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Original Research Article

Prevalence of abnormal amniotic fluid index and its association with maternal and perinatal outcomes: a retrospective observational study

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ABSTRACT

Background: Abnormal amniotic fluid volume is an established indicator of fetal wellbeing and has been linked to increased maternal and perinatal morbidity. Ultrasonographic assessment using the amniotic fluid index (AFI) enables early identification of high-risk pregnancies and guides obstetric decision making. Objectives of the study was to determine the prevalence of abnormal amniotic fluid volume and evaluate its association with adverse maternal and perinatal outcomes.

Methods: This retrospective observational study was conducted at a tertiary care teaching hospital and included 300 consecutive singleton pregnancies beyond 28 weeks' gestation with documented AFI measurements. Amniotic fluid volume was categorized as oligohydramnios (AFI ≤5 cm), normal AFI (5.1–23.9 cm), and polyhydramnios (AFI ≥24 cm). Maternal outcomes assessed included induction of labour, mode of delivery, postpartum hemorrhage, and maternal intensive care unit (ICU) admission. The primary perinatal outcome was a composite of meconium-stained liquor, neonatal intensive care unit (NICU) admission, low Apgar score at 5 minutes (<7), and low birth weight (<2500 g). Statistical analysis included chi square tests and multivariable logistic regression.

Results: Of the 300 pregnancies, 240 (80%) had normal AFI, 45 (15%) had oligohydramnios, and 15 (5%) had polyhydramnios. Cesarean delivery was significantly more frequent in pregnancies with abnormal AFI (53.3% in oligohydramnios and 46.7% in polyhydramnios) compared to normal AFI (29.2%; p=0.001). Abnormal AFI was associated with significantly higher rates of meconium-stained liquor, NICU admission, low Apgar score, and low birth weight (all p<0.001). On multivariable analysis, abnormal AFI remained independently associated with adverse perinatal outcomes.

Conclusions: Abnormal amniotic fluid volume, particularly oligohydramnios, is associated with increased obstetric intervention and adverse perinatal outcomes. AFI is a simple, non-invasive, and effective tool for identifying high risk pregnancies and optimizing maternal and neonatal care.

Keywords: Amniotic fluid index, Oligohydramnios, Polyhydramnios, Perinatal outcome, Maternal outcome

INTRODUCTION

Amniotic fluid provides an essential intrauterine environment that supports fetal growth and development by allowing free fetal movements, protecting the fetus from external trauma, maintaining thermal stability, and facilitating normal pulmonary development. The volume of amniotic fluid is regulated by a dynamic balance between fetal urine production, fetal swallowing, intramembranous absorption, and placental function. Consequently, amniotic fluid volume serves as an important surrogate marker of fetal wellbeing.[1]

Ultrasonographic assessment of amniotic fluid using the four-quadrant amniotic fluid index (AFI) is a widely accepted and routinely employed method in antenatal surveillance.[2] An AFI of 5 cm or less is defined as oligohydramnios, whereas an AFI of 24 cm or more is diagnostic of polyhydramnios.[3] These abnormalities are commonly encountered in late pregnancy and are associated with a wide range of maternal and fetal complications.

Oligohydramnios has been associated with placental insufficiency, hypertensive disorders of pregnancy, fetal growth restriction, postdated pregnancy, and chronic intrauterine hypoxia.[4] Several studies have reported increased risks of labour induction, cesarean delivery, meconium stained liquor, low Apgar scores, low birth weight, and neonatal intensive care unit (NICU) admission in pregnancies complicated by reduced amniotic fluid volume.[5] In contrast, polyhydramnios is frequently associated with maternal diabetes mellitus, fetal structural or chromosomal anomalies, malpresentations, preterm labour, and postpartum hemorrhage.[6]

Despite widespread use of AFI as a screening and surveillance tool, the strength of its association with adverse maternal and perinatal outcomes varies across studies and populations. Differences in study design, gestational age at assessment, and underlying population risk profiles may contribute to this variability. In resource limited, high volume tertiary care settings, particularly in developing countries, locally generated evidence is crucial to guide clinical decision making and optimize obstetric and neonatal outcomes.

The present study was therefore undertaken to determine the prevalence of abnormal amniotic fluid volume assessed by AFI and to evaluate its association with maternal and perinatal outcomes in a tertiary care teaching hospital.

Objectives

Primary objective

Primary objective of this study to evaluate the association between abnormal amniotic fluid volume assessed by the AFI and adverse perinatal outcomes, including meconium stained liquor, neonatal intensive care unit (NICU) admission, low Apgar score at 5 minutes (<7), and low birth weight (<2500 g).

Secondary objective

Secondary objectives were to determine the prevalence of oligohydramnios and polyhydramnios and to assess the association between abnormal AFI and maternal outcomes, including induction of labour, mode of delivery, indications for cesarean section, postpartum hemorrhage, and maternal ICU admission along with to compare maternal and perinatal outcomes among pregnancies with normal AFI, oligohydramnios, and polyhydramnios.

METHODS

Study design and setting

This retrospective observational study was conducted at department of obstetrics and gynaecology Govt medical college Datia, a tertiary care teaching hospital over a one-year period from January 2024 to December 2024.

Study population

Medical records of pregnant women admitted for delivery during the study period were reviewed. A total of 300 consecutive singleton pregnancies beyond 28 weeks' gestation with documented ultrasonographic assessment of AFI were included.

Inclusion criteria were defined as singleton pregnancy, gestational age ≥28 weeks and documented AFI measurement within one week of delivery. Patients with multiple gestation, major congenital fetal anomalies, premature rupture of membranes (PROM) and incomplete medical records were excluded from the study.

Assessment of amniotic fluid

Amniotic fluid volume was assessed using the standard four quadrant technique described by Phelan et al. Pregnancies were categorized as: Oligohydramnios: AFI ≤5 cm, Normal AFI: 5.1–23.9 cm & Polyhydramnios: AFI ≥24 cm

Outcome measures

Maternal Outcomes were measures as induction of labour, mode of delivery, indications for cesarean section, postpartum hemorrhage & maternal ICU admission

Perinatal outcomes (primary)

A composite adverse perinatal outcome including meconium-stained liquor, NICU admission, low Apgar score at 5 minutes (<7) & low birth weight (<2500 g).

Sample size

A sample size of 300 pregnancies provided more than 80% power to detect a clinically meaningful difference in adverse perinatal outcomes between normal and abnormal AFI groups at a significance level of α=0.05.

Statistical analysis

Data were entered into a predesigned proforma and analyzed using standard statistical software. Categorical variables were expressed as frequencies and percentages and compared using the chi square test or Fisher's exact test, as appropriate. Continuous variables were expressed as mean±standard deviation and compared using the independent t test or one way ANOVA.

Multivariable logistic regression analysis was performed to assess the independent association between abnormal AFI and adverse maternal and perinatal outcomes after adjusting for potential confounders, including maternal age, parity, gestational age at delivery, hypertensive disorders of pregnancy, and diabetes mellitus. A p value <0.05 was considered statistically significant.

RESULTS

A total of 300 singleton pregnancies with documented AFI assessment were included in the study. Based on AFI values, 240 (80%) pregnancies had normal AFI, 45 (15%) had oligohydramnios, and 15 (5%) had polyhydramnios.

Baseline maternal and obstetric characteristics stratified by AFI category are presented in Table 1. The mean maternal age was comparable across all three groups. The mean gestational age at delivery was significantly lower in the oligohydramnios group compared with the normal AFI group (p=0.01).

Hypertensive disorders of pregnancy were significantly more common among women with oligohydramnios (31.1%) compared with those with normal AFI (9.2%) (p<0.001). Diabetes mellitus showed a strong association with polyhydramnios, being present in 40% of cases in this group (p<0.001). Induction of labour was significantly more frequent in pregnancies with abnormal AFI, particularly oligohydramnios (62.2%) (p<0.001).

Maternal outcomes

Maternal outcomes according to AFI category are summarized in Table 2. Vaginal delivery was significantly more frequent in pregnancies with normal AFI (63.3%) compared to oligohydramnios (35.6%) and polyhydramnios (46.7%) (p=0.002).

The rate of cesarean section was significantly higher in pregnancies with oligohydramnios (53.3%) and polyhydramnios (46.7%) compared with the normal AFI group (29.2%) (p=0.001). Fetal distress was the most common indication for cesarean section in the oligohydramnios group (62.5%).

Postpartum hemorrhage occurred more frequently in pregnancies with abnormal AFI, particularly in the polyhydramnios group (13.3%), and this difference was statistically significant (p=0.03). Maternal ICU admission was uncommon overall but showed a higher proportion in abnormal AFI groups.

Table 1: Baseline maternal and obstetric characteristics according to AFI.

Variable	Normal AFI (n=240)	Oligohydramnios (n=45)	Polyhydramnios (n=15)	P value
Maternal age (years), mean±SD	26.8±4.1	27.4±4.3	28.1±4.6	0.18
Primigravida, N (%)	118 (49.2)	25 (55.6)	6 (40.0)	0.46
Gestational age at delivery (weeks), mean±SD	38.4±1.6	37.1±1.8	37.8±1.7	0.01
Hypertensive disorders of pregnancy N (%)	22 (9.2)	14 (31.1)	3 (20.0)	<0.001
Diabetes mellitus N (%)	14 (5.8)	4 (8.9)	6 (40.0)	<0.001
Induction of labour N (%)	62 (25.8)	28 (62.2)	6 (40.0)	<0.001

Table 2: Maternal outcomes according to AFI.

Maternal outcome	Normal AFI (n=240)	Oligohydramnios (n=45)	Polyhydramnios (n=15)	P value
Vaginal delivery, N (%)	152 (63.3)	16 (35.6)	7 (46.7)	0.002
Instrumental delivery, N (%)	18 (7.5)	5 (11.1)	1 (6.7)	0.51
Cesarean section, N (%)	70 (29.2)	24 (53.3)	7 (46.7)	0.001
Indications for cesarean section				
Fetal distress, N (%)	28 (40.0)	15 (62.5)	3 (42.9)	0.04
Failed induction / NPOL, N (%)	24 (34.3)	6 (25.0)	2 (28.6)	0.62
Malpresentation, N (%)	10 (14.3)	2 (8.3)	2 (28.6)	0.21
Postpartum hemorrhage, N (%)	8 (3.3)	4 (8.9)	2 (13.3)	0.03
Maternal ICU admission, N (%)	3 (1.3)	2 (4.4)	1 (6.7)	0.07

Table 3: Perinatal outcomes according to AFI.

Perinatal outcome	Normal AFI (n=240)	Oligohydramnios (n=45)	Polyhydramnios (n=15)	P value
Meconium-stained liquor, N (%)	36 (15.0)	20 (44.4)	5 (33.3)	<0.001
Preterm birth (<37 weeks), N (%)	22 (9.2)	10 (22.2)	3 (20.0)	0.01
Birth weight (g), mean±SD	2860±410	2430±380	2980±460	<0.001
Low birth weight (<2500 g), N (%)	32 (13.3)	22 (48.9)	3 (20.0)	<0.001
Apgar score <7 at 5 minutes, N (%)	10 (4.2)	8 (17.8)	2 (13.3)	0.002
NICU admission, N (%)	28 (11.7)	18 (40.0)	5 (33.3)	<0.001

Table 4: Association between abnormal AFI and adverse maternal and perinatal outcomes (logistic regression).

Outcome	Crude OR (95% CI)	Adjusted OR* (95% CI)	P value
Cesarean delivery	2.6 (1.5–4.4)	2.2 (1.2–3.9)	0.01
Meconium-stained liquor	3.9 (2.1–7.3)	3.4 (1.8–6.5)	<0.001
NICU admission	4.3 (2.2–8.4)	3.6 (1.8–7.2)	<0.001
Low Apgar score (<7 at 5 min)	4.6 (1.9–11.1)	3.8 (1.5–9.7)	0.004
Low birth weight	5.2 (2.9–9.3)	4.5 (2.4–8.5)	<0.001

Perinatal outcomes

Perinatal outcomes stratified by AFI category are shown in Table 3. Meconium-stained liquor was significantly more common in pregnancies complicated by oligohydramnios (44.4%) and polyhydramnios (33.3%) compared with normal AFI (15.0%) (p<0.001).

Preterm birth (<37 weeks) was significantly more frequent in abnormal AFI groups (p=0.01). Mean birth weight was significantly lower in the oligohydramnios group (2430±380 g) compared with the normal AFI group (2860±410 g) (p<0.001). Nearly half (48.9%) of neonates in the oligohydramnios group had low birth weight.

Low Apgar score at 5 minutes and NICU admission were significantly more common in pregnancies with abnormal AFI. NICU admission was required in 40% of neonates born to mothers with oligohydramnios and 33.3% with polyhydramnios, compared with 11.7% in the normal AFI group (p<0.001).

Association between abnormal AFI and outcomes

On multivariable logistic regression analysis (Table 4), abnormal AFI was independently associated with increased odds of cesarean delivery, meconium-stained liquor, NICU admission, low Apgar score at 5 minutes, and low birth weight, even after adjustment for relevant confounding variables.

DISCUSSION

In this retrospective observational study, abnormal amniotic fluid volume was identified in 20% of pregnancies, with oligohydramnios occurring more frequently than polyhydramnios. This prevalence is consistent with previous reports from tertiary care centers managing high-risk obstetric populations.[7]

Oligohydramnios demonstrated a strong association with hypertensive disorders of pregnancy and earlier gestational age at delivery, supporting the well-established link between reduced amniotic fluid volume and placental insufficiency.[4,8] Polyhydramnios, though less common, was predominantly associated with maternal diabetes mellitus, in line with existing literature.[6]

Pregnancies with abnormal AFI were associated with significantly higher rates of labour induction and cesarean delivery. The increased cesarean section rate observed in oligohydramnios was largely attributable to fetal distress. Reduced amniotic fluid diminishes the protective cushioning effect around the umbilical cord, increasing susceptibility to cord compression and intrapartum fetal heart rate abnormalities, thereby necessitating operative intervention.[9] Similar findings have been reported by Chauhan et al., who identified oligohydramnios as an independent risk factor for cesarean delivery.[10]

Neonatal morbidity was significantly higher in pregnancies with abnormal AFI, particularly oligohydramnios. Increased rates of meconium-stained liquor, NICU admission, low Apgar scores, and low birth weight likely reflect chronic intrauterine hypoxia and impaired fetal growth.[5,11]

Importantly, abnormal AFI remained independently associated with adverse maternal and perinatal outcomes after adjusting for major confounders, highlighting its clinical utility as an independent prognostic marker rather than a coincidental ultrasonographic finding.[12]

Limitations of the study

Despite providing important insights into the association between abnormal amniotic fluid volume and maternal–perinatal outcomes, this study has several limitations that should be acknowledged including retrospective study

design, the study relied exclusively on the AFI technique. Neonatal outcomes were assessed only until immediate postpartum and NICU admission. Long-term neonatal morbidity, duration of NICU stay, and neurodevelopmental outcomes were not studied, limiting understanding of the full impact of abnormal AFI.

CONCLUSION

Abnormal amniotic fluid volume assessed by the amniotic fluid index is independently associated with adverse maternal and perinatal outcomes. Oligohydramnios is linked to increased obstetric intervention and neonatal morbidity, while polyhydramnios also contributes to adverse outcomes. Routine antenatal assessment of AFI remains a simple, cost effective, and clinically valuable tool for identifying high risk pregnancies and guiding timely obstetric and neonatal management, especially in resource limited settings.

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REFERENCES

1. Brace RA. Physiology of amniotic fluid volume regulation. Clin Obstet Gynecol. 1997;40(2):280-9.
2. Phelan JP, Smith CV, Broussard P, Small M. Amniotic fluid volume assessment with the four-quadrant technique at 36–42 weeks' gestation. J Reprod Med. 1987;32(7):540-2.
3. Moore TR, Cayle JE. The amniotic fluid index in normal human pregnancy. Am J Obstet Gynecol. 1990;162(5):1168-73.
4. Casey BM, McIntire DD, Bloom SL, Lucas MJ, Santos R, Twickler DM. Pregnancy outcomes after antepartum diagnosis of oligohydramnios at or beyond 34 weeks' gestation. Am J Obstet Gynecol. 2000;182(4):909-12.
5. Locatelli A, Vergani P, Toso L, Verderio M, Pezzullo JC, Ghidini A. Perinatal outcome associated with oligohydramnios in uncomplicated term pregnancies. Arch Gynecol Obstet. 2004;269(2):130-3..
6. Biggio JR, Wenstrom KD, Dubard MB, Cliver SP. Hydramnios prediction of adverse perinatal outcome. Obstet Gynecol. 1999;94(5):773-7.
7. Chandra P, Kaur SP, Hans DK, Kapila AK. The impact of amniotic fluid volume assessed intrapartum on perinatal outcome. Obstet Gynecol India. 2000;50:49-52.
8. Rutherford SE, Phelan JP, Smith CV, Jacobs N. The four-quadrant assessment of amniotic fluid volume: An adjunct to antepartum fetal heart rate testing. Obstet Gynecol. 1987;70(3):353-6.
9. Manning FA, Hill LM, Platt LD. Qualitative amniotic fluid volume determination by ultrasound: Antepartum detection of intrauterine growth retardation. Am J Obstet Gynecol. 1981;139(3):254-8.
10. Chauhan SP, Sanderson M, Hendrix NW, Magann EF, Devoe LD. Perinatal outcome and amniotic fluid index in the antepartum and intrapartum periods: A meta-analysis. Am J Obstet Gynecol. 1999;181(6):1473-8.
11. Magann EF, Chauhan SP, Doherty DA, Barrilleaux PS, Martin JN Jr, Morrison JC. Predictability of intrapartum and neonatal outcomes with the amniotic fluid volume distribution: a reassessment using the amniotic fluid index, single deepest pocket, and a dye-determined amniotic fluid volume. Am J Obstet Gynecol. 2003;188(6):1523-7.
12. Nabhan AF, Abdelmoula YA. Amniotic fluid index versus single deepest vertical pocket as a screening test for preventing adverse pregnancy outcome. Cochrane Database Syst Rev. 2008;(3):CD006593.

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