LOW AMNIOTIC FLUID INDEX (AFI) AS A PREDICTOR OF ADVERSE FETAL OUTCOMES IN THE THIRD TRIMESTER OF PREGNANCY

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ABSTRACT

Objectives: To determine the association of low Amniotic Fluid Index with adverse fetal outcome in females presenting in third trimester of pregnancy.
Study Design: Prospective comparative study.
Place and Duration of Study: Department of Obstetrics & Gynecology, CMH Hyderabad, from Apr to Sep 2018.
Methodology: A total of 178 pregnant patients with parity <5, presenting at gestational age between 37-42 weeks with singleton pregnancy were included in the study. Patients with multiple pregnancy, intrauterine fetal anomaly or fetal demise, ruptured membranes, placental abruption, gestational hypertension, and diabetes were excluded. Patients were divided into 2 groups of 89 patients each i.e. group A with Amniotic Fluid Index ≤5cm and group B with Amniotic Fluid Index from 11-21 cm. Frequencies of adverse fetal outcomes in both groups were recorded.
Results: The frequency of low Appearance, Pulse, Grimace, Activity and Respiration (APGAR) score was 15.73% in group A versus 3.39% in the group B (p=0.005) while abnormal fetal heart rate (FHR) was seen in 29.21% patients amongst group A versus 13.48% in group B (p=0.010). The rate of neonatal intensive care unit (NICU) admission was 15.73% in group A as compared to 4.49% in group B (p=0.013), while meconium stained liquor was 41.57% in group A versus 13.48% in group B (p<0.01). All adverse fetal outcomes varied between the two groups by a statistically significant proportion.
Conclusion: Amniotic Fluid Index of ≤5 cm was found to be a reliable predictor of adverse fetal outcomes in the last trimester of pregnancy.

Keywords: Adverse fetal outcome, Low amniotic fluid index, Pregnancy.

INTRODUCTION

Amniotic fluid is the milieu in which the fetus completes its development after the formation of gestational sac on the 12th day after conception. Nature has devised a number of mechanisms of regulation of the amniotic fluid volume (AFV) including transmembranous pathway, fetal urine production and lung liquid secretion, swallowing by the fetus in the uterus and fluid movement according to the osmotic gradient to name a few[1]. Amniotic fluid has a pivotal role in the development and growth of the fetus, provides a low resistance protective environment, cushions against constricting confines of gravid uterus, allows free movements and protects from external trauma. It helps maintain fetal temperature, plays a part in fluid hemostasis and protects against cord compression[2].

The AFV continues to increase up till 33 weeks of pregnancy, after which it begins to decrease in volume by a significant proportion. Pregnancies reaching 40 weeks and beyond have a higher incidence of decreased liquor. The average estimated volume of amniotic fluid is about 750 ml at 40 weeks of gestation[3]. Measurement of AFV can be performed by dye dilution techniques using para amino hippurate, ultrasonography (USG) or it can be calculated during the caesarean section. USG is well suited for the estimation of AFV because other techniques are time consuming, invasive, laboratory dependent and require delivery via caesarean section. Four different methods are employed for USG based evaluation

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of AFV: subjective assessment, amniotic fluid index (AFI), mean vertical pocket (single deepest pocket) measurement and 2 x 2 measurement[4].

Pregnancy is frequently complicated by disorders related to the production of amniotic fluid. These disorders are responsible for considerable perinatal mortality and morbidity. Oligohydramnios is the condition in which too little amniotic fluid is present. If AFI shows fluid level of less than or equal to 5cm or less than 5th percentile for gestational age or absence of fluid pocket of 2-3cm in depth or the total amniotic fluid volume of less than 500ml in a female between 32 to 36 weeks of gestation, the diagnosis of oligohydramnios is made[5,6].

An estimated 3%-8% of all pregnancies can have low amniotic fluid and are diagnosed as oligohydramnios[7]. In uncomplicated term pregnancies, oligohydramnios is independently associated with high risk of low birth weight, abnormal FHR tracing, passage of meconium, need for caesarean section, poor Apgar score, NICU admission and neonatal death[8]. Moore *et al* in 1990 developed the four quadrant technique for assessment of AFV and designated AFI as the gold standard for estimation of AFV. AFI calculated by the same four quadrant technique is a part of antepartum screening in fetal life to segregate fetuses at increased risk of adverse perinatal outcome[9].

The rationale behind the conduct of this study was that there is dearth of local research available on the association of AFI in predicting adverse fetal outcomes in Pakistan. This study was carried out with the objective of bridging this gap in the local literature in pregnant females presenting in the third trimester of pregnancy with low AFI. In the present era of evidence based practices the findings of this study will help to improve our principles and local guidelines for the management of cases of oligohydramnios to prevent fetal complications.

METHODOLOGY

We conducted a prospective comparative study from 1st April 2018 to 30th September 2018 in the Department of Obstetrics & Gynecology, CMH Hyderabad on 178 pregnant patients who fulfilled the sample selection criterion after approval from institutional review board of CMH Hyderabad (IRB No:1/107/Estb-Trg, ID:23LS3N). An informed written consent was taken before inclusion of patients included in the study. Openepi softwarewas used to calculate the sample size taking power of test (1-β) = 80%, two-sided significance level (1-α)=95%, percent of unexposed with outcome = 10% (NICU admissions)[5], percent of exposed with outcome=33%, and ratio of sample size = 1.0. The sample size was calculated to be 89+89=178 patients. The sampling technique was non-probability consecutive sampling.

The inclusion criteria was pregnant female patients between ages of 18-40 years, singleton pregnancy, parity <5 and presenting at gestational age between 37-42 weeks (from the last menstrual period). Patients having AFI ≤5 cm assessed on ultrasound were labelled as group A while patients with normal AFI i-e. 11-21cm assessed on ultrasound were labelled as group B for the study. The exclusion criteria was patients presenting with multiple pregnancy, intrauterine fetal anomaly or fetal demise, ruptured membranes, placental abruption, gestational hypertension, pre-eclampsia, eclampsia and polyhydramnios.

After recording the demographic data of all patients included in the study, history and clinical examination was performed. Cardiotocography (CTG) was done on admission. Adverse fetal outcomes were assessed in terms of abnormal fetal heart rate (FHR), meconium staining of liquor, low Apgar score after 5 minutes and neonatal intensive care unit (NICU) admission. Patients having a non-reactive CTG in active phase of labour were labelled as having abnormal FHR. Liquor was observed for any meconium staining. Apgar score was noted at 1 and 5 minutes after birth of baby and if Apgar score was less than 7 after 5 minutes, it was labelled as poor Apgar score. All newborns were attended by a consultant pediatrician having minimum 3 years post-fellowship experience. The decision

regarding keeping the newborns in NICU was taken by the pediatrician. Data was recorded on a predesigned proforma.

Data was entered in and analyzed by using SPSS version 25. Mean and standard deviation was calculated for quantitative variables. Frequency and percentage was calculated for qualitative variables Independent samplet-test was used for quantitative variables while post-stratification chi-square test was applied to compare the two groups taking $p \leq 0.05$ as significant.

RESULTS

A total of 178 patients were included in this research protocol and they were divided into two equal groups of 89 patients each. Age range of the patients was from 18 to 40 years with mean age of 28.96 ± 3.80 years in group A while 29.14 ± 3.81 years in group B. The mean gestational age was 38.81 ± 1.54 weeks in the group A while it was 38.69 ± 1.58 weeks in the group B. The mean BMI was 26.55 ± 1.68 Kg/m² in the group A and 26.98 ± 1.80 Kg/m² in group B. Both groups were almost similar in demographic characteristics with regards to maternal age, gestational age and BMI ($p > 0.05$).

Table: Descriptive summary table.

	Group A (n=89)	Group B (n=89)	*p*-value
Age (years)	28.96 ± 3.80	29.14 ± 3.81	0.753
Gestational Age (weeks)	38.81 ± 1.54	38.69 ± 1.58	0.609
BMI (Kg/m²)	26.55 ± 1.68	26.98 ± 1.80	0.101

The frequency of low Apgar score was 14 patients (15.73%) in group A versus only 3 patients (3.37%) in group B, the difference being statistically significant ($p=0.005$). Abnormal FHR was seen in 26 patients (29.21%) amongst group A versus 12 patients (13.48%) in group B, the difference was again statistically significant ($p=0.010$). A total of 14 patients (15.73%) were admitted to the NICU in group A as compared to only 4 patients (4.49%) amongst group B with a significant *p*-value equal to 0.013. Finally, meconium stained liquor was observed in 37 patients (41.57%) in the group A versus 12 patients (13.48%) in the group B, the difference was again statistically significant ($p<0.01$). Thus, all the adverse fetal outcomes varied between the two groups by a statistically significant proportion.

The demographic details have been summarized in table below which revealed no difference amongst the two groups in terms of demographic details (figure).

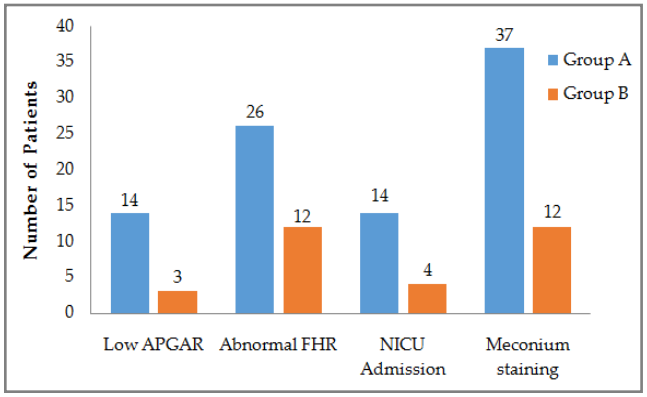

Figure: Comparison of adverse outcomes between the two groups.

DISCUSSION

Our study was the first on the subject comprising of patients belonging to Interior Sindh. The mean age of patients was 28.96 ± 3.80 years in the patients having AFI ≤5 cm (group A) while 29.14 ± 3.81 years in the patients with normal AFI (group B). The mean age of patients was comparable with the study done by Ashwal *et al*[10] who reported a mean age of 30.0 ± 4.9 years, while a younger mean age was reported in the research protocols by Jagatia *et al*[11] (mean age of 23.9 years) Hindumati *et al*[12] (mean age of 22.5 years) and Sangeeta *et al*[2] reported a mean age of 23.1 years in cases and 22.6 years in controls.

Low Apgar score was 15.73% in the patients having AFI ≤5 cm as compared to 3.37% in thepatients with normal AFI ($p=0.005$). It is comparable to the study of Chate *et al* who reported an APGAR score of less than 7 in the study group in 16% newborns at 5 minutes after birth[13]. On the contrary, a similar research protocol by Syria *et al*[14], APGAR score of less than 7 was reported in 38.8% newborns while a study by Casey *et al*[15]

reported low APGAR score in 6% newborns. There was no significant difference for APGAR score in the cases and controls group in the study by Locatelli *et al*[16]. Mahapatro *et al* investigated the relation between AFI and neonatal outcomes and reportedthat the frequency of babies born with APGAR score of less than 7 at 5 minutes after birth was 2.94% as compared to babies with normal or borderline liquor[17].

Our data showed a statistically significant correlation between oligohydramnios as evidenced by a reduced AFI and meconium stained liquor (p<0.01). This finding of our study was in agreement with Rosati *et al* who reported a significant increase in meconium staining in patients with oligohydramnios with meconium staining of liquor seen in 40.42% patients[18]. Giri *et al* also reported that meconium staining of liquor was present in 31% cases versus 15% controls, the difference being statistically significant (p=0.001)[19]. On the other hand, Sangeetha *et al* reported a non-significant difference between cases and controls in terms of meconium staining of liquor (p=0.23)[2].

While performing intrapartum monitoring, FHR decelerations are frequently encountered in pregnant women having AFI ≤5 cm. The frequency of abnormal FHR (p=0.010) and NICU admissions (p=0.013) in our study were found to be significant respectively. Studies by Casey *et al*[20] and Sriya *et al*[21] reported abnormal FHR in 48% and 36.11% newborns with low AFI respectively. The findings in our study were in agreement with the study by Giri *et al* who reported the frequency of abnormal FHR to be 19.4% in cases while 4.8% in controls (p<0.001). Similarly the frequency of NICU admissions was 18.18% in cases and 7.8% in controls which was also significant (p=0.008)[18]. However, Sangeetha *et al* reported a non-significant difference between cases and controls in terms of frequency of abnormal FHR (p=0.24) and frequency of NICU admissions respectively (p=0.18)[2].

In the third world and resource poor countries in which poverty, nutritional deprivation and lack of education along with lack of basic health facilities and poor family planning practices are common, late presentation of pregnant women to the hospital and the association of complications related to pregnancy can be enormous. The need of the hour is to improve maternal health and antenatal care delivery services. Further research protocols including randomized controlled trials are required on the topic with bigger sampleto validate the already available literature. Ours is an era of evidence based practices in all fields of medicine and our study is a small effort towards improvement of the body of knowledge and better healthcare delivery to one of the otherwise most neglected patients' i.e. Pregnant women.

CONCLUSION

An AFI of <5 cm detected in a pregnancy was a reliable indicator of adverse fetal outcomes in females presenting in third trimester of pregnancy. A purposeful ultrasonography with a view to elucidate the AFI could go a long way to select and expedite delivery in fetuses at risk if such services could be provided.

CONFLICT OF INTEREST

This study has no conflict of interest to be declared by any author.

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