

# Frequency of Congenital Heart Defects Detected on Fetal Echocardiography in High-Risk Mothers

Maryam Iftikhar<sup>1</sup>, Syed Najam Hyder<sup>1</sup>, Saba Aziz<sup>1</sup>

<sup>1</sup>Children Hospital and Institute of Child Health, Lahore, Pakistan

## ABSTRACT

**BACKGROUND:** Early detection of congenital heart defects provides better postnatal treatment strategy and prognosis. Therefore, we aimed to determine the frequency of congenital heart defects on fetal echocardiography in high-risk mothers referred to the Children hospital, Lahore.

**METHODS:** A cross-sectional observational study was conducted in the Cardiology department, of Children Hospital, Lahore from July to December 2015. The data were collected from 138 high-risk pregnant mothers. Both maternal and fetal risk factors associated with congenital heart defects were considered for indication of fetal echocardiography.

**RESULTS:** Of the 138 high-risk pregnancies, 131 had maternal and 7 had fetal risk factors. Of the fetuses with maternal risk factors, the prevalence of

congenital heart defects was 6%. We did not find any congenital heart defects in fetuses with fetal risk factors. 2.17% congenital heart defects presented with a history of gestational diabetes mellitus and 3.62% presented with poor obstetric history ( $p \leq 0.05$ ). Atrial septal defects and ventricular septal defects each were present in 2 (1.4%) fetuses while 1 (0.72%) fetus had complete atrioventricular septal defect, 2 (1.4%) had septal hypertrophies and 1 (0.72%) had pericardial effusion.

**CONCLUSION:** We observed a 6% frequency of congenital heart defects in high-risk mothers. With this high frequency of congenital heart defects, fetal echocardiography should be included as part of second-trimester anomaly scan in all high-risk mothers.

**Keywords:** Frequency; Congenital Heart Defects; Maternal Risk Factors; Fetal Risk Factors; Fetal Echocardiography

## INTRODUCTION

The incidence of congenital heart anomalies is 0.4-1.3% [1-3]. Only 40-50% of infants with congenital heart defects are diagnosed in the first week and 50-60% in the first month after birth [4]. Congenital heart defects are associated with high morbidity and mortality rate for neonate and infant. This causes not only an economic burden on health care system, but also an emotional and financial burden on families [1,5,6].

According to a systemic review in 2005, fetal echocardiography proved 100% specific for the diagnosis of congenital heart disease [1, 7]. In 2011, a study of 39,808 fetuses found that fetal echocardiography was 85.4% sensitive and 99.9% specific for detection of congenital heart defects [1]. Furthermore, fetal echocardiography

is a safe and noninvasive procedure. Early detection of congenital heart defects provides thorough counseling of parents about the development of the fetus, postnatal treatment strategy, prognosis, reproductive options and the assessment of recurrent risks to future pregnancies [1,6].

High-risk mothers are those in which the risk of child born with congenital heart defects increases due to the presence of certain risk factors, such as diabetes mellitus, gestational diabetes mellitus, mother with history of congenital heart defects, previous child history (child with congenital heart defects born to mother or child death), mother taking anticonvulsant or anti-epileptic drugs, mother with autoimmune disease (e.g. systemic lupus erythematosus), poor obstetric history (history of stillbirth/ neonatal death, three

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Correspondence to: Dr Syed NajamHyder

Address: Children Hospital and Institute of Child Health, Lahore, Pakistan

Email: [drnajamhyder@gmail.com](mailto:drnajamhyder@gmail.com)

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or more consecutive abortions etc) [8-10]. High-risk fetuses are those in which the risk of congenital heart defects increases due to the presence of risk factors such as fetal hydrops, suspected cardiac abnormality on ultrasound, increased nuchal translucency thickness, the abnormal karyotype of fetus e.g., trisomy 21, fetal arrhythmias [9,11], oligohydramnios and polyhydramnios.

Examination of the fetal heart has evolved considerably over the past 2 decades. Initially, the role of the pediatric cardiologist was counseling of the families on what to expect after delivery if the fetus survived to be evaluated postnatally.

Therefore, this study was designed to determine the frequency of congenital heart diseases in our region especially in high-risk pregnancy and fetus.

## METHODS

This cross-sectional study was performed in the Cardiology Department of the Children Hospital & Institute of Child Health Lahore over a 6 months period. All pregnant women who were referred to the Cardiology Department for fetal echocardiography due to maternal or fetal risk factors were included in the study. Relevant demographic and clinical history was recorded. All echocardiography were performed by a consultant pediatric cardiologist using M4S probe of 3 Hertz frequency on GE vivid 7 model of echocardiography machine. Following echo, modalities were used to evaluate fetal heart using a transabdominal approach by two-dimensional echo (2-D echo), motion-mode echo (M-mode echo), Doppler echo (continuous wave (CW) Doppler, pulsed-wave (PW) Doppler, color flow mapping [1]. Standard transverse, four chamber, five chambers, three vessels view, arch and outflow and inflow track views were taken.

The data was managed and analyzed using SPSS version 20. Data was described in terms of frequencies and percentages for categorical variables. Crosstables and Chi-square tests were used for data analysis. A p-value < 0.05 was considered as significant.

## RESULTS

Of the 138 high-risk pregnant women who underwent fetal echocardiography, congenital heart defects were found in 8 (6%) fetuses. All these congenital heart defects were found in fetuses with maternal risk factors (Table 1).

Maternal risk factors were present in 131(95%) pregnancies with the most common reason being previous child deaths (n=34) followed by gestational diabetes (n=28) and previous child with congenital heart defects (n=21). Fetal risk factors were present in the remaining 7 pregnancies and included 6 with polyhydramnios and 1 with oligohydramnios.

Of the six mothers with congenital heart defects in the fetus, five had a poor obstetric history ( $p \leq 0.05$ ) and three had a history of gestational diabetes mellitus.

Congenital heart defects detected in fetuses were as follows: 2 large atrial septal defects, 2 ventricular septal defects, 1 complete atrioventricular septal defect, 2 were septal hypertrophies, and 1 was pericardial effusion.

Interestingly, the maximum congenital heart defects were found in mothers with age between 25-30 years of age.

## DISCUSSION

We found a relatively low prevalence of congenital heart defects in high-risk mothers. The reported incidence of congenital heart defect in literature is 4-13% per 1000 live births [12,14,15].

The prevalence of congenital heart disease on screening is 9.96% to 10% [13,16,20]. Rocha et.al [13] described the experience of a tertiary center in Brazil after 271 fetal heart screenings. Similar to our findings, other studies have also found that the common reasons for fetal echocardiography referral were maternal risk factors [17-19]. The referral patterns of high-risk women in our study were similar to published literature; a family history of congenital heart defects, diabetes mellitus, autoimmune disease and hydrops [21-24].

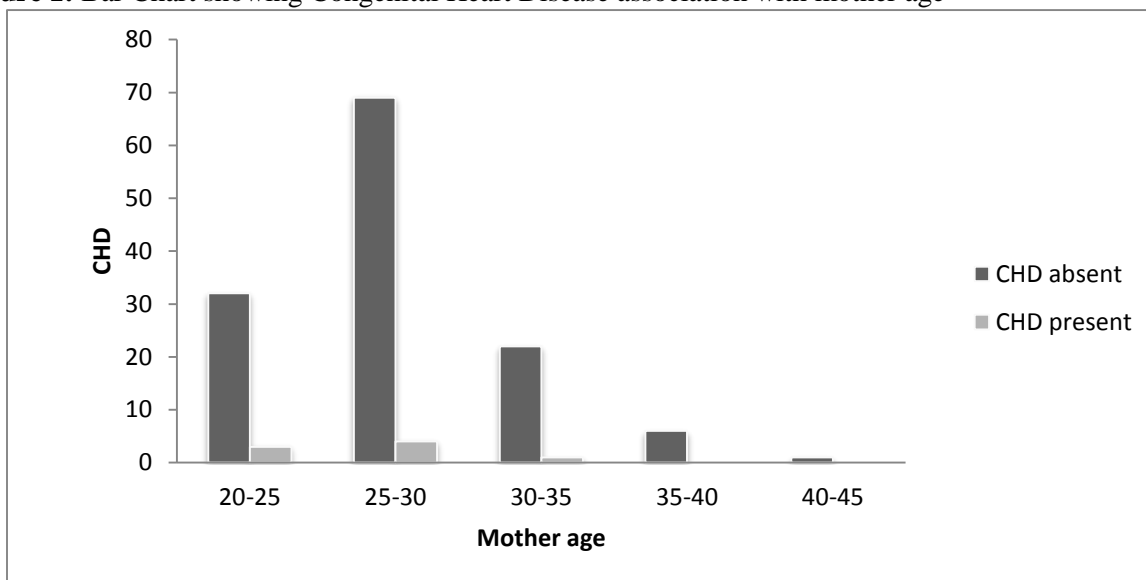
Our study has some important limitations. This was a single center study and thus results might not be generalized to other settings. The identification of high-risk pregnant women was based on referrals and thus referral pattern may have affected the prevalence rate of congenital heart diseases in the fetuses. This was a cross-sectional study and thus, we cannot comment on the outcomes of these fetuses after delivery.

## CONCLUSION

We observed a relatively low (6%) frequency of congenital heart defects in high-risk women. Although low compared to what is reported in the literature, the frequency remains high. There-

**Table 1:** Risk Factors of mothers referred for fetal echocardiography

History	CHD absent	CHD present	Total
<b>Maternal Risk factors</b>			
Diabetes mellitus	15	0	15
Gestational diabetes mellitus	25	3	28
Hypertension	2	0	2
Mother with CHD	8	0	8
Previous child with CHD	21	0	21
Previous child death	34	0	34
Bad obstetric history	13	5	18
Autoimmune disease	1	0	1
Others	4	0	4
<b>Fetal Risk factors</b>			
Polyhydramnios	6	0	6
Oligohydramnios	1	0	1

**Figure 1:** Bar Chart showing Congenital Heart Disease association with mother age

-fore, fetal echocardiography should be included as a part of the second trimester anomaly scan in all high-risk women

#### ETHICS COMMITTEE APPROVAL

Approval was taken through an Ethical committee of The Children Hospital and Institute of Child Health, Lahore. Consent form filled after taking consent from mother and father.

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