

Cardiac Abnormalities in Fetuses of Diabetic Mothers

Thesis

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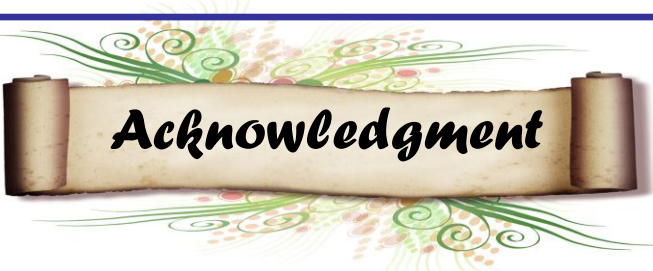
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بِسْمِ اللَّهِ الرَّحْمَنِ الرَّحِيمِ

(...رَبِّ أَوْزَعْنِي أَنْ أَشْكُرَ نِعْمَتَكَ الَّتِي
أَنْعَمْتَ عَلَيَّ وَعَلَى وَالِدَيَّ
وَأَنْ أَعْمَلَ صَالِحاً تَرْضَاهُ وَأَدْخِلْنِي
بِرَحْمَتِكَ فِي عِبَادِكَ الصَّالِحِينَ)

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List of Abbreviations

2D	Two-dimensional
3D	Three-dimensional
4D	Four-dimensional
ADA	American Diabetes Association
AO	Aorta
AVSD	Atrioventricular septal defect
BSA	Body surface area
CAT	Common arterial trunk
CM	Cardiomyopathy
DM	Diabetes mellitus
DORV	Double outlet right ventricle;
EM	Epithelio-mesenchymal
GCT	Glucose challenge test
GDM	Gestational diabetes mellitus
HAPO	Hyperglycemia and Adverse Pregnancy Outcomes
HbA1c	Glycosylated hemoglobin

HCM	Hypertrophic cardiomyopathy
HDL	High-density-lipoprotein
HLHS	Hypoplastic left heart syndrome
IAA	Interrupted aortic arch
IADPSG	The International Association of the Diabetes and Pregnancy Study Groups
IDM	 Infant of a diabetic mother
IUGR	Intrauterine growth restriction
IVST	Interventricular septal thickness
LA	Left atrium
LDL	Low-density-lipoprotein
LGA	Large for gestational age
LV	Left ventricle
NAFLD	Non alcoholic fatty liver disease
NASH	Inflammatory steatohepatitis
NBT	Nitroblue tetrazolium colorimetric
NTB	Nitrotetrazolium-blue
OGTT	Oral glucose tolerance test

OR	Odds ratio
PA	Pulmonary artery
PVH	Pathologic ventricular hypertrophy
PVH	Pathologic ventricular hypertrophy
PVPI	Pulmonary vein pulsatility index
RA	Right atrium
RBCs	Red blood cells
RV	Right ventricle
SGA	Small for gestational age
SSA	Anti-Ro
SSB	Anti-La
T1DM	Type 1 diabetes mellitus
T2DM	Type 2 diabetes mellitus
TBA	Thiobarbituric acid colorimetric
TDI	Tissue Doppler imaging
TGA	Transposition of the great arteries
TGA	Transposition of great arteries

 List of Abbreviations

TOF&PA.....Tetralogy of Fallot with pulmonary atresia

TOF.....Tetralogy of Fallot

TTTS.....Twin-twin transfusion syndrome

VSD.....Ventricular septal defect

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Introduction

The consequences of uncontrolled diabetes mellitus (DM) during pregnancy are severe to both mother and fetus. The risk of congenital malformations among infants of diabetic mothers is related to the diabetic control these mothers receive (*Alien et al., 2007*).

Maternal DM affects the fetal heart both structurally and functionally. In early gestation, it has a teratogenic effect causing primary cardiogenesis defects. In late gestation, it causes a unique form of hypertrophic cardiomyopathy (*Chaudhari et al., 2008*).

Cardiomegaly is a common finding in stillborn infants of mothers with DM and may contribute to the risk of fetal death in these pregnancies (*Russell et al., 2008*).

Given the increased risk of congenital abnormalities among infants of diabetic mothers, an appropriate biochemical and ultrasonographic screening process and a detailed evaluation of fetal cardiac structure should be offered to all pregnant women with diabetes (*Wilson et al., 2007*).

The timing of development of the myocardial changes in the fetus of the diabetic mother has been well demonstrated by fetal echocardiography. Fetal echocardiographic investigations suggest the onset of hypertrophy occurs even before 20 weeks of gestation with documentation of increased ventricular septal

thickening relative to fetuses in non diabetic pregnancies (*Macklon et al., 1998*).

Fructosamines are keto-amines formed by a non-enzymatic reaction between glucose and a protein (60-70% of which is glycosylated with albumin in serum), depending upon the severity and the duration of the hyperglycemia. Therefore, serum fructosamine directly reflects the dynamics of blood glucose concentration and correlates significantly with the mean plasma glucose levels from the preceding 1 to 3 weeks (*Weerasekera et al, 2000*).

Fructosamine testing has been available since the 1980s. Both fructosamine and HbA1c are used primarily as monitoring tools to help diabetics control their blood sugar, but the A1C test is much more popular and more widely accepted. However, the American Diabetes Association (ADA) recognizes both tests and says that fructosamine may be useful in situations where the A1C cannot be reliably measured (*Goldstein et al, 2004*).