

Sonographic Placental Grading in 3rd Trimester of Hypertensive Patients

Samreen Nazir^{1*}, Muhammad Aamir², Sajid Shaheen Malik¹ and Mehreen Fatima¹

¹University Institute of Medical Lab Technology, Faculty of Allied Health Sciences, The University of Lahore, Lahore, Pakistan

²Nawaz Sharif Social Security Hospital, Lahore, Pakistan

Abstract:

Mostly poorly controlled hypertensive women have superimposed preeclampsia. In hypertensive pregnancy, the complications occur when the calcification was present in placental. The risk factor of hypertension is placental abruption that may cause premature birth.

Objective:

To determine the placental grading in 3rd trimester of hypertensive patients through sonography.

Methods:

The study design was observational descriptive and the calculated sample size were 125 hypertensive pregnant women at 3rd trimester. The Study was conducted at the Diagnostic Ultrasound Department of The Nawaz Sharif Social Security Hospital, Lahore. All the pregnant hypertensive women at 3rd trimester were included in this study voluntarily. SPSS version 21.0 was used for data analysis.

Results:

All the mothers included in this study were having mean gestational age 34.9 ± 2.33633 weeks. The number of grade II and III in hypertensive pregnant women were 58.4% (73/125) and 41.6% (52/125) respectively.

Conclusions:

Placental maturity grading increase with hypertension. G-II placenta was observed in more hypertensive pregnancies. Hypertension has effected on placental grading in third trimester, with the increases in lower abdominal pain.

Keywords:

Hypertensive mothers, Placental maturity grading, Cotyledons, Basal layer of placenta, Fetal layer of placenta

Introduction

The placenta is an organ joined to the coating of womb amid pregnancy. The placenta is associated with infant by the umbilical string. It keeps unborn infant's blood supply isolate from mother claim blood supply. The placenta creates from the chorionic villi at the

implantation site at about the fifth seven day stretch of incubation¹. Placental structure and function affect the health of the mother, as seen in the development of insulin resistance, preeclampsia, gestational hypertension, and eclampsia. Placental dysfunction affects the fetus, causing prematurity and neuron developmental abnormalities². Pregnancy initiated hypertension (PIH) incorporates Gestational hypertension; Pre-eclampsia and Eclampsia are the most well-known obstetrical complexities. Worldwide around 76,000 pregnant ladies pass on every year from pre-eclampsia and related hypertensive issue³. Ultrasound reviewing arrangement of the placenta in light of its development. This essentially influences the degree of calcifications. The grading system is as follows: Placental body is homogeneous in grade 0. Chorionic plate shows small indentations with scattered echogenic foci in grade I. Deeper indentations of chorionic plate (does not reach up to basal plate) shown in grade II. Cotyledons and complete indentations of chorionic plate through to the basal plate was shown in grade III⁴. Placental grade III maturity is associated with placental insufficiency due to chronic hypertension. This may lead to intrauterine growth restriction (IUGR), abnormal fetal growth, fetal distress and hyaline membrane disease. Birth weight depends on the mother's body size and the growth of the placenta⁵. In hypertensive pregnancy, the preterm placental calcifications have adverse effects on uteroplacental blood flow, fetal growth and fetal death⁶. The arteries affected by hypertension which are carrying the blood to the placenta. On the off chance that the placenta doesn't get enough blood then the child may get less oxygen and supplements. This can prompt moderate development, low fetal weight (IUGR)⁷. There is a progressive decrease in the mean diameter & surface area of placenta with an increase in severity of pregnancy induced hypertension⁸. The risk factor of hypertension is placental abruption that may cause premature birth⁹. The morphological and histological

changes in the placenta driving component to ischemia because of low course which prompts diminished oxygen supply to the hatchling prompting intrauterine growth restriction (IUGR) contributing to premature birth and fetal death¹⁰. When sonographers examined the fetal, they also examined the placenta as secondary object. The importance of sonographic examination and documentation of the placenta must be conscious for ultrasound professionals. In two-dimensional ultrasound techniques, the location and perimeters of placenta easily discovered. In three-dimension ultrasound techniques have opened the frontier of placental examination. Placental maturity can be assessed by ultrasound to visualize the changes in placental substance. The placental grades are the amount of calcium deposition¹¹.

A study conducted by Lilyan W et al, result in a generally safe obstetric populace, ultrasound recognition of Grannum review III placenta at 36 weeks' growth distinguishes in danger pregnancy. It seems to foresee resulting advancement of protein uric PIH and may help in recognizing the development limited infant¹². A study conducted by Jeanne et al, that Placental development surveyed by ultrasound has been arranged into 3 reviews by Grannum. Review 3 placental developments previously the 36th seven day stretch of pregnancy is related with unfavorable maternal and fetal morbidity¹³. Deopa study concluded that at the gestational age of 28-31 weeks, Grade II and III placentas in hypertension and IUGR. Placental development increments with gestational age in ordinary and high-chance cases, yet in high-hazard cases placenta develop prior¹⁴. Vassiliki study concluded that the placental injuries in hypertensive pregnancies, for example, areas of localized necrosis, villous fibrinoid putrefaction, and villous hyper development are essentially associated with hypertension seriousness. Moreover, the placenta vascularization and angiogenesis are altogether poorer when the hypertension level is higher¹⁵.

Ultrasound is very useful and accurate in the visualization of placenta and its maturity grading. If the maturity grading of placenta is timely visualized and properly managed, most of the adverse fetal outcomes will be avoided. The research determined the anticipated outcomes of the pregnancies with maternal hypertension.

Methods:

The study design was observational descriptive and the calculated sample size 125 of hypertensive pregnant women during 3rd trimester of pregnancy.

Non probability sampling technique was used. The study was conducted at Nawaz Sharif Social Security Hospital, Lahore. All the pregnant hypertensive women at 3rd trimester were included in this study. The outcomes measures were maternal age, blood pressure, headache, vaginal bleeding, lower abdominal pain and ultrasound grading of placental maturity. The ultrasound was performed on NEMIO 10 (TOSHIBA) gray scale machine. The convex transducer was used. The Transducer frequency range was 4.6-6 MHz. As this research followed scientific methods, related information and data was taken from questionnaire scientific journals, internet and books, data collection sheet and lectures. It was gained prior from the Ethical Committee of the University before study. Written informed consent was taken from the patients or their guardian. Patient's identification and details were not published. The pre-tested questionnaire was used to collect data while, Microsoft excel and SPSS Version 21.0 was used to record and analyze the data. Results were presented in the form of mean \pm S.D and percentages.

Results:

The table 1 showed the total of 125 hypertensive pregnant females taken in this study. The mean \pm S.D of maternal age was 27.7 \pm 4.3 years with minimum and maximum maternal age were 20 and 40 years respectively (table-1).

	N	Minimum	Maximum	Mean	Std. Deviation
Maternal Age in years	125	20.00	40.00	27.7440	4.32715

Table 1: Mean maternal age of hypertensive pregnant females
The table 2 showed the mean \pm S.D of gestational age was 34.9 \pm 2.3 weeks with minimum and maximum were 27 and 39 in weeks respectively (Table 2).

	N	Minimum	Maximum	Mean	Std. Deviation
Gestational Age in weeks	125	27.00	39.00	34.9040	2.33633

Table 2: Mean gestational age of hypertensive pregnant females
In between 26-28 weeks of gestational ages, 2 pregnant women were presented with grade II and no one with grade III. Between 29- 31 weeks of gestational ages, 3 pregnant women were presented with grade II and 3 with grade III. Between 32-34 weeks of gestational ages, 34 pregnant women were presented with grade II and 9 with grade III. Between

35-37 weeks of gestational ages, 31 pregnant women were presented with grade II and 25 with grade III. Between 38-40 weeks of gestational ages, 3 pregnant women were presented with grade II and 15 with grade III (figure 1).

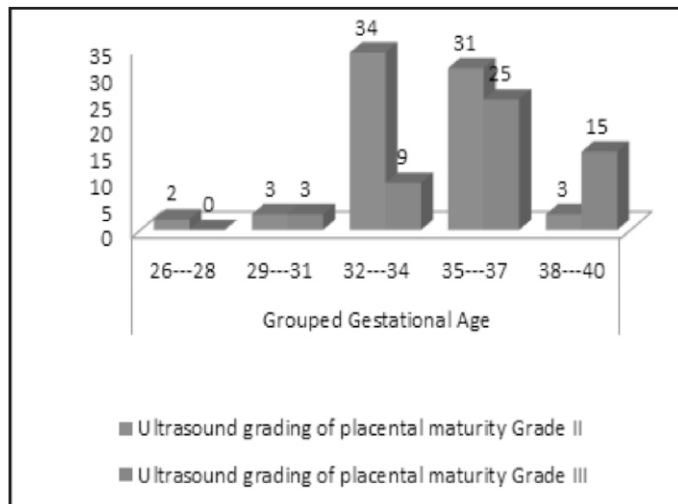


Figure 1: Frequency distribution of grouped gestational age and ultrasound grading of placental maturity

The table 3 showed the number of grade II and III of placenta in hypertensive pregnant women were 58.4% (73/125) and 41.6% (52/125) respectively (Table 3).

	Frequency	Percent
Grade II	73	58.4
Grade III	52	41.6
Total	125	100.0

Table 3: Frequency of grade II & III of placenta in hypertensive pregnant women



Figure 2: Grade III placental maturity of hypertensive pregnant woman



Figure 3: Grade II placental maturity of hypertensive pregnant woman



Figure 4: Grade II placental maturity of hypertensive pregnant woman

Discussion:

Obstetrical and fetal or neonatal complications were common in pregnancies complicated with hypertensive disorders. Ultrasonic study has shown that the strong echoes detected ultrasonically during antenatal scanning of the placental correspond to deposits of calcium. In the third trimester, placenta might begin to thin and calcify.

The placental grading at third trimester in high risk pregnancies was established from various studies. According to K. M. Sunanda et al., 100 pregnant women with Preeclampsia and 100 normotensive women were included in the study. Majority of the patients were in the age group of 20-25 years (70%). Result of this study, in the control group 33%, 50%, and 17% women had placental grading of I, II and III respectively as against 18%, 56% and 26% in the women in the study group¹⁶. According to Deopa DD et al., study included 42 cases after 28 weeks of gestation. In 42 cases out of 16 were included in high-

risk pregnancy and 26 were in normal pregnancy. In the study of high-risk cases majority of all cases were of hypertensive group, i.e. 62.5%. At the gestational age of 28-31 weeks, Grade II and III placentas in hypertension and IUGR. Placental development increments with gestational age in ordinary and high-chance cases, yet in high-hazard cases placenta developed prior. Fouedjio JH et al., in a study of Placental development surveyed that ultrasound have been characterized into 3 reviews by Grannum. Review 3 preceding the 36th, seven day stretch of pregnancy was related with unfavorable maternal and fetal grimness. 102 ladies with singleton pregnancies between the 34th and 36th weeks were incorporated. Review 3 placenta represented 5.9% of our sample¹⁴⁻¹⁷. According to Daniel McKenna et al. a sum of 1802 patients were checked at 36 weeks of development to decide placental development. Review III placenta at 36 weeks' development was 3.8% (68/1802). The occurrence of protein uric pregnancy-incited hypertension in the investigation and control bunches was 7.4% (5/68) and 1.56% (27/1734), individually. Ultrasound location of a review III placenta at 36 weeks' growth in an okay population distinguished the "at-risk" pregnancy¹⁸. According to Saliha et al., the impact of hypertension on the development procedure of the placenta which is identified by ultrasonography. 100 pregnant women were included. 50 normotensive and 50 hypertensive ladies were analyzed by ultrasonography at three periods. Initially between 29-32 weeks growth, second between 33-35 weeks and third following 36 weeks till 40 weeks development were included. The result, G II and G III placenta was 27 of 50 (54%) and 2 of 50 (4%) at third trimester¹⁹. In a study conducted by Afzal E et al., the sample size was 100, in which 50 normal full term placenta and 50 premature placentas from hypertensive mothers were selected. In the placenta of untimely gathering the rate of placental infarcts were expanded. Fetal result was poor within the sight of placental infarcts. Antagonistic perinatal results including development, limitation and still birth was higher in hypertensive untimely conveyances with placental infarcts than in typical full term deliveries²⁰.

Conclusion:

Hypertension has effected on placental grading in third trimester. The placental maturity grading has increased with hypertension. G-II placenta was observed more in hypertensive pregnancies. Lower abdominal pain had also increased with hypertension.

References:

- 1- Mathai BM, Singla SC, Nittala PP, Chakravarti RJ, Toppo JN. Placental thickness: its correlation with ultrasonographic gestational age in normal and intrauterine growth-retarded pregnancies in the late second and third trimester. *The Journal of Obstetrics and Gynecology of India*. 2013 Aug 1;63(4):230-3.
- 2- Silasi M, Cohen B, Karumanchi SA, Rana S. Abnormal placentation, angiogenic factors, and the pathogenesis of preeclampsia. *Obstetrics and gynecology clinics of North America*. 2010 Jun 30;37(2):239-53.
- 3- Singh M, Pathak MS, Paul A. A study on atherogenic indices of pregnancy induced hypertension patients as compared to normal pregnant women. *Journal of clinical and diagnostic research: JCDR*. 2015 Jul;9(7):BC05.
- 4- Murry MM, Minn R. High blood pressure in pregnancy. Department of Obstetrics & Gynecology at Mayo Clinic. 2012.
- 5- Barker DJ, Thornburg KL, Osmond C, Kajantie E, Eriksson JG. The surface area of the placenta and hypertension in the offspring in later life. *The International journal of developmental biology*. 2010;54:525.
- 6- Risk WI, a Doctor WT. Preeclampsia and High Blood Pressure During Pregnancy.
- 7- Xiong X, Fraser WD. Impact of pregnancy-induced hypertension on birthweight by gestational age. *Paediatric and Perinatal Epidemiology*. 2004 May 1;18(3):186-91.
- 8- Roberts JM, Escudero C. The placenta in preeclampsia. *Pregnancy Hypertension: An International Journal of Women's Cardiovascular Health*. 2012 Apr 30;2(2):72-83.
- 9- Tuovinen S, Aalto-Viljakainen T, Eriksson JG, Kajantie E, Lahti J, Pesonen AK, Heinonen K, Lahti M, Osmond C, Barker DJ, Räikkönen K. Maternal hypertensive disorders during pregnancy: adaptive functioning and psychiatric and psychological problems of the older offspring. *BJOG: An International Journal of Obstetrics & Gynaecology*. 2014 Nov 1;121(12):1482-91.
- 10- Seely EW, Ecker J. Chronic hypertension in pregnancy. *New England Journal of Medicine*. 2011 Aug 4;365(5):439-46.
- 11- Holzman J, Zalud I, Bartholomew ML. Ultrasound of the placenta. *Donald school journal of ultrasound in obstetrics and gynecology*. 2007;

- 1(4): 47-60.
- 12-** Sersam LW. Ultrasonographically Observed Grade III Placenta at 36 Weeks' Gestation: Maternal and Fetal Outcomes. The Iraqi postgraduate medical journal. 2011;10.
 - 13-** Fouedjio JH. Associations between the Grade of Placental Maturity at Third Trimester Ultrasound and Maternofetal Outcomes at the Maternity of the Yaoundé Central Hospital: A Prospective Cohort Study.
 - 14-** Deopa D, Babu CR, Dubey K, Aneja S. Comparison of Placental Grading by Ultrasonographic Study in Normal and High Risk Pregnancy in North Indian Population. J. Anat. Soc. India. 2011 Jun 1;60(1):31-6.
 - 15-** Krielessi V, Papantoniou N, Papageorgiou I, Chatzipapas I, Manios E, Zakopoulos N, Antsaklis A. Placental pathology and blood pressure's level in women with hypertensive disorders in pregnancy. Obstetrics and gynecology international. 2012 May 7;2012.
 - 16-** Sunanda KM, Srinivas K, Satyanarayana. Clinical Significance of Ultrasonic Placental Grading during Third Trimester in Hypertensive Disorders of Pregnancy and its Correlation with Fetal Outcome. Journal of Evidence Based Medicine and Healthcare. 2014; 1(7): 599-607.
 - 17-** Fouedjio JH. Associations between the Grade of Placental Maturity at Third Trimester Ultrasound and Maternofetal Outcomes at the Maternity of the Yaoundé Central Hospital: A Prospective Cohort Study.
 - 18-** McKenna D, Tharmaratnam S, Mahsud S, Dornan J. Ultrasonic evidence of placental calcification at 36 weeks' gestation: maternal and fetal outcomes. Acta obstetrica et gynecologica Scandinavica. 2005 Jan 1;84(1):7-10.
 - 19-** Saliha. The effect of hypertension on grade of placental maturation and its relation to neonatal weight. Kufa Medical Journal. 2009; 12(1).
 - 20-** Afzal E, Sherin F, Seema N. CORELATION OF ADVERSE PERINATAL OUT COMES AND PLACENTAL INFARCTS IN HYPERTENSIVE PRETERM PREGNANCIES. Journal of Ayub Medical College Abbottabad. 2015 Sep 30;27(3):647-9.