The Role of Umbilical Cord Thickness, Interventricular Septum Thickness and HbA1c Levels in the Prediction of Fetal Macrosomia in Patients with Gestational Diabetes Mellitus

Thesis

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بسم الله الرحمن الرحيم

وقُلِ اعْمَلُوا فَسَيَرَى اللَّهُ عَمَلَكُمْ ورَسُولُهُ والْمُؤْمِنُونَ

صدق الله العظيم

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*First, thanks are all due to **Allah** for Blessing this work until it has reached its end, as a part of his generous help throughout our life.*

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Noha Atteya Elsayed Mohamed Selim

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List of Abbreviations

ACCORD	:	Action to Control Cardiovascular Risk in Diabetes
ACOG	:	American college of obstetrician and gynecology.
ADA	:	The American Diabetes Association
BMI	:	Body mass index
DCCT	:	Diabetes Control and Complications Trial
EASD	:	European Association for the Study of Diabetes
GDM	:	Gestational diabetes mellitus
HAPO	:	Hyperglycemia and Adverse Pregnancy Outcome
HbA1	:	hemoglobin A1
HGF	:	Hepatocyte growth factor
HPLC	:	High-performance liquid chromatography
IDF	:	International Diabetes Federation
IFCC	:	International Federation of Clinical Chemistry and Laboratory Medicine
IVS	:	Interventricular septum
NGSP	:	National Glycohemoglobin Standardization Program
OGTT	:	Oral glucose tolerance test
PSL	:	Prednisolone

List of Abbreviations (Cont.)

RTK	:	Receptor Tyrosine kinase
T2DM	:	Type 2 diabetes mellitus
TNF	:	Tumor necrosis factor
VADT	:	Veterans Affairs Diabetes Trials
WHO	:	World health organization

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Abstract

Introduction: Gestational diabetes mellitus (GDM) is defined as any degree of glucose intolerance with onset or first recognition during pregnancy. The prevalence may range from one to 14% of all pregnancy depending on population study and diagnostic test. Gestational diabetes mellitus is associated with an increased risk for adverse maternal as well as neonatal outcome.

Aim of The Work: The aim of this work is the prediction of fetal macrosomia by measuring: HbA1c level. ; Umbilical cord thickness; Interventricular septum thickness.

Patients and Methods : This prospective case-control study was carried out at Ain shams University maternity hospital between April 2015 and October 2015 on 80 patients. The patients were divided into two groups, 40 pregnant women as case group with gestational diabetes mellitus and 40 non-diabetic pregnant women as control group after being approved by the local hospital ethics and research committee.

GDM is associated with an increased risk of fetal macrosomia which has adverse maternal as well as neonatal outcomes, maternal complications such as postpartum heamorrhage, infections as well as third to fourth vaginal lacerations because of operative delivery due to macrosomia. Fetal macrsomia complicates 20-30% of pregnancies with (GDM).

Fetal complications like shoulder dystocia during delivery and brachial plexus injury. Both neonatal mortality and morbidity are higher in macroscomic fetuses compared with normal weight fetuses. Ceaserian section performed for fetal macrosomia are not rare at all, birth weight of the fetus is an important factor in determining the mode of delivery as the fetus is considered macrosomic if fetal weight is higher than or equal 4 kg.

Keywords: GDM : Gestational diabetes mellitus; HbA1:hemoglobin A1

Introduction

The umbilical cord is responsible for materno-fetal blood flow. Normally, it is composed of two arteries permeated with venous blood and a vein that transports arterial blood, cushioned by a special type of mucous connective tissue known as Wharton's jelly and by remnants of the allantois ***(Wang et al., 2004)***.

Gestational diabetes mellitus (GDM) is defined as any degree of glucose intolerance with onset or first recognition during pregnancy ***(Bener et al., 2011)***.

The prevalence may range from one to 14% of all pregnancy depending on population study and diagnostic test ***(Aslan et al., 2011).***

Gestational diabetes mellitus is associated with an increased risk for adverse maternal as well as neonatal outcome ***(Ogonowski et al., 2011).***

Maternal hyperglycemia leads to fetal hyper-glycemia, which stimulates pancreatic islet cells; and consequently fetal hyperinsulinemia. This state results in excessive fat tissue and total body size ***(Zawiejska et al., 2008 and Stotland et al., 2004)***, and the major reason for

poor perinatal outcome is accelerated fetal growth and macrosomia ***(Khan et al., 2007).***

Fetal macrosomia complicates 20–30 % of pregnancies with gestational diabetes mellitus (GDM) ***(de Onis et al., 2010).***

The birth of a macrosomic fetus has been associated with adverse outcomes for both mother and fetus. Shoulder dystocia during delivery and related permanent brachial plexus injury may be seen. Both neonatal mortality and morbidity are higher in macrosomic fetuses compared with normal weight fetuses ***(Ghezzi et al., 2007).***

Maternal complications such as postpartum hemorrhage, infections, as well as third- or fourth-degree vaginal lacerations may occur because of operative delivery ***(Ferber et al., 2010).***

Today, cesarean sections performed for fetal macrosomia are not rare at all. Birth weight of the fetus is an important factor in determining the mode of delivery, but pelvic assessment should not be ignored ***(Hadlock et al., 2005).***

The presence of hyperglycemia influences biochemical transformation processes in the fetus ***(Corrigan et al., 2009 and Langer et al., 2000).***

In addition, maternal diabetes induces placental genes related to chronic stress and inflammation, and recent data suggest the potential role of inflammation for embryopathy related to maternal diabetes ***(Desoye et al., 1996).***

The myocardial tissue is the most likely structure affected by hyperglycemia. The ventricular free walls are less affected by hypertrophy compared with the interventricular septum (IVS) ***(Gandhi et al., 1995).***

Aim of The Work

The aim of this work is the prediction of fetal macrosomia by measuring:

1. HbA1c level.
2. Umbilical cord thickness.
3. Interventricular septum thickness.

Gestational diabetes

Definition :

Gestational diabetes (or **gestational diabetes mellitus**, **GDM**) is a condition in which women without previously diagnosed diabetes exhibit high blood glucose (blood sugar) levels during pregnancy (especially during their third trimester).

Fig. (1): Universal blue circle symbol for diabetes
(Diabetes Blue Circle Symbol, 2006)

Gestational diabetes is caused when insulin receptors do not function properly. This is likely due to pregnancy-related factors such as the presence of human placental lactogen that interferes with susceptible insulin receptors. This in turn causes inappropriately elevated blood sugar levels ***(Thomas et al., 2005)***.

Gestational diabetes generally has few symptoms and it is most commonly diagnosed by screening during pregnancy. Diagnostic tests detect inappropriately high levels of glucose in blood samples. Gestational diabetes affects 3-10% of pregnancies, depending on the population studied ***(Thomas et al., 2005)***.