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Original Research Article

Association of amniotic fluid index with feto-maternal outcomes: a prospective observational study

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ABSTRACT

Background: Amniotic fluid index (AFI) serves as a critical marker for foetal wellbeing. Abnormal AFI values such as oligohydramnios and polyhydramnios have been associated with adverse pregnancy outcomes. Objective was to assess the association between AFI and feto-maternal outcomes amongst pregnant women between 32 and 40 weeks of gestation.

Methods: This prospective observational study was conducted at Holy Family Hospital, New Delhi, from July 2022 to March 2024. A total of 150 women with singleton pregnancies were evaluated and categorized into four groups based on AFI: oligohydramnios (<5 cm), borderline low (5.1-8 cm), normal (8.1-18 cm), and polyhydramnios (>18 cm). Clinical, intrapartum, and neonatal outcomes were analysed.

Results: Of the 150 participants, 14% had oligohydramnios, 23.3% borderline low, 39.3% normal, and 23.3% polyhydramnios. Oligohydramnios was significantly associated with preterm birth (47.6%, p<0.0001), low birth weight (57.1%, p<0.0001), emergency caesarean (61.9%, p<0.0001), NICU admissions (71.4%, p=0.004), and low APGAR scores at 1 and 5 minutes (61.9%; p=0.001 and 23.8%; p=0.0009, respectively). Polyhydramnios was strongly associated with gestational diabetes mellitus (51.4%, p<0.0001) and increased birth weight.

Conclusions: Abnormal AFI, particularly oligohydramnios, is significantly associated with adverse feto-maternal outcomes. Routine assessment of AFI should be emphasized in late pregnancy to enable timely intervention.

Keywords: Amniotic fluid index, Feto-maternal outcome, Oligohydramnios, Polyhydramnios, Pregnancy complications

INTRODUCTION

Amniotic fluid plays an essential role in foetal development by cushioning the fetus, allowing movement, and contributing to lung and gastrointestinal tract development. AFI, a semiquantitative sonographic assessment method, is commonly used to evaluate amniotic fluid volume and predict perinatal outcomes.[1-3]

Chamberlain et al introduced the concept of evaluating amniotic fluid volume by utilising the depth of the maximum vertical pocket which is visible with ultrasound.[2] Phelan et al introduced the amniotic fluid index (AFI) to help single out which patients undergoing external breech version were most likely to be successful.[4,5] The technique involves adding up the deepest vertical pockets in each of the four quadrants of the uterus. An AFI of <5 cm denotes oligohydramnios, while >24 cm defines polyhydramnios. Deviations from normal AFI values are linked to complications such as preterm birth, growth restriction, caesarean delivery, and perinatal mortality.

This study aimed to assess how variations in AFI affect feto-maternal outcomes in pregnancies nearing term.

METHODS

It was prospective observation study which was conducted on 150 antenatal women coming to the department of obstetrics and gynecology at Holy family Hospital, New Delhi between 32 to 40 weeks of period of gestation from July 2022 to March 2024. A detailed history was recorded. Thorough clinical examination was done. Detailed ultrasound examination was done to determine AFI using Phelan's four quadrant ultrasound technique. The following AFI ranges were considered: <5 cm: very low (oligohydramnios), 5.1-8 cm: borderline low, 8.1-18 cm: normal, >18 cm: high (polyhydramnios).

Inclusion criteria for cases

Pregnant women with gestational age between 32 to 40 weeks (gestational age was calculated by LMP or first trimester USG), singleton pregnancies, intact membranes

Exclusion criteria for cases

Gestational age <32 weeks and >40 weeks, premature rupture of membranes, congenital anomalies of foetus, twin gestation.

A formal approval was taken from the intuitional ethical committee before starting the research. Written informed consent for participation in the study was taken from the patients before enrolling them for the study.

All the data pertaining to the patients including the demographic profile, gestational age, AFI, gestational hypertension, gestational diabetes, mode of delivery (CS, normal vaginal delivery, instrumental delivery), meconium-stained liquor, birth weight, APGAR score at birth, 1 minute, and 5 minutes, NICU admission, respiratory distress syndrome, meconium aspiration, non-stress test were noted.

Continuous variables were presented as mean and standard deviation and were compared with t test. Categorical variables were presented as frequencies and percent values and compared with chi-square test. P value <0.05 were considered as significant for all statistical tests. All these clinical and neonatal data were analysed using SPSS v25.

RESULTS

The mean age of the study subjects was 29.22 years with a standard deviation of ±5.1. 79 patients (52.7%) were nulliparous, while 71 patients (47.33%) were multiparous. Out of 150 antenatal patients, 59 (39.33%) had a normal amniotic fluid index ranging from 8.1 to 18 cm. Additionally, 35 (23.33%) cases had a borderline low index ranging from 5.1 to 8 cm, 35 (23.33%) cases had a high index greater than 18 cm indicating polyhydramnios, and 21 (14.00%) cases had a very low index less than 5cm indicating oligohydramnios. Demographic profile of patients enrolled in study is shown in Table 1.

Table 1: Demographic profile of patients enrolled in study.

Parameters	Value (%)
Total patients enrolled	150 patients
Mean age	29.22 years
Nulliparous patients	79 (52.7)
Multiparous	71 (47.33)
Normal AFI	59 (39.33)
Oligohydramnios	21 (14)
Borderline AFI	35 (23.33)
Polyhydramnios patients	35 (23.33)

Table 2: Comparison of various parameters in different groups of AFI.

Parameters	Oligohydramnios	Borderline	Normal liquor	Polyhydramnios	P value
Non-reactive NST (%)	47.62	20	8.47	17.14	0.002
Induction of labour (%)	61.90	74.29	62.71	60	0.0007
Caesarean section (%)	61.90	45.71	13.56	51.43	<0.0001
Emergency CS (%)	92.31	93.75	87.50	72.22	0.37
Meconium-stained liquor (%)	38.10	17.14	22.03	8.57	0.062
Preterm delivery (<37 weeks) (%)	47.62	20	3.39	11.43	<0.0001
Low birth weight (1500-2500 gm) (%)	57.14	40	8.47	5.71	<0.0001
Macrosomia (≥4000 gm) (%)	0	0	0	11.43	
APGAR <7 at 1 minute (%)	61.90	25.71	20.34	17.14	0.001
APGAR <7 at 5 minutes	23.81	5.71	0	5.71	0.0009
NICU Admission (%)	71.43	37.14	28.81	28.57	0.004
Respiratory distress syndrome (%)	38.10	14.29	3.39	8.57	0.0008
Meconium aspiration (%)	4.76	2.86	0	0	0.257
Neonatal death (%)	9.52	0	0	0	0.019

A significant association was observed in the distribution of comorbidities across the different amniotic fluid levels. Gestational HTN showed a significant association with oligohydramnios (28.57% and p=0.009) while gestational DM was associated with polyhydramnios significantly (51.43% and p<0.0001).

Comparison of various parameters in different groups of AFI is given in Table 2.

The rate of induced labour was significantly higher in patients with borderline low amniotic fluid compared to those with oligohydramnios, normal amniotic fluid, and polyhydramnios (p=0.0007). The proportion of patients with oligohydramnios who were taken up for a caesarean section in view of non-reactive none stress test or foetal distress prior to induction or spontaneous onset of labour were notably higher compared to those with borderline low amniotic fluid, normal amniotic fluid levels, and polyhydramnios (p<0.0001).

A significant association with AFI was observed in the mode of delivery. Notably, the proportion of patients undergoing instrumental delivery was significantly higher in cases of oligohydramnios and polyhydramnios (23.81% and 17.14% respectively). Moreover, the proportion of patients undergoing caesarean section was notably higher in cases of oligohydramnios and polyhydramnios (61.90% and 51.43% respectively). Conversely, the proportion of patients undergoing vaginal delivery was significantly higher in cases of normal liquor (79.66%) (p value <0.0001).

In our study, the indication of LSCS was not significantly influenced by the amniotic fluid index. The proportion of cases with meconium-stained liquor was higher in patients with oligohydramnios as compared to borderline low, normal liquor, polyhydramnios group (38.10%, 17.14%, 22.03%, 8.57%, respectively) but this did not reach statistical significance.

A significant association with AFI was observed in the gestational age of delivery. The highest mean gestational age was observed in cases with normal liquor (39.09 ±1.15 weeks), followed by polyhydramnios (37.97±1.14 weeks), borderline low (37.97±1.5 weeks), and the lowest mean gestational age was observed in cases with oligohydramnios (36.87±2.54 weeks) (p<0.0001).

Birth weight of the infant (grams) was significantly associated with AFI. The proportion of infants with a birth weight ranging from 1500-2500 grams was significantly higher in oligohydramnios (57.14%) whereas the polyhydramnios group had infants with birth weight ≥4000 grams (11.43%) (p<0.0001).

A positive correlation was obtained with APGAR scores of infants recorded at 1 minute and 5 minutes of birth. Proportion of infants with APGAR score <7 was significantly higher in oligohydramnios group. p=0.001 for APGAR score at 1 minute and p=0.0009 for APGAR score at 5 minutes.

The proportion of neonates requiring ICU admission was significantly higher (p=0.004) in cases of oligohydramnios compared to those with borderline low, normal liquor, and polyhydramnios (71.43% versus 37.14%, 28.81%, and 28.57% respectively).

Specifically, the proportion of neonates diagnosed with RDS were significantly higher in cases of oligohydramnios compared to those with borderline low, normal liquor, and polyhydramnios (38.10% versus 14.29%, 3.39%, and 8.57% respectively). These differences were statistically significant with a p value of 0.0008.

The proportion of patients with neonatal death was significantly higher (p=0.019) in cases of oligohydramnios compared to those with borderline low, normal liquor, and polyhydramnios (9.52% versus 0%, 0%, and 0% respectively).

The proportion of patients displaying a non-reactive NST was significantly higher in cases of oligohydramnios compared to those with borderline low amniotic fluid, normal amniotic fluid levels, and polyhydramnios, with percentages of 47.62%, 20%, 8.47%, and 17.14% respectively.

DISCUSSION

In our study, the rate of induced labour was significantly higher with borderline low amniotic fluid as compared to other groups. It was similar to a study by Suneetha et al who also observed that induction of labour was done in 50% of the women with low amniotic fluid group which was significantly higher than the control group.[6]

Most of the patients with oligohydramnios (61.9%) or polyhydramnios (51.3%) underwent caesarean section as compared to only 13.56 % of patients with normal liquor (p<0.001). It was consistent with study by Guin et al, who did a study on feto-maternal outcome in 200 pregnant females with abnormal amniotic fluid volume and found that oligohydramnios (42.8%) and polyhydramnios (22.2%) patients had more caesarean sections.[7] Similarly, the study by Bawa et al, showed 55.9% women with oligohydramnios underwent CS.[8]

Studies by Vidyasagar et al found that MSL was significantly higher in oligohydramnios as compared to polyhydramnios and normal AFI.[9] But, in our study the MSL was not significantly associated with any of the AFI group similar to study by Mathuriya et al and Bhagat et al.[10,11]

The proportion of patients with a gestational age of less than 37 weeks was significantly higher in cases of oligohydramnios compared to those with borderline low,

normal liquor, and polyhydramnios (47.62% versus 20%, 3.39%, and 11.43% respectively). Conversely, the proportion of patients with 56 a gestational age of 37 weeks or more was significantly higher in cases of borderline low, normal liquor and polyhydramnios compared to those with oligohydramnios (80%, 96.61%, 88.57% versus 52.38% respectively). Jamal et al conducted a study to determine adverse pregnancy outcomes in borderline AFI.[12] It was observed that gestational age at delivery in pregnancies with borderline AFI was significantly lower than normal liquor volume.

In our study, the oligohydramnios patients had significantly higher number of babies with birth weight 1500-2500gm while polyhydramnios patients had significantly higher birthweight of 4000 gm or more. This was consistent with studies by Bhagat et al, who found LBW weight babies were significantly higher in oligohydramnios patients.[11] And Ott et al, who found a significant association between polyhydramnios and large for gestational age babies.[13]

APGAR score was significantly low than 7 at 1 minute (p=0.001) and 5 minutes (p=0.0009) in cases of oligohydramnios as compared to other groups. It was also by Jeng et al, who found that AFI≤8 cm is significantly associated with APGAR of ≤7 at 1 minute.[14]

The proportion of neonates requiring ICU admission was significantly higher in cases of oligohydramnios compared to other groups (p=0.004). Casey et al it was found that oligohydramnios (AFI<5 cm) was significantly associated with NICU admission (7% versus 2%; p<0.001).[15]

RDS was significantly higher in cases of oligohydramnios compared to other groups with p value of <0.001. In a study conducted by Vyas et al to investigate the maternal outcomes and perinatal outcomes in borderline AFI versus normal AFI, they found that the borderline AFI group also had a higher rate of respiratory distress syndrome (RDS) (p=0.001) in the infant.[16]

There was no significant difference among all the groups in terms of meconium aspiration syndrome (p=0.2) which was seen by Casey et al.[15]

Neonatal death was significantly higher in cases of oligohydramnios compared to other groups (p=0.019). which consistent with study by Casey et al who found that oligohydramnios (AFI<5 cm) was significantly associated with neonatal deaths (5% versus 0.3%; p<0.001).[15]

non-reactive NST was significantly higher in cases of oligohydramnios in our study. retrospective study by Suneetha et al, singleton pregnancy outcomes in 60 pregnant women diagnosed with oligohydramnios by USG after 37 weeks of gestation were compared to 60 women who did not have oligohydramnios.[17] A significant finding that occurred more frequently in the oligohydramnios group (36.6 %) than in the control group (21.6%) (p=0.05) was non-reactive NST.

The findings of this study align with existing literature indicating that abnormal AFI is a risk factor for adverse pregnancy outcomes. Oligohydramnios increases the likelihood of preterm birth, fetal distress, and neonatal morbidity. Polyhydramnios correlates strongly with maternal GDM and macrosomia. These findings support the need for routine AFI monitoring.

This was a single-centre study with a modest sample size. Results may not generalize to the broader population. Future multicentre studies are recommended.

CONCLUSION

AFI is a reliable indicator for monitoring feto-maternal well-being. Abnormal values, especially oligohydramnios, are significantly associated with complications such as low birth weight, increased NICU admissions, and caesarean delivery. Timely identification and management of abnormal AFI can reduce adverse outcomes.

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REFERENCES

1. Cunningham FG, Leveno KJ, Bloom SL, Dashe JS, Hoffman BL, Casey BM, et al, editors. William's Obstetrics. 25th edn. United States: McGraw-Hill Education; 2018.
2. Chamberlain PF, Manning FA, Morrison I, Harman CR, Lange IR. Ultrasound evaluation of amniotic fluid volume. II. The relationship of increased amniotic fluid volume to perinatal outcome. Am J Obstet Gynecol. 1984;150:250-4.
3. Manning FA, Morrison I, Lange IR, Harman CR, Chamberlain PF. Fetal assessment based on fetal biophysical profile scoring: experience in 12,620 referred high-risk pregnancies. I. Perinatal mortality by frequency and etiology. Am J Obstet Gynecol. 1985;151:343-50.
4. Phelan JP, Platt LD, Yeh SY, Broussard P, Paul RH. The role of ultrasound assessment of amniotic fluid volume in the management of the postdate pregnancy. Am J Obstet Gynecol. 1985;151:304-8.
5. Phelan JP, Ahn MO, Smith CV, Rutherford SE, Anderson E. Amniotic fluid index measurements during pregnancy. J Reprod Med. 1987;32:601-4.
6. Suneetha KB, Parvathanenidey S. Perinatal outcome in pregnancies complicated with oligohydramnios at term. Int J Reprod Contracept Obstet Gynecol. 2022;11:410-4.
7. Guin G, Punekar S, Lele A, Khare S. A prospective clinical study of feto-maternal outcome in

pregnancies with abnormal liquor volume. J Obstet Gynecol India. 2011;61:652-5.
8. Bawa R, Neerja. The predictive value of amniotic fluid index for adverse perinatal outcome and suggested plan of action. Int J Reprod Contracept Obstet Gynecol. 2017;6:2952-4.
9. Vidyasagara M, Chandrashekhar T, Raiker SS. Correlation of amniotic fluid index with fetomaternal outcome. Int J Reprod Contracept Obstet Gynecol. 2021;10:3137-41.
10. Mathuriya G, Verma M, Rajpoot S. Comparative study of maternal and fetal outcome between low and normal amniotic fluid index at term. Int J Reprod Contracept Obstet Gynecol. 2017;6:640-4.
11. Bhagat M, Chawla I. Correlation of amniotic fluid index with perinatal outcome. J Obstet Gynecol India. 2014;64:32-5.
12. Jamal A, Kazemi M, Marsoosi V, Eslamian L. Adverse perinatal outcomes in borderline amniotic fluid index. Int J Reprod Biomed. 2016;14:705-8.
13. Ott WJ. Reevaluation of the relationship between amniotic fluid volume and perinatal outcome. Am J Obstet Gynecol. 2005;192:1803-9.
14. Jeng CJ, Lee JF, Wang KG, Yang YC, Lan CC. Decreased amniotic fluid index in term pregnancy. Clinical significance. J Reprod Med. 1992;37:789-92.
15. Casey BM, McIntire DD, Bloom SL, Lucas MJ, Santos R, Twickler DM, et. al. Pregnancy outcomes after antepartum diagnosis of oligohydramnios at or beyond 34 weeks' gestation. Am J Obstet Gynecol. 2000;182:909-12.
16. Vyas A, Prasanna G, Dash S, Rath S. Comparison of perinatal and maternal outcomes in borderline versus normal amniotic fluid index in a tertiary care center in Odisha: an observational prospective study. Cureus. 2021;13:e19876.
17. Suneetha KB, Parvathanenidey S. Perinatal outcome in pregnancies complicated with oligohydramnios at term. Int J Reprod Contracept Obstet Gynecol. 2022;11:410-4.

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