findings were also obtained in our study, which had a male-to-female ratio of 1.97 with a majority of 66.30% men and 33.7% women. In our study, which was primarily male, and in several other studies conducted throughout the nation, the findings were consistent. Due to the fact that we have a relatively small sample size, we have an impact on their diabetes status. Fetal CHD is known to be more likely in women with maternal diabetes mellitus (MDM), with an estimated risk increase of up to 8.5% in live births. MDM has been linked to the majority of cardiac structural abnormalities, from minor septal defects to duct-dependent heart disease.

Numerous studies conducted at the national and international levels report similar frequencies in a more or less consistent manner. The diverse sample size choices and lengths of research periods are to blame for variations in the frequency of distinct CHD in all studies. Due to the fact that we have a relatively short research period while only a small number of studies have investigated their patients for up to five years. A 9-month observational prospective research examined infants of moms with GDM who were recruited. 65 infants delivered to 82 women who had poor glucose metabolism participated in the research. 11(16.9%) patients had patent ductus arteriosus (PDA). 4(6.2%) had moderate pulmonary stenosis and 23(33.8%) had hypertrophy of the ventricular septum.

The most prevalent echocardiographic findings in one study included patent ductus arteriosus (PDA) in 54.7% of cases, hypertrophic cardiomyopathy (HCM) in 24%, ventricular septal defect (VSD) in 4%, atrial septal defect (ASD) in 2.7%, transposition of the great arteries (TGA) in 1.3%, and coarctation of the aorta (COA) in 1.3% of cases. According to the findings of a local research carried out in Lahore, 84(6%) of the 1530 full-term neonates who were recorded in the study were children of diabetes mothers (IDMs). 11(13%) of the IDMs had congenital abnormalities, with congenital heart disease being the most common.

According to a Saudi Arabian study, patent ductus arteriosus (PDA), patent foramen ovale (PFO), atrial septal defect (ASD), small muscular ventricular septal defect, mitral valve prolapse, and pulmonary stenosis were the most frequent echocardiographic findings in infants of diabetics. According to a recent study, asymmetrical septal hypertrophy, patent foramen ovale (PFO), and
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patent ductus arteriosus (PDA) were the three most prevalent echocardiographic abnormalities in IDMs. Early CHD discovery is crucial for good therapy since it helps to prevent problems. Examining babies at maternity units, postpartum clinics, special baby care units, immunisation centres, primary Health care units, and at school entry can do this.

CONCLUSION
In this high-risk population useful assessment and early CHD diagnosis are strongly suggested, and echocardiography is advised as soon as feasible for all newborns of diabetes mothers. Prenatal CHD screening programs for neonates of diabetes moms are required in our setup. Therefore, additional confirmation is anticipated in a study of a larger diabetic population.

Conflict of interest: Nil

REFERENCES