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PROSPECTIVE STUDY ON SONOGRAPHIC MEASUREMENT OF UMBILICAL CORD THICKNESS,FETAL FAT LAYER , AND SHOULDER PAD THICKNESS AS PREDICTORS OF MACROSOMIA IN FETUS OF WOMEN WITH GESTATIONAL AND PREGESTATIONAL DIABETES MELLITUS

Gynaecology

KEYWORDS: fetal macrosomia, umbilical cord thickness, fetal fat layer, shoulder pad thickness.

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ABSTRACT

Diabetes mellitus is one of the commonest problem encountered in pregnancy. In Asia, the incidence is around 5-8%.Fetal macrosomia complicates more than 10% of all pregnancies. Macrosomia is associated with significant fetal, neonatal and maternal risks. **AIM**: To evaluate the sonographic measurement of umbilical cord thickness, fetal fat layer and shoulder pad thickness as predictors of macrosomia in fetus of women with gestational and pregestational diabetes mellitus**. MATERIALS AND METHODS:** This study was conducted for a period of one year fromApril 2015 to March 2016, at the Institute of Obstetrics and Gynecology, Egmore. Antenatal women with GDM or PRE GDM, diagnosed by OGTT , dates confirmed by early scans in their late third trimester (35-36 weeks) who attended Antenatal OPD at IOG, were recruited prospectively into the study. **CONCLUSIONS:** Among the ultrasound parameters, a cut of abdominal circumference >35 cms ,fetal fat layer>5mm,had good sensitivity , specificity and negative predictive value as predictors of macrosomia. Umbilical cord thickness greater than 90th percentile had good negative predictive value.

INTRODUCTION:

Diabetes mellitus is one of the commonest problem encountered in pregnancy. In Asia the incidence is around 5-8%. Infants of diabetic mothers are more prone to be macrosomic which is a major cause of fetal and maternal morbidity. Fetal macrosomia complicates more than 10% of all pregnancies. Macrosomia is associated with significant fetal, neonatal and maternal risks. In order to avoid the complications associated with delivery of macrosomic fetuses, it is prudent to antenatally predict macrosomia such that effort can be taken to provide a modified intrapartum care.

AIMs and OBJECTIVES:

To evaluate the sonographic measurement of umbilical cord thickness, fetal fat layer and shoulder pad thickness as predictors of macrosomia in fetus of women with gestational and pregestational diabetes mellitus.

MATERIALS AND METHODS:

This prospective analytical study was conducted for a period of one year from April 2015 to March 2016,at Institute of Obstetrics and Gynecology, Egmore. Antenatal women with GDM or PRE GDM, diagnosed by OGTT, dates confirmed by early scans in their late third trimester (35-36 weeks) who attended Antenatal OPD at IOG, were recruited prospectively into the study. Those who met the inclusion criteria were invited to participate in the study. Ethical committee clearance was obtained for the study and informed written consent was obtained from all the participants.

INCLUSION CRITERIA:

-Pregnant women with GDM/DM in late third trimester(35-36 weeks) with reliable dates confirmed by dating scan and having a three vessel umbilical cord.

EXCLUSION CRITERIA:

-Multiple pregnancy and known anomalous baby

Proforma were filled after obtaining consent from each patient. Participants underwent a third trimester scan. Three extra measurements- umbilical cord thickness, Fetal fat layer and shoulder pad thickness were measured in addition to the normal examination.. The abdominal circumference and estimated fetal weight were part of routine scan. The measurements were performed by sonologist at the department of radiology, IOG, Egmore with 3.5 Mhz abdominal probe. Fetal anthropometric parameters, biparietal diameter(BPD), abdominal circumference(AC) and femur length (FL) were measured in all fetuses. EFW was obtained using the formula proposed by Hadlock et al. Umbilical cord thickness was calculated using the umbilical cord diameter which was measeured in a free loop of umbilical cord.For fetal fat layer- The AC plane was magnified such that AC was completely focused in the screen area. The measurement of vertical distance between the outer and inner border of the echogenic subcutaneous fat of abdomen is measured. The fetal humerus was visualized in a longitudinal view, and the measurement taken immediately below the humeral head from the outer edge of the bone to the skin surface is taken as the shoulder pad thickness.

RESULTS:

Total No. of GDM/Pre-GDM patients in late 3rd trimester :512

Total No. of GDM/Pre-GDM patients satisfying the study criteria :437
Total No.of drop outs :32
Total No. of patients in our study :405

Of the 405 patients under study, 350 patients had GDM,55 patients had pre-GDM.
Of the 405 patients, 57 patients delivered macrosomic babies

DISCUSSION:

MATERNAL CHARACTERISTICS:

Age:

In our study among 57 macrosomic fetus a majority (43.9%) were delivered by mothers in age group of 26-30 years. The chance of macrosomia among the particular age group was highest in 36-40 years(66.7%) compared to 15.1% in the age group of 26-30 years. Thus, maternal age greater than 35 years was significantly associated with increased risk of macrosomia.

Karim et al analysed prevalence and outcome of macrosomia in Pakisthan. He reported that maternal age over 35 years was associated with fetal macrosomia.

Weissmann etal reported that maternal age was significantly higher among macrosomic neonates.

Meshari et al reported similar results in their study in Saudi Arabia.

PARITY:
In our study population majority of the patients (44%) were nulliparous women. Hence majority (33.3%) of macrosomia occurred in this group. The risk of delivering a macrosomic baby within a group was highest among para- 4 group . Thus, as parity increases the chance of delivering macrosomic fetus also increases.
Karim et al reported that grand multiparity was associated with macrosomia.

Mahin Najafian et al reported that multiparity was significantly associated with macrosomia.

GESTATIONAL AGE AT DELIVERY:
Our study included the patients with DM and they were followed up from 36 weeks of gestation until delivery. Hence post maturity was not allowed. All patients were delivered at 37 completed weeks. The mean gestational age at delivery in macrosomic and non-macrosomic group were 37.9 and 37.67 respectively, which was not statistically significant.

BMI:
In our study among the 57 patients who delivered macrosomic babies,87.7% had BMI≥26 . In group with BMI≥30 about 85.7% delivered macrosomic babies. Thus maternal BMI has significant association with macrosomia.

Karim et al reported that maternal obesity was asoociated with macrosomia.

Mahin Najafian et al reported similar results.

ULTRASOUND MEASUREMENTS:
ABDOMINAL CIRCUMFERENCE:

ABDOMINAL CIRCUMFERENCE	NO OF PATIENTS	NO OF MACROSOMIA	PERCENTAGE AGE WITHIN MACROSOMIA	P-value
AC<35 cm	298	10	17.5	<0.001
AC>35 CM	107	47	82.5	
TOTAL	405	57	100	

In our study umbilical cord thickness had low sensitivity, but good specificity and negative predictive value. Umbilical cord thickness greater than 90th percentile had good negative predictive value.

Cromi et al reported that the proportion of cases with large umbilical cord was significantly higher in the group of macrosomic compared to non-macrosomic fetus.(54.7% Vs 8.7%)

FETAL FAT LAYER:

FETAL FAT LAYER	NO OF PATIENTS	NO OF MACROSOMIA	PERCENTAGE WITHIN MACROSOMIA	p-VALUE
<5MM	325	8	14	<0.001
>5 MM	80	49	86	
TOTAL	405	57	100	

In our study, Fetal fat layer >5 mms as predictor of macrosomia had sensitivity of 86% and specificity of 91.1%.Thus,it's a reliable predictor of macrosomia.

M.Bethune et al reported that Fetal fat layer >5 mms was the most useful predictor of macrosomia at term. He reported that the risk of macrosomia increases ten fold when fetal fat layer >5 mms.

SHOULDER PAD THICKNESS:

SHOULDER PAD THICKNESS	MACROSOMIA	TOTAL	p-VALUE	
	YES	NO		
<12 MM	8	315	323	<0.001
>12MM	49	33	82	
TOTAL	57	348	405	

shoulder pad thickness ≥12 mm had good sensitivity, specificity and negative predictive value as predictors of macrosomia.

Nadia et al reported the sonographic measurement of fetal shoulder pad thickness positively correlated with new born weight. In their study shoulder pad thickness ≥12 mm had sensitivity of 87.2%,specificity of 74.2% ,positive predictive value of 84.2%.
Landon et al reported similar results.

ESTIMATED FETAL WEIGHT:
In our study multiple regression model was used to analyse estimated fetal weight as predictor of fetal macrosomia.It was statistically significant.

Nadia et al reported that sonographic fetal weight estimation as predictor of macrosomia was useful with sensitivity of 74.5%, specificity of 85.7%.

SHOULDER DYSTOCIA:
In our study 12.3% of deliveries of macrosomic fetus were complicated by shoulder dystocia as against 1.1% among non macrosomic group. The shoulder dystocia is much more common in macrosomic fetus than non macrosomic fetus. In pregnancies complicated by diabetes, shoulder pad thickness is higher predisposing them to shoulder dystocia.

Mahin Najafian et al reported shoulder dystocia in 11% of macrosomia group against 0.5% in non macrosomia group.

FETAL GENDER:
In our study among 57 macrosomic babies 61.4% were boys and 38.6% were girls. But this difference was not statistically significant. Mahin najafian et al reported that fetal sex influences macrosomia tendency. Male infants weigh more than female infants at any gestational age.

MODE OF DELIVERY:
In our study 70.2 % of macrosomic fetus needed caesarean section. thus, macrosomia increases the rate of caesarean section. Batuhan et al reported caesarean section rate of 58.7% in birth weight of 4-4.249kg and 63.6% in birth weight of 4.250-4.5kg.

Mahin najafian et al reported that incidence of caesarean section in macrosomic group was 89% compared to 11% in non macrosomic group.

CONCLUSIONS:
Macrosomia is every obstetrician"s nightmare and hence clinicians are in constant search for better methods of prediction .Fetal fat layer and shoulder pad thickness are good predictors of fetal macrosomia. In the assessments of risk of macrosomia in addition to the ultrasonographic measurements the clinical risk factors must be considered .Further studies are needed to evaluate the clinical value of incorporating these soft tissue measurements in formulas for estimation of fetal weight.

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