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Original Research

To Study The Correlation Between Placental Thickness And Amniotic Fluid Index In Third Trimester Of Uncomplicated Pregnancy In Indian Females

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Abstract
Background: A healthy term infant is the result of three critical components: a well-nourished mother, normal genetic factors, and effective placental implantation and development. The placenta, while often overlooked, is a vital organ. Its proper functioning is essential for the adequate growth and development of the fetus. Hence; the present study was conducted for assessing the correlation between placental thickness and amniotic fluid index in third trimester of uncomplicated pregnancy in Indian females.
Materials & methods: 200 patients who were recruited for the study were categorized into four distinct groups based on their gestational age: 26 to 30 weeks, 31 to 34 weeks, 35 to 38 weeks and 39 to 42 weeks. The gestational age of participants was verified through prior ultrasonography reports from the first trimester. Comprehensive ultrasound examinations were conducted, during which the placenta was identified as a hyper-echoic region, delineated from the fetus by a hypo-echoic area filled with amniotic fluid. The thickness of the placenta was measured, and the Amniotic Fluid Index (AFI) was calculated by summing the vertical measurements of the deepest fluid pockets across the four quadrants of the uterus.
Results: A total of 200 subjects were evaluated. Mean age of the subjects was 29.3 years. 41.5 percent of the subjects belonged to the gestational age group of 35 to 38 years. Among subjects with gestational age of 26 to 30 weeks, 31 to 34 weeks, 35 to 38 weeks and 39 to 42 weeks, mean placental thickness was 3.62 cm, 4.08 cm, 4.13 cm and 3.89 cm respectively. Among subjects with gestational age of 26 to 30 weeks, 31 to 34 weeks, 35 to 38 weeks and 39 to 42 weeks, mean AFI was 146.3 mm, 138.2 mm, 121.3 mm and 96.7 mm respectively. Significant negative correlation of AFI with gestational age was seen. However; no significant correlation of placental thickness with gestational age was seen. No-significant correlation of placental thickness with AFI was seen.
Conclusion: Normal placental function and structure are required for normal growth and development of the fetus. Placental thickness is the simplest measurement of placental size and can be measured at any center equipped with ultrasound machine. No-significant correlation of placental thickness with gestational age was seen. AFI significantly correlated with gestational age.
Key words: Placental thickness, Amniotic fluid index

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Introduction

A healthy term infant is the result of three critical components: a well-nourished mother, normal genetic factors, and effective placental implantation and development. The placenta, while often overlooked, is a vital organ. Its proper functioning is essential for the adequate growth and development of the fetus. Historical data indicate that, in a typical pregnancy at term, the weight of the placenta is approximately one-fifth that of the fetus.[1, 2]

Both the fetus and the placenta experience similar stresses during gestation. Consequently, any maternal health issues can adversely affect both the fetus and the placenta. Therefore, measurements of the placenta, such as its thickness, should be indicative of the fetus's nutritional status and overall outcomes. Placental thickness is the most straightforward metric for assessing placental size. This measurement tends to be greatest at the center and diminishes towards the edges. Numerous studies have established that placental thickness should be measured perpendicularly at the site of the umbilical cord.[3-5]Various pathological conditions can lead to placentomegaly, which may arise from inflammation, edema, or compensatory hypertrophy. A thick placenta is often observed in cases of Rh-negative pregnancies, gestational diabetes, intrauterine infections, and hydropsfetalis, while a thin placenta is typically associated with preeclampsia, intrauterine growth restriction, and chorioamnionitis.[5]Amniotic fluid is essential for the growth and development of the fetus. In the early stages, a portion of this fluid is produced by amniotic cells; however, the majority originates from maternal tissues and interstitial fluid, which diffuse across the amniochorionic membrane from the decidua parietalis. Subsequently, fluid diffuses through the chorionic plate from the blood present in the intervillous space of the placenta.[5- 7]Hence; the present study was conducted for assessing the correlation between placental thickness and amniotic fluid index in third trimester of uncomplicated pregnancy in Indian females.

Materials & methods

The present study was conducted for assessing the correlation between placental thickness and amniotic fluid index in third trimester of uncomplicated pregnancy in Indian females.The primary source of data for the study was patients were from the teaching hospital attached to Bapuji Education Association J.J.M. Medical College, Davangere namely. The study was approved by the Institutional Scientific Committee and the Institutional Ethics Committee of J.J.M. Medical College, Davangere. Patients who were recruited for the study were categorized into four distinct groups based on their gestational age: 26 to 30 weeks, 31to 34 weeks, 35 to 38 weeks and 39 to 42 weeks. The subjects included women with uncomplicated singleton pregnancies exceeding 26 weeks who provided written informed consent. Exclusion criteria encompassed cases involving fetal congenital anomalies, placental abnormalities, maternal medical conditions, maternal gynecological disorders, and maternal obstetric complications that could lead to oligohydramnios or polyhydramnios. The gestational age of participants was verified through prior ultrasonography reports from the first trimester. Comprehensive ultrasound examinations were conducted, during which the placenta was identified as a hyper-echoic region, delineated from the fetus by a hypo-echoic area filled with amniotic fluid. The thickness of the placenta was measured, and the Amniotic Fluid Index (AFI) was calculated by summing the vertical measurements of the deepest fluid pockets across the four quadrants of the uterus. All data were meticulously recorded in a Microsoft Excel spread-sheet and subsequently analyzed statistically using SPSS software.

Results

A total of 200 subjects were evaluated. Mean age of the subjects was 29.3 years. 41.5 percent of the subjects belonged to the gestational age group of 35 to 38 years. Among subjects with gestational age of 26 to 30 weeks, 31 to 34 weeks, 35 to 38 weeks and 39 to 42 weeks, mean placental thickness was 3.62 cm, 4.08 cm, 4.13 cm and 3.89 cm respectively. Among subjects with gestational age of 26 to 30 weeks, 31 to 34 weeks, 35 to 38 weeks and 39 to 42 weeks, mean AFI was 146.3 mm, 138.2 mm, 121.3 mm and 96.7 mm respectively. Significant negative correlation of AFI with gestational age was seen. However; no significant correlation of placental thickness with gestational age was seen. No-significant correlation of placental thickness with AFI was seen.

Table 1: Distribution of subjects according to gestational age

Gestational age (weeks)	Number	Percentage
26 to 30	40	20
31 to 34	51	25.5
35 to 38	83	41.5
39 to 42	26	13
Total	200	100

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Table 2: Placental thickness according to gestational age

Gestational age (weeks)	Mean (cm)	SD
26 to 30	3.62	1.1
31 to 34	4.08	1.1
35 to 38	4.13	1.3
39 to 42	3.89	1.2
Total	3.98	1.5
p-value	0.223	

Table 3: AFI according to gestational age

Gestational age (weeks)	Mean (mm)	SD
26 to 30	146.3	32.5
31 to 34	138.2	29.1
35 to 38	121.3	33.6
39 to 42	96.7	28.7
Total	129.4	30.8
p-value	0.001 (significant)	

Table 4: Correlation of placental thickness with amniotic fluid index

Gestational age (weeks)	Pearson's r-value	p-value
26 to 30	0.892	0.28
31 to 34	0.337	0.33
35 to 38	1.322	0.81
39 to 42	0.980	0.19
Total	1.124	0.46

Discussion

Currently, first-trimester USG in the embryo or fetus is the most accurate method for estimation or confirmation of gestational age (GA). Accurate estimation of GA is the basis of current routine antenatal USG scanning and is crucial for successful prenatal delivery and optimal postnatal care, especially in developing countries. It is imperative for prompt postnatal maternal and neonatal management. Placenta plays a critical role in normal fetal growth. It is a multifunctional organ, that performs the critical function of mediating the passage of materials and nutrients between the maternal and fetal circulation. Placental thickness (PT) changes are indicative of normal growth of the "fetoplacental unit" and can be measured by ultrasonography. Previous literature suggests that there is a linear increase in placental thickness with GA through the course of normal pregnancy.[7-9]Hence; the present study was conducted for assessing the correlation between placental thickness and amniotic fluid index in third trimester of uncomplicated pregnancy in Indian females.

A total of 200 subjects were evaluated. Mean age of the subjects was 29.3 years. 41.5 percent of the subjects belonged to the gestational age group of 35 to 38 years. Among subjects with gestational age of 26 to 30 weeks, 31 to 34 weeks, 35 to 38 weeks and 39 to 42 weeks, mean placental thickness was 3.62 cm, 4.08 cm, 4.13 cm and 3.89 cm respectively. Among subjects with gestational age of 26 to 30 weeks, 31 to 34 weeks, 35 to 38 weeks and 39 to 42 weeks, mean AFI was 146.3 mm, 138.2 mm, 121.3 mm and 96.7 mm respectively. Vinchurkar KN et al determined the relationship between placental thickness and gestational age and routinely used fetal growth parameters in the second and third trimesters. There was a strong correlation between placental thickness and gestational age ($p < 0.001$), BPD ($p < 0.001$), HC ($p < 0.001$), FL ($p < 0.001$), and AC ($p < 0.001$) in both trimesters combined. In the second trimester, there was a strong correlation between placental thickness and gestational age ($p < 0.001$), BPD ($p < 0.01$), HC ($p < 0.001$), and AC ($p < 0.001$). In the third trimester, there was a strong correlation between placental thickness and gestational age ($p < 0.001$), BPD ($p < 0.001$), HC ($p < 0.001$), FL ($p < 0.001$) and AC ($p < 0.001$). Patients delivering Small for gestational age (SGA) babies had significantly thinner placentas as compared to those with normal-weight babies ($p < 0.001$). Placental thickness has a strong correlation with gestation age as well as BPD, HC, and AC in the second and third trimesters.[10]

In the present study, significant negative correlation of AFI with gestational age was seen. However; no significant correlation of placental thickness with gestational age was seen. No-significant correlation of placental thickness with AFI was seen.Khajjayam A et al evaluated placental thickness by USG in various GA subgroups and to see the correlation of PT with GA and fetal outcome. The mean placental thickness progressed from 1.8 cm to 3.5 cm as the gestational age advanced from 14 weeks to 35 weeks and six days. After that, it decreased until delivery. PT was positively correlated only with birth weight amongst all fetal outcome parameters. GA can be determined using PT with the help of regression techniques.[11]

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Alka Patil et al described association of placental thickness with estimated fetal weight and actual birth weight. There was a strong positive correlation between placental thickness and estimated fetal weight at different gestational age with p<0.000. There was also strong positive correlation between placental thickness and actual birth weight of baby with p<0.000. Ultrasonographic measurement of placental thickness in antenatal period can be effective, simple and non-invasive method of estimating fetal growth.[12]

Conclusion

Normal placental function and structure are required for normal growth and development of the fetus. Placental thickness is the simplest measurement of placental size and can be measured at any center equipped with ultrasound machine. No-significant correlation of placental thickness with gestational age was seen. AFI significantly correlated with gestational age.

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