# Role of Fetal Echocardiography in Diagnosis of Fetal Congenital Heart Disease

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**Abstract:** Prenatal diagnosis of congenital heart disease is now well established for a wide range of cardiac anomalies. Diagnosis of congenital heart disease during fetal life not only identifies the cardiac lesion but may also lead to detection of associated abnormalities. This information allows a detailed discussion of the prognosis with parents. For continuing pregnancies, appropriate preparation can be made to optimize the postnatal outcome. Reduced morbidity and mortality, following antenatal diagnosis, has been reported for coarctation of the aorta, hypoplastic left heart syndrome, and transposition of the great arteries. With regard to screening policy, most affected fetuses are in the "low risk" population, emphasizing the importance of appropriate training for those who undertake such obstetric anomaly scans. As a minimum, the four chamber view of the fetal heart should be incorporated into mid trimester anomaly scans, and where feasible, views of the outflow tracts should also be included, to increase the diagnostic yield. Newer screening techniques, such as measurement of nuchal translucency, may contribute to identification of fetuses at high risk for congenital heart disease and prompt referral for detailed cardiac assessment. **In conclusion:** As regarding the stronge association between the risk factor and the fetal congenital heart, yet the high incidence of congenital heart disease among the low risk female make the basic fetal echocardiography is mandatory study throughout the all fetuses.

[Amani Emad Eldin Radi, Yasser Ibrahim Abdelkhalek, Ali Hagag Ali, Samar Hosny Hassan Suliman. **Role of Fetal Echocardiography in Diagnosis of Fetal Congenital Heart Disease.** *Nat Sci* 2018;16(11):89-91]. ISSN 1545-0740 (print); ISSN 2375-7167 (online). http://www.sciencepub.net/nature. 13. doi:10.7537/marsnsj161118.13.

**Keywords:** Fetal, Echocardiography, Diagnosis, Congenital, Heart

## 1. Introduction

Congenital heart disease is a leading cause of infant morbidity and mortality, Accurate prenatal diagnosis offers potential clinical benefit with regard to infant outcome.

Fetal echocardiography is broadly defined as a detailed sonographic evaluation that is used to identify and characterize fetal heart anomalies before delivery. This specialized diagnostic procedure should be performed only when there is a valid medical reason, and the lowest possible ultrasonic exposure settings should be used to gain the necessary diagnostic information. While it is not possible to detect every abnormality, adherence to the proper parameter will maximize the probability of detecting most cases of clinically significant congenital heart disease.

When congenital heart disease is diagnosed during fetal life, the expectant parents should have a detailed discussion with a fetal cardiologist with regard to the prognosis of the cardiac lesion, covering not only procedural risks, but also long-term mortality, morbidity, and quality of life. There should also be a discussion with regard to possible associations, including karyotypic abnormalities, noncardiac structural anomalies, and syndromes to have a full picture of the prognosis for their baby.

Depending on the severity of the cardiac lesion, the associated abnormalities, gestational age, and local laws, one of the options open to parents may include termination of pregnancy ( Hoffman and Massaro, 2008 ).

**The aim of the work:**

The aim of the current study is to evaluate the role of fetal echocardiography in diagnosis of different fetal congenital heart disease in high risk pregnancies compared to non risk pregnancy in order to asses how the fetal echocardiography is benificial in early diagnosis and mangement of fetuses with congenital heart diseases.

## 2. Patients and Methods

**Study place**: Fetal medicine unit –Ain Shams hospital – Egypt.

**Sample size:** 60 patients.

**Equipment used:**

Colour Doppler ultrasonography is used.

**The routine fetal echocardiography will be done as follow:**

**General consediration:**

Fetal echocardiography is commonly performed between 18 and 22 c weeks.

**Cardiac imaging parameters (basic approach):**

The fetal echocardiogram is adetailed evaluation of cardiac structure and function. this method include segmentalanalysis of 3 basic areas include the atria,

ventricles and great vessels, by the following protocoal.

**Gray scale imaging:**

Determining the abdominal situs.

Transverse view of the abdomen.

Four-chamber view.

Left ventricular outflow tract view.

Right ventricular outflow tract view.

Three-vessel view**.**

Three-vessel-trachea view (transverse aortic and ductal arch view).

Aortic arch view.

Ductal arch view.

Bicaval view (SVC and IVC view).

- Doppler sonography (optional but recommended for suspected cardiac flow abnormalities).
- M- mode echocardiography (optional for cardiac rhythm abnormalities ).
- **Inclusion criteria:-**

All pregnant female with high risk and without risk factor to congenital anomalies were included in this study.

**Risk factors includes:**

**Fetal factor:**

Suspected cardiac abnormality onscreening ultrasound.

Fetal hydrops.

Increase fetal nuchal translucency in early fetal ultrasound.

Fetal abnormality with known association of congenital heart disease e.g., exomphalos, diaphragmatic hernia.

Fetal arrhythmia.

Abnormal fetal karyotype, e.g., trisomy 21.

**Maternal and familial risk factors**

Family history of congenital heart disease (CHD) in a first degree relative.

Diabetes mellitus – Mothers who are established diabetics on treatment. Mothers taking known teratogenic drugs, e.g., anticonvulsants, lithium.

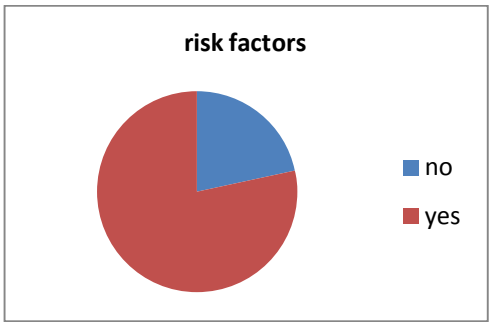


Figure1. Distribution of patients according to presence of risk factor

## 3. Results

Table1. distribution of patients according to presence of risk factor

| | | Count | Column N % |
|---|---|---|---|
| Risk | no risk | 11 | 21.6% |
| | risk | 40 | 78.4% |

This table shows that 78.4% of patients had risk factors and other 21.6% had no risk factors

**Table2. association between risk factors and occurrence of congenital anomalies**

| | | Risk | | | | | | Fisher exact test | P |
|---|---|---|---|---|---|---|---|---|---|
| | | no risk | | | risk | | | | |
| | | Count | Column N % | Row N % | Count | Column N % | Row N % | | |
| anomaly_c | VSD | 1 | 9.1% | 16.7% | 5 | 12.5% | 83.3% | 20.186 | .018* |
| | ASD | 0 | 0.0% | 0.0% | 1 | 2.5% | 100.0% | | |
| | AVSD or AV canal | 0 | 0.0% | 0.0% | 7 | 17.5% | 100.0% | | |
| | Fallottetrology | 0 | 0.0% | 0.0% | 4 | 10.0% | 100.0% | | |
| | Hypoplastic left heart | 0 | 0.0% | 0.0% | 4 | 10.0% | 100.0% | | |
| | Hypoplastic right heart | 0 | 0.0% | 0.0% | 2 | 5.0% | 100.0% | | |
| | TGA | 1 | 9.1% | 50.0% | 1 | 2.5% | 50.0% | | |
| | Coarctation | 2 | 18.2% | 50.0% | 2 | 5.0% | 50.0% | | |
| | Valve stenortic anomalies | 2 | 18.2% | 100.0% | 0 | 0.0% | 0.0% | | |
| | Rare (double outlet) | 1 | 9.1% | 50.0% | 1 | 2.5% | 50.0% | | |
| | Arrhythmia | 2 | 18.2% | 66.7% | 1 | 2.5% | 33.3% | | |
| | vascular anomalies other interruption aa or ductus aneurysm | 2 | 18.2% | 40.0% | 3 | 7.5% | 60.0% | | |
| | cardiac masses | 0 | 0.0% | 0.0% | 1 | 2.5% | 100.0% | | |
| | Ebstein | 0 | 0.0% | 0.0% | 1 | 2.5% | 100.0% | | |
| | Combined | 0 | 0.0% | 0.0% | 7 | 17.5% | 100.0% | | |

This table shows that there was significant association between presence of risk factors and occurrence of congenital anomalies p-value 0.018

**4. Discussion**

In the current study we found that 78.4% of patients had risk factors and other 21.6% had no risk factors, 31.4% of patients had associated other anomalies,29.4% had abnormal 4th chamber of heart,21.6% of patients had no risk factors,7.8% had previous baby anomaly,3.9% had multiple risk factors,2% had positive family history, exposure to radiation, gestational diabetes, there was significant association between presence of risk factors and occurrence of congenital anomalies p-value 0.018 and no significance association between the prescence of risk factor and occurrence of different syndromes p-value 0.628, Mohammed NB et al and Stümpflen I et al studied that majority of pregnancies in fetus with cardiac anomaly are at no increased risk and routine prenatal ultrasound almost misses an isolated cardiac anomaly, hence routine fetal echo must be done to rule out Congenital heart disease (**Stümpflen et al.,1996; Mohammed et al.,2011).**

In agreement with our result In **Barani** et al (2016) study, out of 11 cardiac anomaly cases, 4 cases (36.6%) did not have any high risk factor followed by Oligohydramnios in 3cases (27.27%) Mother with congenital heart disease, IUGR and Oligohydramnios were the risk factors found to have significant difference ($p<0.01$) between patients with and without cardiac anomaly. Patients without any risk factors was also found to have statistically significant difference ($p<0.01$) (**Barani et al., 2016).**

In addition to Pavlicek J et al (2018) study found that the risk factors were identified in 25% (8990/35,831) of pregnancies. In total, CHDs were detected in 1.1% (394/35,831) of fetuses. The prevalence rate of CHDs was higher in the pregnancies with than in those without the risk factors (2.5% [221/8990] versus 0.6% [173/26,841]; $p < .0001$). The presence of pregnancy- and fetus-related risk factors (odds ratio [OR], 6.5; 95% confidence interval [CI], 4.3-9.7) and pregnancy after IVF (OR, 2.8; 95% CI, 1.5-5.2) were found to be independent risk factors of CHDs (**Pavlicek et al.,2018**) and this in consistence with our result.

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9/5/2018