



## Second Trimester Fetal Echocardiography in Women With Diabetes. A Tertiary Care Experience

### KEYWORDS

CHD, fetal echo, diabetes.

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**ABSTRACT BACKGROUND:** *Incidence of Diabetes during pregnancy varies widely, from 5 to 7%. Diabetes, especially uncontrolled and poorly managed, has an adverse outcome in fetus and is associated with increased incidence of congenital heart disease.*

**AIMS AND OBJECTIVES:** *The present study aims to study the profile of congenital heart disease in fetuses of women with Diabetes, both gestational and preexisting, to examine the relation of Diabetes control as diagnosed by HbA1c level in the last 3 months with the incidence of congenital heart disease, to follow through the pregnancies and to study the incidence of CHD in the newborns.*

**MATERIAL AND METHODS:** *The study is a retrospective and observational study, with followup 2DEcho of the newborns.*

*From January 2014 to April 2016, a total number of 982 fetal echoes were performed by a single operator. Of these patients, 106 women were diabetic. 89 of them had gestational diabetes. 17 patients were already diabetic at the time of pregnancy. The incidence of CHD was recorded in all pts. The Hba1c levels in the past 3 months was recorded where they were available.*

*Statistical analysis was performed using Statistical Package for Social Services (SPSS) CHICAGO, IL USA. Except the cases where complex CHDs were diagnosed, all women with Diabetes were instructed to bring the newborns for 2DEcho within one day of birth.*

**RESULTS :** *Overall CHD incidence at the time of fetal echo cardiogram in second trimester was 13.2%. Commonest disease was D transposition of great arteries, followed by TOF, AVSD and septal defects. Women with isolated gestational Diabetes had more incidence of CHD than women who were already diabetic at the time of conception. HbA1c levels were available only in 54% women with GDM but were available in all women with established Diabetes. Complex CHD was found only in women with GDM. In the newborns, 8 (7.7%) had hypertrophic cardiomyopathy and all of them were asymptomatic.*

**CONCLUSIONS :** *The second trimester fetal echocardiogram is a valuable tool for diagnosing CHD in fetuses of women with Diabetes. Commonest CHD diagnosed in diabetes was D transposition of great arteries, followed by equal incidence of TOF, AVSD and septal defects. The commonest CVS anomaly diagnosed in the newborn period was HCM*

### ABBREVIATIONS:

CHD : Congenital heart disease

FE : Fetal echo

AIUM : American institute of ultra sound in medicine (AIUM )

DTGA : D Transposition of Great Arteries

AVSD : atrioventriculr Septal Defect

TIFFA : Targeted imaging for fetal anomalies

OS ASD : Ostium secundum atrial septal defect

VSD : Ventricular septal defect

GDM : Gestational Diabetes Melitus

HCM : hypertrophic cardiomyopathy

### INTRODUCTION :

The incidence of Diabetes in pregnancy is 5 to 8% in various study populations, with GDM being more common than established Diabetes.<sup>1</sup> Some studies suggest that the risk of cardiac disease is lower in GDM, as they have better glycemic control. Fetal echocardiogram is an accurate tool for diagnosing CHD prenatally. In high risk groups like Diabetes, fetal echo helps in planning the management of newborns<sup>2</sup>. Schayer et al reported the rate of major congenital anomalies in type 2 Diabetes to be 8.9%, with one third be-

ing cardiac anomalies. Compared to pregestational Diabetes, GDM is associated with less CHD, as there is less maternal hyperglycemia during organogenesis in the first trimester<sup>3</sup>.

We present the data of incidence and an analysis of the type of CHD in fetuses of diabetic women referred to us for fetal echocardiogram. The correlation between Hba1c in the past three months and the incidence of CHD and the correlation with results of 2DEcho in the newborns..

**MATERIAL AND METHODS:**

From January 2014 to April 2016, a total number of 982 fetal echoes were performed at our center. Of them, 106 women were referred with Diabetes as the indication for fetal echo. All fetal echoes were performed on Philips IE33 Echo machine, by a single operator. Of these patients, 106 women were diabetic. 89 of them had gestational diabetes. 17 patients were already diabetic at the time of pregnancy. The incidence of CHD was recorded in all pts. The HbA1c levels in the past 3 months were recorded where they were available. All the women were referred for fetal echo between 20 to 22 weeks of gestation. The patient demographics are given below.

**PATIENT DEMOGRAPHICS OF DIABETIC WOMEN REFERRED FOR FETAL ECHOCARDIOGRAM**

Average age of patients	25 years
Preexisting Diabetes	17 {16%}
Gestational Diabetes	89 {83%}
Obesity { BMI of more than 30kg/M <sup>2</sup> }	48{45%}
Primipara	82 {77%}
Hypertension	26{24%}
Hypothyroidism	8{ 7%}

Fetal 2D, M mode and Doppler echocardiography including color flow imaging was performed with IE 33 echo machine ( Philips ), using 1 to 5 MHz and 3 to 8 MHz probes.

The FE studies were performed in accordance with American institute of ultra sound in medicine (AIUM ) practice guide lines for the performance of fetal echo cardiography<sup>2</sup>

Statistical analysis was performed using statistical package for social sciences SPSS: CHICAGO, IL USA program, version 15. Continuous data were expressed as mean +standard deviation.

Women with diagnosis of complex CHD on FE were advised close prenatal monitoring and in hospital delivery , with neonatologist and pediatric cardiologist in attendance. All the other women with diagnosed CHD and women were advised to bring the newborns for 2D echo within 1 day of delivery.

**ATRIOVENTRICULAR SEPTAL DEFECT IN FETAL ECHO IN A GESTATIONAL DIABETES PATIENT**

**RESULTS :** Of the 106 women with Diabetes, 17 pts had preexisting Diabetes and all of them were started on long acting insulin once pregnancy was diagnosed. HbA1c was available in all these patients. 89 patients had gestational diabetes and were on insulin and oral metformin. HbA1c levels were available in only 48 pts.(54%). The incidence of heart disease was as follows.

**INCIDENCE OF CONGENITAL HEART DISEASE IN FETUSES OF DIABETIC MOTHERS**

CONGENITAL HEART DISEASE	PERCENTAGE
D Transposition of great arteries	4{3.7%}
Atrioventricular septal defect	2 ( 1.8%)
Ostium secundum ASD	2 (1.8%)
Tetralogy of Fallot	2 (1.8%)
Subaortic VSD	2 (1.8%)
Taussig Bing anomaly	1 (0.9%)
Hypoplastic left heart syndrome	1 (0.9%)

The noncardiac anomalies associated were ,polyhydramnios in 10 pts(9.4%) ,single umbilical artery in one pt.(0.9%).

Hypertrophic Cardiomyopathy was diagnosed by in 8 fetuses by increased interventricular septum and free wall thicknesses. On followup all these newborns were asymptomatic.

All women ,except when complex CHDs were diagnosed, were asked to bring the newborns for 2DEcho.

On followup, only the diagnosis of one case of ostium secundum ASD was missed. All the complex CHDs were diagnosed in women with GDM.

On followup, there was one stillbirth ,of the fetus with HLHS.

**DISCUSSION :**

Diabetes in pregnancy is associated with 5 to 8.5% incidence of CHD in 100 livebirths<sup>1</sup>. In our study the incidence of CHD, apart from HCM , was 13.2%.(14 cases.).

The glycemic control especially in the first trimester is closely related to the incidence of CHD<sup>3</sup>. In our study the correlation could not be performed as the HbA1c levels were not available in half the number of patients.

Usually GDM is associated with lesser adverse CVS outcomes compared to established Diabetes<sup>5</sup>. But In our study, complex CHD was found only in patients with GDM. This could be because of more number of GDM pts in our study, lack of patient awareness of the consequences of hyperglycemia, presence of hitherto undiagnosed Diabetes by the time of pregnancy. Also, lack of complex CHD in patients with preexisting Diabetes could be because of controlled glycemic conditions at the time of conception and during early months of pregnancy.

Uncontrolled Diabetes is commonly associated with conotruncal anomalies and VSDs<sup>4</sup>. The commonest CHD diagnosed by fetal echo in our study was D Transposition (3.7%), followed by equal incidence of TOF, AVSD and septal defects. In the newborns, the commonest cvs anomaly was HCM (7.5%). HCM is usually associated with self limited heart failure<sup>8</sup>. But all the newborns with HCM were asymptomatic at birth in our study.

**CONCLUSIONS :**

The second trimester fetal echocardiogram is a valuable tool for diagnosing CHD in fetuses of women with Diabetes . Commonest CHD diagnosed in diabetes was D transposition of great arteries, followed by equal incidence of TOF ,AVSD and septal defects. The commonest CVS

anomaly diagnosed in the newborn period was HCM

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