

A study of the effect of abnormal amniotic fluid volume on maternal and fetal outcome**Dr Aruna Vadde¹, Dr. Veeraboina Jayasree²**^{1,2}Assistant Professor, Department of OBG, Arundathi Institute of Medical Sciences and Hospital**Corresponding Author: Dr. Veeraboina Jayasree****ABSTRACT**

Background: Amniotic fluid has many important functions and is regulated by multiple factors. It is integral to fetal development, including fetal pulmonary, gastrointestinal, and musculoskeletal maturation. It also acts to cushion the fetus from trauma. It is also believed to be sterile and possesses bacteriostatic properties. Amniotic fluid is regulated by fetal swallowing, fetal urine production, lung secretions, and intramembranous absorption. Amniotic fluid abnormalities (either increased or decreased fluid) are due to dysregulation of these processes from maternal or fetal disease. Normal amniotic fluid volume has been extensively studied using direct measurement, dye dilution methods, and ultrasound estimation.

Materials and methods: The present study was conducted in the Department of Obstetrics and Gynecology, Arundathi Hospital over a period of 1 year. This study subjects consisted of registered antenatal patients at term gestation with single live fetus in cephalic presentation. The study group subjects constituted registered 90 antenatal cases presented at gestational age above 37 weeks. The mothers during their first visit were included for detailed history, clinical examination and blood investigations as follows. Detailed case history including age / parity / menstrual history / obstetric history/ past and family history were taken. Detailed general and systemic examination of the patient was done.

Result: The study was done on 90 antenatal patients with oligohydramnios. The mean age group of the study participants was 28.39 ± 6.49 years. Majority (50%) of them were primigravida and most of them (44%) belonged to the age group of 26 to 30 years. 41(82%) patients required an emergency LSCS and 35 (38.9%) of the new-born required an extra care and were admitted in NICU. Gestational age, birth weight and abnormal doppler study were found to have an association with the perinatal outcome. The present study revealed that children with increased birth weight and gestational age had a favourable perinatal outcome. Those with an abnormal doppler study had an unfavourable perinatal outcome. Other factors like age of the mother, parity, mode of delivery and AFI did not have any association with perinatal outcome. Perinatal mortality in the present study was 8.9%.

Conclusion: In conclusion, due to such adverse outcomes mentioned in patients with borderline AFI and because there is no sufficient evidence and specific decision about delivery based on a borderline AFI, there should be a close observation and antepartum surveillance for them. Also, further studies with prospective design are needed.

Keywords: Amniotic fluid, Maternal outcome, Fetal outcome

INTRODUCTION

Modern obstetrics is concerned with the health and well-being of both the mother and the unborn child. Recognition of a fetus at risk for death or damage in utero, quantifying the risk, balancing the fetal risk against the risk of neonatal complications from immaturity, and determining the optimal time and mode of intervention are the cornerstones of modern perinatal medicine ^[1]. Clinical estimation of amniotic fluid volume (AFV) is an important part of fetal assessment as variation in its amount has been related to a variety of pregnancy complications. ^[2] Amniotic fluid provides a protective milieu for the growing fetus, cushioning it against mechanical and biological injury. ^[3]

Amniotic fluid has many important functions and is regulated by multiple factors. It is integral to fetal development, including fetal pulmonary, gastrointestinal, and musculoskeletal maturation. It also acts to cushion the fetus from trauma. It is also believed to be sterile and possesses bacteriostatic properties. ^[4] Amniotic fluid is regulated by fetal swallowing, fetal urine production, lung secretions, and intramembranous absorption. ^[5] Amniotic fluid abnormalities (either increased or decreased fluid) are due to dysregulation of these processes from maternal or fetal disease. ^[6] Normal amniotic fluid volume has been extensively studied using direct measurement, dye dilution methods, and ultrasound estimation. ^[7] Ultrasound estimation of amniotic fluid gives clinicians the ability to obtain a real time assessment of fetal status – a window to the intrauterine environment. Thus, measures of amniotic fluid have been considered a vital sign for fetal wellbeing. ^[7] Amniotic fluid abnormalities have been associated with many adverse maternal and neonatal outcomes. ^[8]

Quantification of amniotic fluid is an important component of the biophysical profile in ultrasound evaluation of fetal well-being, especially in the third trimester. ^[9] Antenatal tests use amniotic fluid volume as a fundamental assessment of chronic in utero stress. Ultrasound being a non-invasive test is ideal for application on a large scale and can be used frequently for repeat AFV determination in the case of suspected abnormalities. ^[10] Links have been found between decreased amniotic fluid volume and stillbirths, fetal anomaly, abnormal FHR tracings in labor, increase in cesarean section for fetal distress, and possibly fetal acidosis. ^[11] In the present study, amniotic fluid quantification was done by the four-quadrant technique as described by Phelan et al. ^[5] to determine AFI and we sought to determine if an antepartum AFI of 5 cm or less is a predictor of adverse perinatal outcome in terms of meconium staining, cesarean section for fetal distress, birth weight, low Apgar scores, and cord pH. ^[12,13]

MATERIALS AND METHODS

The present study was conducted in the Department of Obstetrics and Gynecology, Arundathi Hospital over a period of 1 year. This study subjects consisted of registered antenatal patients at term gestation with single live fetus in cephalic presentation.

The study group subjects constituted registered 90 antenatal cases presented at gestational age above 37 weeks.

Inclusion Criteria

- Full term pregnancy
- Primigravida and multigravida
- Singleton pregnancy
- High risk pregnancies – hypertensive disorders, Diabetes mellitus, cardiac diseases
- Previous abortions also included
- Previous vaginal delivery.
- Willing to participate.

Exclusion Criteria

- Multiple gestations.
- Previous scar
- Premature rupture of membranes
- Anomalous foetus
- Not willing to participate

The mothers during their first visit were included for detailed history, clinical examination and blood investigations as follows. Detailed case history including age / parity / menstrual history / obstetric history/ past and family history were taken. Detailed general and systemic examination of the patient was done. Obstetric examination with special reference to height of the uterus, symphysio-fundal height, abdominal girth, presentation and position of fetus, engagement of the presenting part and fetal heart was done Ultrasonography was done by radiologists, available on call i.e. by multiple persons (scan machine used LOGIQ S7). All patients underwent obstetric ultrasound examination to know the amniotic fluid index which was determined using Phelan's four quadrant technique. The largest vertical pocket free of fetal parts and umbilical cord loops in each quadrant was measured and sum of these measurements gave AFI in cm. An AFI of 10-12cm was considered normal at term. AFI of < 5 cm was considered severe oligohydramnios, and > 25cm was considered as severe polyhydramnios.

Maternal and foetal wellbeing was monitored in labour and labour was managed as per the hospital policy. Maternal outcome was assessed on the mode of delivery as to whether it is vaginal delivery, instrumental or operative delivery and postnatal complications if any. Fetal outcome was noted in the form of perinatal morbidity, which was assessed using Apgar score,

birth weight, maturity, IUD, still births, neonatal deaths, admission to NICU or immediate perinatal period.

Statistical analysis

Data was compiled and was analyzed for the statistical significance using chi-square test.

RESULTS

The study was done on 90 antenatal patients with oligohydramnios. The mean age group of the study participants was 28.39 ± 6.49 years. Majority (50%) of them were primigravida and most of them (44%) belonged to the age group of 26 to 30 years. 41(82%) patients required an emergency LSCS and 35 (38.9%) of the new-born required an extra care and were admitted in NICU.

The relationship of maternal and fetal outcomes with certain selected parameters was studied as seen in Table 1. Gestational age, birth weight and abnormal doppler study were found to have an association with the perinatal outcome. The present study revealed that children with increased birth weight and gestational age had a favourable perinatal outcome. Those with an abnormal doppler study had an unfavourable perinatal outcome. Other factors like age of the mother, parity, mode of delivery and AFI did not have any association with perinatal outcome. Perinatal mortality in the present study was 8.9%.

Table 1: Relationship of certain selected variables with the perinatal outcome.

Parameter	Perinatal outcome		p value
	Discharged without issues	NICU admission	
Mode of delivery			
FTND	14 (15.6%)	11 (12.2%)	0.29
Emergency LSCS	41 (45.6%)	24 (26.6%)	
Birth weight in kg			
< 2 kg	7 (7.8%)	26 (28.8%)	< 0.001*
2.10-2.5 kg	25 (27.8%)	9 (10%)	
> 2.5 kg	23 (25.6%)	0 (0%)	
Congenital anomalies			
Present	0 (0%)	8 (8.9%)	0.08
Absent	55(61.1%)	27 (30%)	
Parity			
Primigravida	30 (33.3%)	15 (16.7%)	0.49
Multipara	25 (27.8%)	20 (22.2%)	
AFI			
< 8	44 (48.9%)	30 (33.3%)	0.871
> 8	11 (12.2%)	5 (5.6%)	

Doppler study			
Normal	40 (44.4%)	14 (15.6%)	0.002*
Abnormal	15 (16.7%)	21 (23.3%)	

Table 2: Relationship between diagnosis in the patient and the perinatal outcome.

Diagnosis	Discharged	NICU admission	Total	p value
Severe PE	8 (8.9%)	15 (16.7%)	23 (25.6%)	0.008
Hypothyroidism	7 (7.8%)	4 (4.4%)	11 (12.2%)	0.806
Breech	6 (6.7%)	3 (3.3%)	9 (10%)	0.579
IUGR	6 (6.7%)	3 (3.3%)	9 (10%)	0.579
Fever	3 (3.3%)	3 (3.3%)	6 (6.7%)	0.725
Rh Negative	6 (6.7%)	0 (0%)	6 (6.7%)	0.260
Gestational Diabetes	0 (0%)	2 (2.2%)	2 (2.2%)	0.199
Anaemia	3 (3.3%)	0 (0%)	3 (3.3%)	0.431
Nil	16 (17.7%)	5 (5.6%)	21 (23.3%)	0.088
Total	55 (61.1%)	35 (38.9%)	90 (100%)	-

Table 2 shows the relationship between diagnosis in the patient and the perinatal outcome. It was seen that the neonates born to mothers with severe preeclampsia landed more often in NICU than those born to normal mothers. Other factors did not have any association with perinatal outcome. It can also be seen that neonates born to mothers without any complication had more chance of getting discharged without any issues rather than those born to mothers with complications during antenatal period who most often land up in NICU.

DISCUSSION

Many studies have been done to show the association of a borderline amniotic fluid index with some adverse perinatal outcomes and, in most findings, the occurrence of maternal and fetal complications was reported more often in pregnancies with borderline AFI than in those with normal AFI.^[14]

However, there were no specific perinatal cares or other care protocols for these patients and that could be because of different reasons such as the variations in the study designs, the likelihood of a borderline index varied from 6-44% and 25-35% and the absence of receiver-operating characteristic curve to determine the thresholds of adverse outcomes, and therefore, more research will be required to find out the effect of AFI on adverse pregnancy outcome.^[15]

So in the present study, the maternal and fetal complications in women with borderline AFI were compared with complications in those with normal AFI among 235 pregnant women in Alzahra

Hospital which confirmed the increased adverse perinatal outcomes in women with borderline AFI. Findings indicated that maternal outcomes such as preterm delivery and labor induction in women with borderline AFI were considerably higher than those in normal group and that was consistent with the findings in some other studies with the same results. ^[16]

In addition, the borderline AFI group had higher rate of neonatal complications such as Apgar score of less than, IUGR, LBW, and crucial need to NICU and there were similarities between the findings of this research and the existing work of others. For example, Petrozella et al reported the rate of caesarean 24% and the birth weight below the third percentile 21%; or Banks considered the likelihood of IUGR up to 4 times greater, and Gumus et al found a higher rate of IUGR, LBW, Apgar score of less than 7 at 5 minutes, and NICU admission among women with borderline AFI which were in accordance to our results. ^[17]

The present study showed no statistical differences between the ratios of gravidity and parity in the two study groups; whereas, in Gumus et al and Voxman et al study, the groups were similar with respect to maternal age, gravidity and parity. ^[19] Also, the present study analysis showed no significant differences between the two groups in terms of high blood pressure, pre-eclampsia and diabetes for the mother and that was consistent with the results of Gumus et al. However, there were a significantly higher percentage of NICU admission in patients with normal AFI than in those with oligohydramnios. That appeared to be attributable to the higher percentage of women with diabetes in the normal AFI group. Then reanalysis of their data with exclusion of the diabetic patients resulted in no significant difference between the two groups. ^[20]

In our institution, infants with apgar less than 7 at 1 and 5 minute are routinely observed in the NICU after delivery and this may contribute to the higher rate of admission in NICU. Therefore, because of the fact that the findings in this study reinforces the increased pregnancy complications in women with borderline AFI, and because of the lack of a definite care protocol to care the patients, the physicians recommend that the patients have twice weekly sonography assessment to evaluate AFI and to permanently monitor the patients for IUGR and SGA and to take all necessary measures in order to avoid adverse perinatal complications. ^[21] Further studies are warranted to confirm the effect of AFI on pregnancy outcome.

CONCLUSION

In conclusion, due to such adverse outcomes mentioned in patients with borderline AFI and because there is no sufficient evidence and specific decision about delivery based on a borderline AFI, there should be a close observation and antepartum surveillance for them. Also, further studies with prospective design are needed.

REFERENCES

1. Magann EF, Chauhan SP, Hitt WC, Dubil EA, Morrison JC. Borderline or marginal amniotic fluid index and peri-partum outcomes: a review of the literature. *J Ultrasound Med* 2011; 30: 523-528.
2. Ali HS. Assessment of amniotic fluid index in normal pregnancy at a tertiary care hospital setting. *J Ayub Med Coll Abbottabad* 2009; 21: 149-151.
3. Karim R, Jabeen S, Pervaiz F, Wahab S, Yasmeen S, Raees M. Decreased amniotic fluid index and adverse pregnancy outcome at term. *JPMI* 2010; 4: 307-311.
4. Voxman EG, Tran S, Wing DA. Low amniotic fluid index as a predictor of adverse perinatal outcome. *J Perinatol* 2002; 22: 282-185.
5. Pankaj D, Purvi P, Anjali G. Decrease of amniotic fluid index in low- risk pregnancy. Any significance? *J Obstet Gynecol Ind* 2004; 54: 464-466.
6. Magann EF, Chauhan SP, Bofill JA, Martin JN Jr. Comparability of the amniotic fluid index and single deepest pocket measurements in clinical practice. *Aust N Z J Obstet Gynaecol* 2003; 43: 75-77.
7. Anderson D, Yang Q, Hohimer A, Faber J, Gi Raud G, Davi SL. Int r amembranous absorption rate is unaffected by changes in amniotic fluid composition. *Am J Physiol Renal Physiol* 2005; 288: 964-968.
8. Rutherford SE, Phelan JP, Smith CV, Jacobs N. The 4 quadrant assessment of amniotic fluid volume: An adjunct to antepartum fetal heart rate testing. *Obstet Gynecol* 1987; 70: 353-356.
9. Kwon JY, Kwon HS, Kim YH, Park YW. Abnormal Doppler velocimetry is related to adverse pregnancy outcome for borderline amniotic fluid index in the third trimester. *J Obstet Gynecol Res* 2006; 32: 545549.
10. Haas DM, Magann EF. External cephalic version with an amniotic fluid index ≤ 10 : a systematic review. *J Matern Fetal Neonatal Med* 2005; 18: 249-252.
11. Gumus II, Koktener A, Turhan NO. Perinatal outcome of pregnancies with borderline amniotic fluid index. *Arch Gynecol Obstet* 2007; 276: 17-19.
12. Moore TR. Amniotic fluid dynamics reflect fetal and maternal health and disease. *Obstet Gynecol*. 2010;116:759–65.
13. Hashimoto BE, Kramer DJ, Brennan L. Amniotic fluid volume: fluid dynamics and measurement technique. *Semin Ultrasound CT MR*. 1993;14:40–55.
14. Vermillion Stephen T, Kooba Austin M, Soper David E. Amniotic fluid index values after preterm premature rupture of the membranes and subsequent perinatal infection. *Am J Obstet Gynecol*. 2000;183:271–5.
15. Newbould MJ, Lendon M, Barson AJ. Oligohydramnios sequence; the spectrum of renal malformations. *Br J Obstet Gynaecol*. 1994;101:598–604.
16. Ariel M, Hill Lyndon M, Lazebnic Noam, et al. The association between polyhydramnios and preterm delivery. *Obstet Gynecol*. 1995;86:389–91.
17. Carlson DE, Platt Lawrence D, Medearis Arnold L, et al. Quantifiable polyhydramnios: diagnosis and management. *Obstet Gynecol*. 1990;75:989–92.

18. Panting-Kemp Andrea, Nguyen Tuan, Chang Elaine, et al. Idiopathic polyhydramnios and perinatal outcome. *Am J Obstet Gynecol.* 1999;181:1079–82.
19. Chauhan SP, Sharp TW, Runjel Ar, et al. Intrapartum amniotic fluid index and adverse outcome: experience at a community hospital. *J Matern Fetal Invest.* 1993;3:37–9.
20. Baron' BC, Morgan MA, Garite TJ. The impact of amniotic fluid volume assessed intrapartum on perinatal outcome. *Am J Obstet Gynecol.* 1995;173:167–74.
21. Moore Thomas R, Cayle Jonathan E. The amniotic fluid index in normal human pregnancy. *AmJ Obstet Gynecol.* 1990;162:1168–73.