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FETAL ECHO AS AN ANTENATAL SCREENING TOOL IN LOW RISK WOMEN

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ABSTRACT
Around 2,40,000 children in India are born with CHD. Accurate prenatal diagnosis has potential to improve postnatal outcome. Fetal echo is highly specific for early detection of CHD. Aim of this study is to assess the Role of fetal Echo along with anomaly scan and to determine the prevalence of congenital heart disease with or without risk factors. Our study is Prospective Observational Study done at fetal medicine unit, Saveetha Medical College and Hospital from April 2020 to March 2021. 600 antenatal mothers recruited for fetal echo along with anomaly scan. Maternal (elderly gravida, Diabetes, with CHD, previous birth with CHD,1st degree relative with CHD, maternal autoimmune disorder, H/O drug intake) & fetal risk factors(raised NT, polyhydramnios, ascites, arrhythmias) analyzed, type of fetal cardiac defect noted postnatal follow up done. In our study the overall prevalence of CHD was 5.5%. Incidence of CHD in high risk mother 0.3% & low risk 5.17%. More than 50% CHD occurred in low risk maternal patients. Mean age women- 24.37yrs & mean GA fetus – 21+2wks. A total of 600 fetal echo were performed, 118-High risk mother & 482 low risk conventionally with CHD. Among high risk, TAPVC-2, Multiple membranous VSD-3, Double outlet RV with PS-1. Among low risk small 3mm VSD – 6, large VSD-4, VSD with aortic arch hypoplasia-1, TGA-2, Supraventricular Tachycardia for fetus-1, TOF-4, Ebsteins Anomaly-2, Common atria/TAPVC/TR-1, Asymmetrical cardiac chamber outflow tract-1, HLH-4, Situs-inversus wih Dextrocardia without any defect-1. Medical termination of pregnancy done for 7 cases (aortic arch hypoplasia-1, Common atria-1, HLH-4, Assymertical cardiac chamber-1), rest admitted in NICU and treated. Our study clearly reveals substantial proportion of CHD occurs in low risk women. Therefore, we recommend that atleast one detailed FE should be considered.

INTRODUCTION
By every year around 2,40,000 children are born with congenital heart disease in India.[1] Definitive prenatal diagnosis will potentially improve survival in such cases especially in postnatal period ranging from prostaglandin infusion to emergent atrial septosomy.[2,3] Due to limited availability of cardiac care in our country, timely inutero referral of fetus with complex cardiac disease to centers well with obstetric and neonatal cardiac care are more relevant. As the fetal cardiac examination requires time and skill, some are missed during routine screening.[4] Fetal echo has highest sensitivity and specificity for detection of congenital heart disease. Some fetal echo are reported abnormal even after anomaly scan.[5] Based on these observation, some recommend fetal echo as a part of anomaly scan in low risk women. Due to lack of large data fetal echo has not been incorporated into routine practice or into guidelines.[6] As the fetal echo was reserved mostly for high risk pregnancies, the present study was conducted to evaluate role of fetal echo in finding congenital heart disease in low risk antenatal women while doing anomaly scan.

METHODS
Study design, subject and demographic data: This is a prospective observational analytical study done in fetal medicine unit; Saveetha medical college and Hospital in 600 antenatal women with GA 18-22weeks from April 2020 to March 2021 after getting informed consent. The GA was determined by early obstetric scan.All were subjected to routine anomaly scan before doing fetal echo. Baseline data including maternal age, GA, history of consanguinity, drug intake, history of congenital heart disease in mother or in offspring or in first degree relative(also in paternal side), maternal diabetes, exanthematous fever in first trimester, connective tissue disorders, any non-cadiac abnormalities in obstetric scan (including raised nuchal translucency, fetalarrhythmias, fetalhydrops, fetal growth restriction, polyhydramnios), number of fetuses in current pregnancy and suspected

cardiac abnormality during anomaly scan. They were categorized into high risk groups and low risk groups.

Institutional ethical committee approved and written informed consents obtained from the participants.

Fetal echocardiography: Detailed fetal cardiac imaging was done in fetal medicine unit, imaging done using available ultrasound system (Vinno G60) underfetal echo-2T mode using S2-L curvilinear transducer following recommendations from American institute of ultrasound medicine(AIUM) and ISUOG. In fetal echo initially situs confirmed, structural normalcy confirmed with four chamber view(4CV), apical five chamber view, left and right ventricular outflow tract views(LVOT & RVOT respectively),3-Vessel view,3- vessel tracheal view, bicavalview, long axis view of aortic arch, long axis view of ductal arch, high short-axis view great arteries and low short axis view ventricles. Fetal heart rate and any arrhythmia if, confirmed in M-mode. Pulse wave Doppler and color Doppler used across shunts and wherever necessary. All images were recorded and stored in digital media.

RESULTS

The mean age of participating women was 24.37years and the mean gestational age of fetus on the date of fetal echocardiography was 21.2weeks.The prevalence of risk factors is mentioned in Table 1. A total of 600 fetal ECHO was performed; of which 118 had at least one risk factor either maternal or fetal factor and 482 subjects had no risk factor associated conventionally for CHD. A total of 56 fetuses were found to have some cardiac abnormality in fetal echo, of which 33 had CHD; 2 had isolated moderate pericardial effusion which was not found in next scan,21 had hyperechoic spots (20 in left ventricle and 1 right ventricle).

Of the 33 cases of CHD, Total anomalous pulmonary venous connection-2, Multiple membranous ventricular septal defect -3, Double outlet right ventricle with pulmonic stenosis – 1, small 3mm VSD – 6, large VSD-4, VSD aortic arch hypoplasia-1,Transposition of great arteries - 2,Supraventricular tachycardia for fetus-1,Tetralogy of fallot -4,Ebsteins anomaly -2, Common atria/TAPVC/TR-1,Asymmetrical cardiac chamber, outflow tract-1,Hypoplastic left heart-4, situsinversus with dextrocardia without any other associated defect -1. Medical termination of pregnancy done for 7 cases (aortic arch hypoplasia-1, common atria-1, Hypoplastic left heart-4, asymmetrical cardiac chamber-1), rest admitted in NICU and treated.

In addition to the structural anomalies 8 fetuses had sinus tachycardia, 1 had sinus bradycardia. Of all the fetuses with CHD, only 2 belong to high risk group, rest to the pregnancies without conventional maternal risk factors. This comes statistically significant where p value is p=0.043 by the Fischer exact test.

DISCUSSION

CHDs are the most common form of congenital anomaly among humans. The technique of fetal echocardiography was pioneered by Winsberg in 1972[7], since then fetal echo was evolved significantly to its current stage of highly specialized and clearly evaluating functional and structural prenatal evaluation of fetal heart. Early diagnosis of CHDs in prenatal period by fetal echocardiography is very important in managing such pregnancies ranging from prenatal visits to outcome of delivery including termination[8,9], thus treating the fetus as individual patient, with already available as well as with evolving therapeutic options[10], expanding fron maternal administration of medication to minimally invasive fetoscopic guided techniques to open fetal heart surgeries.[6] The prenatal detection of CHD in unselected mothers was excellent and comparable to investigators where fetal echo was done trained professionals[11,12] on the contrary when it was done by persons with basic ultrasound training. Hence, we could achieve more sensitivity and specificity probably if all cardiac screening were done by professionals trained in fetal echocardiography.

Similar to other studies which investigates role of fetal echo in pregnancies[13,11,12,14], we obsereved that a substantial proportion of CHDs occurred in fetus recognized to be at low risk for developing CHD. The incidence of CHD as seen in our study is 5.5% for 100 pregnancies, 0.3% - high risk, 5.1% - low risk pregnancies. Large proportion of CHD detected in low risk group (31 out of 33cases). Based on these findings it is suggested highly that every woman should be subjected to fetal echocardiography as a part of routine anomaly screening. If prenatal diagnosis is delayed [15,16,17], it delays appropriate action often causing mental trauma to the parents, prohibiting them to take timely decision about pregnancy termination. Most common reason in failure to recognize cardiac malformation during routine obstetric scan is due to lack of operator skill[18,19], since the assessment of heart is different from other organs due to its size and continuous motion. It is also noticed that defects in 4CV are relatively less missed when compared to abnormalities missed in outflow tract and conotruncal anamolies.[20,21] To overcome this, different strategies and technologies are being tried which reduces operator dependency like 3D,4D echo[22], with STIC – spatio temporal image correlation and the 5D heart[23], utilizes fetal intelligence navigation echocardiography. Though encouraging these sophisticated techniques are not going to help for our existing problem of under and delayed diagnosis. Therefore, offering fetal echocardiography by an expert once, to all the pregnant women, in addition to routine second trimester scan is more practical, efficient and cost effective method in improving the diagnosis and prognosis of CHD.

CONCLUSION

In our study the substantial proportion of CHD occurred in women not considered high risk giving birth to fetus with congenital heart disease. Also confirms that fetal echo has high sensitivity and specificity with strong predictive value. Therefore, we would like to emphasize that fetal echocardiography should be included as a part of routine anomaly screening irrespective of risk factors for CHDs.

STRENGTH AND LIMITATION: Enough sample size, prospective collection of data, post natal follow up in 85% cases ensures accuracy of this study; follow up postnatal echocardiography could not be done to all cases and autopsy not done either if abortion or baby died immediately after birth out of our institution.

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