

Original Article

Correlation Between Amniotic Fluid Index and Estimated Fetal Weight in Third Trimester of Pregnancy

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Abstract

This study was conducted to find out the correlation between amniotic fluid index (AFI) & estimated fetal weight (EFW) in third trimester of pregnancy. This cross sectional study was carried out on 105 women with normal singleton pregnancies at third trimester. The pregnant women were subdivided into three groups. The AFI & EFW were evaluated according to gestational age groups & fetal sex. Significant positive correlations were found

Introduction

The assessment of amniotic fluid is very important in evaluation of fetal well-being. Amniotic fluid serves many functions. The volume of amniotic fluid is an important indicator of fetal condition.¹

Polyhydroamnios may be associated with anencephaly, esophageal or duodenal atresia, twin pregnancy or maternal diabetes. Oligohydroamnios may due to intrauterine growth retardation (IUGR), hypoplasia of fetal lung, renal agenesis, cystic kidneys, chromosomal abnormality, post maturity, intrauterine death (IUD) or leaking membrane. Association of body weight with urine output has been observed in human neonates.² Because fetal renal perfusion and size are anticipated to increase with increasing fetal weight, it can be assumed that there may be an association between AFI and estimated fetal weight. In contrast to the relationship between the AFI and gestational age, the relationship between the AFI and estimated fetal weight is not well known. This study was carried out to find out association between AFI and EFW in third trimester of pregnancy, if any.

Materials and Methods

This cross sectional study was carried out in Department of Radiology and Imaging of Bangladesh Institute of Research and Rehabilitation in Diabetes, Endocrine and Metabolic Disorders (BIRDEM), from June 2006 to May 2007.

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between estimated fetal weight and amniotic fluid index in female fetuses of all three groups. In male fetuses, there was a significant positive correlation between AFI & EFW in group III (38 to 40 weeks), but insignificant correlation in other two groups. No study was conducted previously in Bangladesh to see the relationship between AFI & EFW. This study shows that amniotic fluid volume can be evaluated more precisely during third trimester of pregnancy by taking estimated fetal weight into consideration in third trimester of pregnancy.

The study was carried out on 105 pregnant women with gestational age between 29 to 40 weeks who were referred for obstetric ultrasound. The indications of referral were measurements of fetal size, pregnancy dating and evaluation of fetal well being or routine third trimester evaluation.

The inclusion criteria were women with normal singleton pregnancies from 29 to 40 weeks. Pregnancies complicated by gestational diabetes,

hypertension, fetal anomalies, premature ruptures of membranes or multiple pregnancies were excluded. Written informed consent was taken accordingly. After clinical examination, transabdominal ultrasonogram was performed. Each subject was scanned once. Amniotic fluid index was measured by dividing the uterine cavity into 4 quadrants; the vertical diameter of the largest pocket in each quadrant was measured. Care was taken not to include any loop of umbilical cord in the measurement. Then the amniotic fluid index was determined by the sum of the 4 vertical diameters.

The sonographic fetal weight was estimated by Hadlock's formula by using biparietal diameter (BPD), abdominal circumference (AC) and femoral length (FL). The gestational ages were expressed in weeks (wks). After collecting all the necessary information regarding the study, data were collected in a pre-designed structured data collection sheet. Further statistical analyses of the results were done by computer software using statistical packages for social scientists (SPSS). The results were presented in table displaying the differences among the groups and presence of correlation between the measures of outcome variables.

Results

The pregnant women were stratified into three gestational age groups, group I: 29 wks – 33 wks 6 days, group II: 34 wks - 37 wks 6 days and group III: 38 wks– 40 wks. Out of 105 women, highest percentage was 47.6% in the group II followed by 28.6% in the group III and 23.8% in group I. Small for gestational age fetuses (<10th percentile EFW)

accounted for 4(3.8%) subjects and large for gestational age fetuses (± 90 th percentile EFW) were observed in 4(3.8%) subjects.

The gestational age of the subjects was expressed in weeks (wks), the amniotic fluid index was expressed in centimeter (cm) and the estimated fetal weight was expressed in grams (gm).

The age of pregnant women ranged from 18 to 33 years and the maximum number were found in the age group of 26-30 years. The mean age was 26.57 years (SD ± 0.43).

Out of 105 women, there were 60(57.1%) male fetuses and 45(42.9%) female fetuses. Both male and female fetuses were divided into three gestational age groups. Among the male fetuses, highest percentage was (50.0%) in group II, followed by 33.3% in group III and the lowest (16.7%) in group I. Among the female fetuses, highest percentage was 44.4% in group II, followed by 33.3% in group I and lowest percentage was 22.2% in group III. The mean gestational age of the male fetuses was 36.5 ± 0.33 weeks (mean \pm SD) with range of 29 – 40 weeks and mean gestational age of the female fetuses was 33.1 ± 0.46 weeks (mean \pm SD) with range of 29 – 40 weeks.

The mean (\pm SD) estimated fetal weight of group I was 1623.2 ± 60.2 gm (range 1270 - 2104 gm), 2594.7 ± 45.5 gm (range 2036 - 3121 gm) in group II and 3285.8 ± 21.4 gm (range 3150 - 3487 gm) in group III. The mean amniotic fluid index of group I was 12.30 ± 0.9 cm (range 9 - 23 cm), group II was 15.0 ± 1.0 cm (range 7 -18 cm) and group III was 13.6 ± 0.6 cm (range 8 - 19 cm).

Significant positive correlations were found between estimated fetal weight and amniotic fluid index in female fetuses in all three groups.

In male fetuses, there was a significant positive correlation between AFI & EFW in group III (38 to 40 weeks), but no significant correlation was found in other two groups.

Table 1: Correlation between estimated fetal weight and amniotic fluid index in 3 groups of subjects

Group		Pearson's correlation Coefficient('r')	'p' value
Group I (29 wks- 33 wks 6 days)	Male fetus	0.2358	>0.05
	Female fetus	0.5620	*<0.05
Group II (34 wks-37 wks 6 days)	Male fetus	0.2380	>0.05
	Female fetus	0.5265	*<0.05
Group III (38 wks-40 wks)	Male fetus	0.6079	*<0.05
	Female fetus	0.6052	*<0.05

'p' value <0.05 is considered as the lowest value of significance.

Discussion

The assessment of amniotic fluid volume and fetal weight are integral parts of evaluating fetal well-being and subsequent perinatal outcome. Abnormalities in these two parameters are associated with adverse perinatal outcome.³

In contrast to the relationship between amniotic fluid index and gestational age, the relationship between AFI & EFW is not well established. The objective of this study was to find out the correlation between AFI & EFW in third trimester of pregnancy.

A study on 426 pregnant women 4 showed significant positive correlation between AFI and EFW in female fetuses throughout the third trimester of pregnancy and in male fetuses at 38 to 40 weeks gestation which were very similar to the current study. Another previous study examined the relationship between estimated fetal weight and amniotic fluid index.⁵ This study on 274 low risk pregnant women found no association between AFI & EFW. However, gestational diabetic patients were included in that study that could have influenced the relationship.

A retrospective study was conducted in 2005 on women with 28 to 42 weeks' normal singleton pregnancies, 50 ultrasound scans were randomly selected for each 2 weeks gestational age group.⁶ The results showed a significant positive correlation between EFW and AFI at 28-30 weeks, 30-32 weeks and 38-40 weeks intervals. Another study examined the possibility of assessing the amniotic fluid volume to improve the accuracy of fetal weight estimation for diagnosing large for age (LGA) fetuses.⁷ That study showed that polyhydramnios occurred more frequently in LGA fetuses than in non-LGA fetuses but had a minimal effect in positive predictive value of fetal weight estimation above the 90th percentile.

In contrast, our study showed a significant positive correlation between the AFI and EFW in female fetuses of all three groups of third trimester pregnancy. The positive correlation between the amniotic fluid index and estimated fetal weight only in case of female fetuses should be considered here. A study showed that estrogen-treated female rats had higher water intake and greater amount of dilute urine output compared to controls, which may be due to abnormalities in synthesis and release of antidiuretic hormone.⁸ Thus difference in micturition in male and female fetuses may be partly hormone-dependant, which may affect the values of amniotic fluid index and also its relationship with estimated fetal weight.

Limitations

Limitations of the study are relatively smaller number of subjects and also highest numbers of subjects are in group II.

Conclusion

In this study, significant positive correlation was found between the amniotic fluid index and estimated fetal weight in female fetuses of all groups of third trimester of pregnancy. In addition, there was a significant positive correlation between the amniotic fluid index and estimated fetal weight between 38 and 40 weeks of gestation in case of male fetuses. However these correlations are applicable only in case of normal singleton pregnancies. So evaluation of amniotic fluid volume should take estimated fetal weight into consideration in third trimester of pregnancy. Thus amniotic fluid volume can be assessed more precisely, which will be helpful in obstetric decision-making.

Recommendations

The present study was carried out in a small group of subjects with normal third trimester singleton pregnancies. Such studies should be conducted in large groups and also in pregnancies with other medical disorders.

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