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Original Research

Third Trimester Placental Grading by Ultrasonography and Pregnancy Outcome in Patients Delivering in a Tertiary Care Centre: A Retrospective Study

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Abstract

Introduction: Placental maturation in the form of calcification is a normal phenomenon as the gestation advances. It is seen as Grade III placental morphology on antenatal ultrasound. However, if these changes occur early in gestation, it may be a sign of certain pathologies that are linked to placental ischemia like preeclampsia and fetal growth restriction.**Aims and Objectives:** This study aimed to study the correlation of early placental maturation with adverse perinatal outcomes. **Material and Methods:**This retrospective study was conducted over a period of two years based on the case records of women delivering in the hospital who fulfilled the inclusion criteria. The women under study were divided into two groups (Group A with Grade I/II placenta and Group B with Grade III placenta based on their placental maturity between 28-36 weeks. The maternal and fetal outcomes of pregnancy were compared between the two groups.**Results:**There were total 168 women in the study and 52 had Grade III placenta. Preeclampsia and fetal growth restriction was seen in 9.6% and 15.4% of women with Grade III placenta compared to 0.9% and 4.3% in women with Grade I/II placenta. Gestational diabetes and obstetric cholestasis were seen in equal number of women, being 4.3% and 3.8% women in Group A and Group B respectively. Women with Grade III placenta had 21.6% women delivering by LSCS for foetal distress while it was 6.9% in women with Grade I/II placenta. Preterm birth and low birth weight was seen in 15.4% and 19.2% women with Grade III placenta when compared to 4.8% and 3.4% in women with Grade I/II placenta. There was no case of placental abruption, stillbirth or NICU admission in the study group.**Conclusion:**The use of placental morphology and maturity on antenatal ultrasound can serve as a useful adjunct to monitor pregnancies for development of perinatal complications and planning management in such pregnancies.

Key words:antenatal, placental maturity, outcomes, preeclampsia, ultrasound

Introduction

The role of ultrasonography in obstetric practice is immense. Placental calcification is a physiologic phenomenon associated with increasing gestational age(1).Maturational changes in placenta on antenatal ultrasound have been found to correlate with functional maturity of the foetus.Grannum et al in 1979, classified all placentae into different grades according to their ultrasonographic appearance.They graded placenta from 0 (immature) to III (mature) on the basis of changes in the appearance of the chorionic plate, placental substance and basal layer.Grade 0 indicates a smooth chorionic plate and homogenous texture of the placenta; Grade I shows occasional calcification in the basal plate; Grade II has occasional calcification in placental texture; and Grade III indicates a circular appearance of calcifications up to the basal plate and divides the placenta into discrete parts(2).

As the gestation advances, placental maturation takes place from lower to higher grades but early ripening is linked to adverse pregnancy outcomes. In 2005, McKenna et alconfirmed that the detection of a grade III placenta at 36 weeks gestation, also called as Preterm Placental Calcification (PPC),helps in the identification of high risk pregnancy(3).Various investigators later reported an association between grade III placental maturation and subsequent obstetric problems like gestational hypertension, fetal growth restriction and pregnancy

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complications during labour with increased risk of perinatal deaths (4,5,6)

Ultrasound study being a routine part of antenatal care is a relatively easier and convenient way to predict development of any adverse outcome in third trimester of pregnancy. This led us to conduct this study in this institute where all low-risk and high-risk pregnant women in and around Jammu city come for delivery.The aim of the present study was to assess placental grading in normal and high risk pregnancy and its correlation with adverse maternal and foetal outcomes

Material and methods

This retrospective case control study was conducted in the Department of Obstetrics and Gynaecology, Acharya Shri Chander College of Medical Sciences andHospital, Jammu which is a tertiary care centre. Prior approval was obtained from the Institutional Ethical Committee. Data was collected from the case records of all women delivering in the hospital over a period of two years who fulfilled the inclusion criteria. All delivering women who had singleton pregnancy and who had ultrasound available between 28 and 36 weeks were included in the study. Women who had multiple pregnancy, congenitally malformed foetus and women who had no ultrasound available between 28 and 36 weeks were excluded from the study. The gestational age was established from last menstrual period. In cases where there was discrepancy in determining gestational age, earliest available ultrasound was used for dating. In our institute, during routine ultrasounds, placental grading is assessed according to the criteria of Grannum et al(2).

All women were divided into two groups based on placental maturity (Grannum classification) between 28 and 36 weeks. Group A comprised of patients with Grade I/II placental maturity and Group B comprised of patients with Grade III placental maturity. Age and parity were recorded for both the groups. Maternal outcomes noted were preeclampsia, Fetal Growth Restriction (FGR), placental abruption, obstetriccholestasis and Gestational DiabetesMellitis (GDM). Perinatal outcomes noted were LSCS for fetal distress, preterm birth, Low Birth Weight (LBW), still-birth and admission to NICU. The outcomes were compared between the two groups.

Results

The present study included 168 women who fulfilled the inclusion criteria during the study period.Table 1 shows the distribution of women in Group A(Grade I/II) and Group B(Grade III).In both the groups, maximum number of women were in age group 25-30years. 53.4% women in Group A were primigravida and 46.6 % of women were multigravida. In Group B, it was 53.8% and 46.2% respectively(Table 2)(Figure 1 and 2). In absence of risk factors, Grade III placental maturity before 36 weeks was observed in 57.7% of women. It was observed that preeclampsia and fetal growth restriction was seen more in women with Grade III placenta (9.6% and 15.4% respectively) than in women with Grade I/II placenta (0.9% and 4.3% respectively). In presence of other maternal risk factors like obstetric cholestasis and GDM, there was not much difference in number of women in either group (4.3% and 3.8% in Group A and Group B respectively). There was no case of placental abruption in the population under study(Table 3)(Figure 3).

Regarding perinatal outcomes,caseswith fetal distress requiring LSCS were seen much more in women with Grade III placenta (21.6%) than in women with Grade I/II placenta (6.9%). Adverse fetal outcomes like preterm birth and low birth weight were also observed to be higher in women with Grade III placenta (15.4% and 19.2% respectively) than in women with Grade I/II placenta (4.8% and 3.4% respectively). There was no case of stillbirth or NICU admission in the women included in the study(Table 4)(Figure 4).

Table 1: Distribution of women based on placental grading

	Grade I/II	Grade III
Total number of women	116	52
Percentage of women	69%	31%

Table2: Demographic characteristics

Age (in years)	Grade I/II (n=116)	Grade III(n=52)
19-24	20 (17.2%)	10 (19.2%)
25-30	48 (41.4%)	22 (42.3%)
31-35	27 (23.3%)	14 (26.9%)
36-40	21 (18.1%)	6 (11.5%)
Obstetric History		
Primigravida	62 (53.4%)	28 (53.8%)
Multigravida	54 (46.6%)	24 (46.2%)

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Table 3: Comparison of maternal outcomes based on placental grading

	Grade I/II(n=116)	Grade III(n=52)
No risk factors	90 (77.5%)	30 (57.7%)
Preeclampsia	1 (0.9%)	5 (9.6%)
FGR	5 (4.3%)	8 (15.4%)
Abruption	0 (0%)	0 (0%)
Obstetric Cholestasis	5 (4.3%)	2 (3.8%)
GDM	5 (4.3%)	2 (3.8%)

Table 4: Comparison of perinatal outcomes based on placental grading

	Grade I/II(n=116)	Grade III(n=52)
LSCS for fetal distress	8 (6.9%)	11 (21.6%)
Preterm birth	5 (4.3%)	8 (15.4%)
LBW	4 (3.4%)	10 (19.2%)
Stillbirth	0 (0%)	0 (0%)
NICU admission	0 (0%)	0 (0%)

Figure 1. Age distribution of women based on placental grading

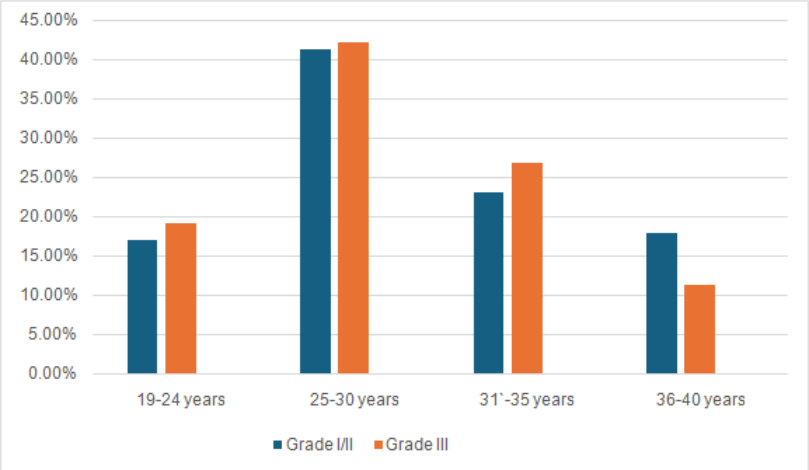

Figure 2. Parity distribution of women based on placental grading

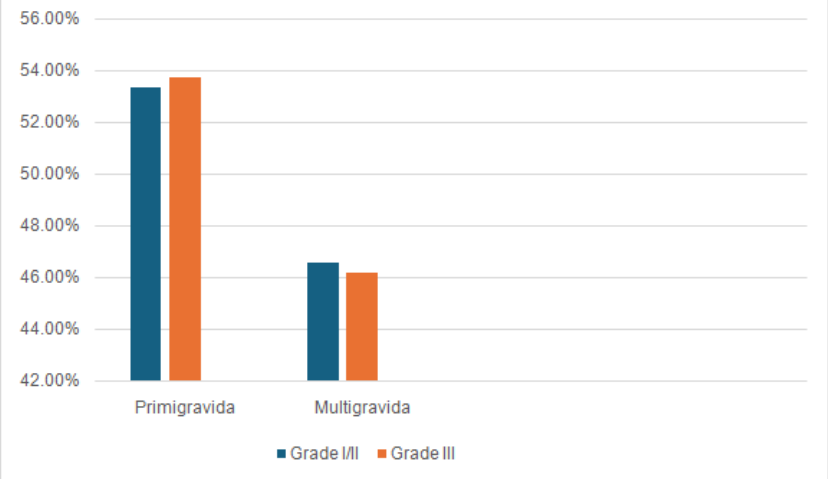

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Figure 3. Comparison of maternal outcomes based on placental grading

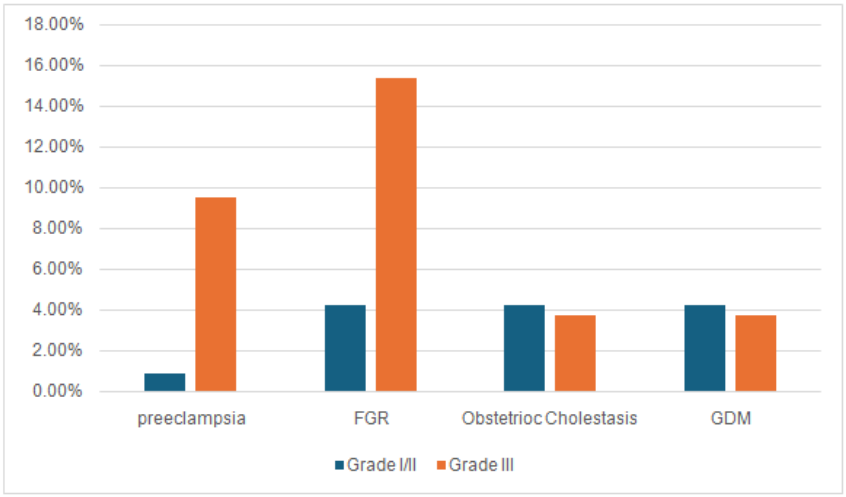
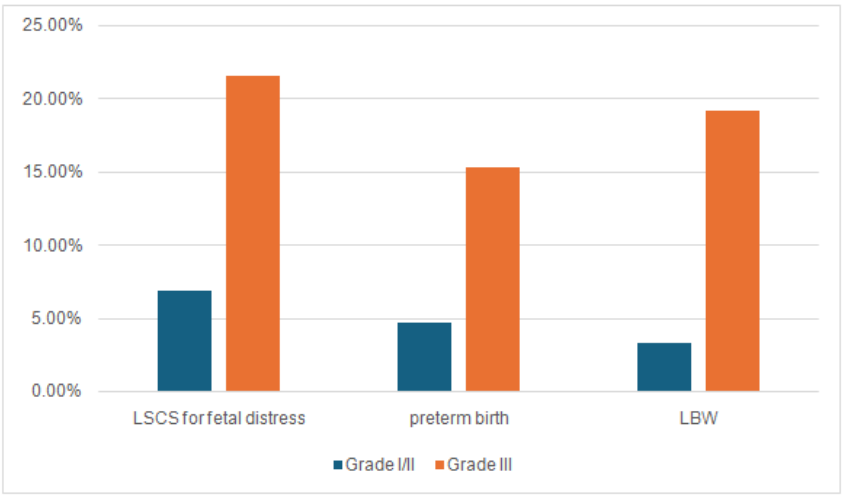


Figure 4: Comparison of perinatal outcomes based on placental grading



Discussion

In the present study, we had tried to compare the distribution of women with Grade I/II and Grade III placental maturity in normal and high-risk pregnancies. We observed that premature placental calcification or early placental maturation was observed in31% of women delivering in our institution during the study period. Mc Kenna et al found in their study Grade III placenta at 36 weeks in only 4% of the pregnancies while it was 23.5% in the study by Jamal et al (1,3). This high figure inthe present study is explained by more admissions in our institution of high-risk women with these placental findings on antenatal ultrasound. Both the groups were comparable with respect to age and parity.

It was observed that in women with no high-risk factors, percentage of Grade III placental maturity was less(57.7%) compared to women with Grade I/II placental maturity (77.5%). This finding throws light on the fact that Grade III placental changes are more confined to the high-risk women leading to more women with uncomplicated pregnancies falling in Grade I/II group. There was higher percentage of women with maternal risk factors like preeclampsia(9.6%) and fetal growth restriction(15.4%)in Group B than Group A (0.9% and 4.3% respectively). Other studies also demonstrated that the childbirth would probably become complex with FGR and preeclampsia if the placenta emerged to be grade-III before 34 weeks gestation(7,8,9). This large difference signifies the association of accelerated placental maturity and utero-placental ischemia which contributes to the etiopathogenesisof these conditions.

Studies by BaezaVA et al and Chen et al demonstrated significant correlation between diabetes and early placental calcification(10,11). Whereas other studies demonstrated correlation of diabetes with delayed placental calcification(12,13,14,15). However, this correlation was not seen in our study probably due to small sample size.

In obstetric cholestasis, elevation in maternal and fetal serum bile acid levels leads to abnormalities in the placenta. The placenta displays a reduction in the amount of trophoblast and dilated maternal vascular lacunae. Furthermore, there is an increased apoptosis

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and oxidative stress in the placenta(16).No correlation between placental morphology on ultrasound and obstetric cholestasis was seen in our study. However further research is needed in this aspect.

With respect to perinatal outcomes, women who underwent LSCS for fetal distress and women who had babies with preterm birth and LBW were more likely to have grade III placenta on antenatal ultrasound(21.6%,15.9% and 19.2% respectively) when compared to Grade I/II placenta(6.9%,4.8% and3.4% respectively). These findings suggest a correlation between the early placental ageing as reported on antenatal ultrasound and the resultant placental ischemic changes that manifest as adverse fetal outcomes suggesting a compromised foetus. Similar toour study, Mirza et al also found correlation between early placental calcification and LBW and poor perinatal outcome(18). A randomised controlled trial has also suggested that a grade III placenta is associated with low birthweight, problems during labour, poor condition at birth and perinatal death(7).

Conclusion

If grade III placenta is observed before 36 weeks in a pregnant women, these women can be considered to be high risk for perinatal complications. Therefore, it may be reasonable to conclude that detection of preterm grade III placenta is a useful adjunct in the screening of pregnant women for development of adverse outcomes so that close observation of these women can be done. Hence management of these high risk women be optimised especially in low resource countries like ours. Further research is needed to include study of placental morphology as a tool for assessment of fetal well-being in routine obstetric care.

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