



Maternal And Neonatal Outcomes Following Pregnancies Complicated By Abnormal Amniotic Fluid Volume: A Comparative Study Of Oligohydramnios, Polyhydramnios, And Normal Amniotic Fluid Volume.

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Abstract

Background: Abnormal amniotic fluid volume, including oligohydramnios and polyhydramnios, is associated with various maternal and fetal complications and may adversely affect pregnancy and neonatal outcomes. **Objective;** To compare maternal and neonatal outcomes among pregnancies complicated by oligohydramnios, polyhydramnios, and normal amniotic fluid volume. **Materials and Methods;** A prospective comparative observational study was conducted in the Department of Obstetrics and Gynaecology, KLE JGMM Medical College, Hubballi, in collaboration with the Department of Paediatrics, over a period of 6 months. A total of 100 pregnant women with singleton viable pregnancies were included and categorized into oligohydramnios (n=35), polyhydramnios (n=25), and normal amniotic fluid volume (n=40) groups based on ultrasonographic assessment. Maternal outcomes including gestational age at delivery, mode of delivery, and maternal complications were assessed. Neonatal outcomes included birth weight, APGAR score, neonatal complications, NICU admission, and neonatal mortality. **Results;** Preterm delivery was observed in 34.3% of women with oligohydramnios, 28.0% with polyhydramnios, and 15.0% with normal amniotic fluid volume. Caesarean delivery occurred in 54.3%, 44.0%, and 32.5%, respectively. Maternal complications were more frequent in the abnormal fluid groups. Low birth weight (<2.5 kg) was observed in 68.6% of neonates in the oligohydramnios group, 56.0% in the polyhydramnios group, and 35.0% in the normal group. NICU admission was required in 42.9%, 44.0%, and 20.0%, respectively. Neonatal complications were more frequent in pregnancies with abnormal amniotic fluid volume, with respiratory distress being the most common complication. Neonatal mortality was 5.7% in oligohydramnios, 8.0% in polyhydramnios, and 2.5% in the normal group. **Conclusion;** Abnormal amniotic fluid volume was associated with increased maternal and neonatal morbidity compared with normal amniotic fluid volume. Early detection, appropriate antenatal surveillance, timely obstetric intervention, and adequate neonatal care are important for improving outcomes.

Keywords: Oligohydramnios; Polyhydramnios; Amniotic Fluid; Maternal Outcome; Neonatal Outcome; NICU; Birth Weight.



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INTRODUCTION

Amniotic fluid plays an essential role in normal fetal development by providing mechanical protection, permitting fetal movement, supporting lung development, and maintaining an appropriate intrauterine environment. Amniotic fluid volume changes throughout pregnancy and is influenced by fetal urine production, fetal swallowing, placental function, and maternal and fetal factors [1,2]. Abnormalities in amniotic fluid volume may therefore indicate underlying maternal, placental, or fetal pathology.

Oligohydramnios refers to abnormally reduced amniotic fluid volume, whereas polyhydramnios represents excessive accumulation of amniotic fluid. Ultrasonographic assessment using the amniotic fluid index (AFI) and single deepest vertical pocket (SDP) is commonly used for evaluation. Evidence comparing these methods indicates that AFI may diagnose oligohydramnios more frequently and lead to increased obstetric intervention without a clear improvement in perinatal outcomes [3,4]. Consequently, ultrasound findings should be interpreted together with the overall maternal and fetal clinical condition [5].

Oligohydramnios may be associated with placental insufficiency, fetal growth restriction, hypertensive disorders, fetal renal or urinary tract abnormalities, and rupture of membranes. Reduced amniotic fluid may increase the risk of umbilical cord compression, abnormal fetal heart rate patterns, meconium-stained liquor, operative delivery, and adverse perinatal outcomes [6]. The clinical significance of oligohydramnios also depends on gestational age and the presence of associated maternal or fetal disease.

Polyhydramnios has a different range of etiologies and may be associated with maternal diabetes, fetal structural or genetic abnormalities, impaired fetal swallowing, and idiopathic causes. Depending on severity and underlying cause, polyhydramnios may be associated with preterm birth, malpresentation, dysfunctional labour, placental abruption, postpartum haemorrhage, and neonatal complications [7,8].

Both oligohydramnios and polyhydramnios can therefore influence the course of pregnancy and delivery. Recent evidence has demonstrated increased risks of adverse obstetric and neonatal outcomes among pregnancies with idiopathic polyhydramnios, including preterm delivery, caesarean delivery, postpartum haemorrhage, low APGAR scores, and perinatal complications [7]. The severity of polyhydramnios and the presence of an underlying maternal or fetal condition are important considerations when interpreting these risks.

Abnormal amniotic fluid volume also has implications for antenatal surveillance. Current recommendations recognize isolated oligohydramnios and moderate or severe polyhydramnios as clinical conditions in which antenatal fetal surveillance may be considered, with management individualized according to gestational age and associated maternal and fetal factors [9].

The method used to assess amniotic fluid can itself influence the diagnosis and subsequent management. Randomised studies have demonstrated differences between AFI- and SDP-based assessments, particularly regarding the frequency of oligohydramnios diagnosis and obstetric interventions [10,11]. Therefore, standardized ultrasonographic assessment combined with clinical evaluation is important in the management of abnormal amniotic fluid volume.

Maternal hydration has also been investigated as a potential method of increasing amniotic fluid volume, particularly in pregnancies with oligohydramnios. Evidence suggests that maternal hydration can temporarily increase amniotic fluid volume, although its effect on clinically important perinatal outcomes remains less certain [12].

Prematurity, fetal growth abnormalities, intrapartum fetal compromise, congenital abnormalities, and associated maternal disease may influence neonatal outcomes in pregnancies with abnormal amniotic fluid volume. Low birth weight, low APGAR scores, respiratory morbidity, NICU admission, and neonatal mortality may therefore occur in affected pregnancies [6-8].

Comparative evaluation of pregnancies with oligohydramnios, polyhydramnios, and normal amniotic fluid volume can help describe differences in maternal and neonatal outcomes within a defined obstetric population. Therefore, the present study was undertaken to compare maternal and neonatal outcomes among pregnancies complicated by oligohydramnios, polyhydramnios, and normal amniotic fluid volume, with particular emphasis on gestational age at delivery, mode of delivery, maternal complications, birth weight, APGAR scores, neonatal complications, NICU admission, and neonatal mortality.

MATERIALS AND METHODS

Study Design and Setting

A prospective comparative observational study was conducted to evaluate and compare maternal and neonatal outcomes among pregnancies complicated by oligohydramnios, polyhydramnios, and normal amniotic fluid volume. The study was carried out in the Department of Obstetrics and Gynaecology, KLE JGMM Medical College, Hubballi, Karnataka, in collaboration with the Department of Paediatrics.

Study Duration

The study was conducted over a period of 6 months.

Sample Size

A total of 100 pregnant women were enrolled in the study. Participants were categorized into three groups according to the antenatal assessment of amniotic fluid volume:

- **Group I:** Oligohydramnios
- **Group II:** Polyhydramnios

• **Group III:** Normal amniotic fluid volume

The study population was selected according to predefined inclusion and exclusion criteria.

Study Population

Pregnant women attending the antenatal clinic or admitted to the obstetric unit during the study period were screened. Eligible women were enrolled after obtaining written informed consent. Amniotic fluid volume was assessed using obstetric ultrasonography, and participants were classified into the respective study groups.

Inclusion Criteria

Pregnant women fulfilling the following criteria were included:

1. Pregnant women with a viable singleton pregnancy.
2. Gestational age appropriate for assessment of amniotic fluid volume.
3. Women diagnosed antenatally with oligohydramnios or polyhydramnios, or having normal amniotic fluid volume.
4. Women who delivered at the study institution.
5. Women willing to participate and provide informed consent.

Exclusion Criteria

The following were excluded:

1. Multiple pregnancies.
2. Pregnancies with major fetal congenital anomalies.
3. Women with incomplete antenatal or delivery records.
4. Pregnancies complicated by conditions in which amniotic fluid assessment could not be reliably performed.
5. Women unwilling to participate in the study.

Assessment of Amniotic Fluid Volume

Amniotic fluid volume was assessed by ultrasonography using standard obstetric parameters. The amniotic fluid index (AFI) and/or single deepest vertical pocket (SDP) were recorded according to the ultrasound assessment.

For study classification, oligohydramnios was defined as an AFI ≤ 5 cm or a single deepest pocket < 2 cm, while polyhydramnios was defined as an AFI ≥ 24 –25 cm or a single deepest pocket ≥ 8 cm, according to the criteria used by the treating obstetric team. Pregnancies with values within the normal range were classified as having normal amniotic fluid volume.

Maternal Data Collection

A structured study proforma was used to record maternal demographic and obstetric details, including:

- Maternal age
- Gravidity and parity
- Gestational age at diagnosis
- Antenatal risk factors
- Blood pressure and other relevant clinical findings
- Associated obstetric complications
- Gestational age at delivery
- Mode of delivery
- Indications for caesarean delivery
- Maternal complications
- Duration of hospital stay

Maternal Outcome Assessment

Maternal outcomes were assessed and compared among the three groups. The outcomes included:

- Mode of delivery
- Induction of labour
- Caesarean delivery
- Postpartum haemorrhage
- Pregnancy-induced hypertension/preeclampsia
- Placental complications
- Maternal infection
- Other obstetric complications

Neonatal Assessment

All newborns were evaluated by the paediatric/neonatal team immediately after birth. The following parameters were recorded:

- Sex of newborn
- Birth weight
- Gestational age at birth
- APGAR score at 1 and 5 minutes
- Requirement for neonatal resuscitation
- NICU admission
- Respiratory distress
- Neonatal sepsis
- Neonatal jaundice
- Other early neonatal complications
- Duration of NICU stay
- Neonatal mortality, if any

Comparative Outcome Measures

Maternal and neonatal outcomes were compared among pregnancies with oligohydramnios, polyhydramnios, and normal amniotic fluid volume. Particular attention was given to differences in mode of delivery, gestational age at delivery, birth weight, APGAR scores, NICU admission, neonatal complications, and neonatal mortality.

Statistical Analysis

Data were entered into a structured database and analysed using appropriate statistical methods. Continuous variables were expressed as mean $\pm$ standard deviation, while categorical variables were presented as frequency and percentage. Comparisons among the three groups were performed using one-way ANOVA for normally distributed continuous variables or an appropriate non-parametric test when required. Categorical variables were compared using the Chi-square test or Fisher's exact test. A p-value <0.05 was considered statistically significant.

RESULTS

A total of 100 pregnant women were included in the present prospective comparative observational study conducted over a period of 6 months at KLE JGMM Medical College, Hubballi. Participants were categorized into three groups according to amniotic fluid volume: oligohydramnios, polyhydramnios, and normal amniotic fluid volume.

Table 1. Distribution of Study Participants According to Amniotic Fluid Volume

Study group	Number (n=100)	Percentage (%)
Oligohydramnios	35	35.0
Polyhydramnios	25	25.0
Normal amniotic fluid	40	40.0
Total	100	100.0

Normal amniotic fluid volume was observed in 40% of participants, followed by oligohydramnios in 35% and polyhydramnios in 25%.

Table 2. Distribution According to Maternal Age

Age group (years)	Oligohydramnios n=35	Polyhydramnios n=25	Normal n=40	Total n=100
<20	2 (5.7%)	1 (4.0%)	2 (5.0%)	5 (5.0%)
20–24	9 (25.7%)	6 (24.0%)	10 (25.0%)	25 (25.0%)
25–29	13 (37.1%)	9 (36.0%)	16 (40.0%)	38 (38.0%)
30–34	8 (22.9%)	6 (24.0%)	9 (22.5%)	23 (23.0%)
≥ 35	3 (8.6%)	3 (12.0%)	3 (7.5%)	9 (9.0%)
Total	35 (100%)	25 (100%)	40 (100%)	100 (100%)

The majority of participants in all three groups were in the 25–29-year age group.

Table 3. Distribution According to Parity

Parity	Oligohydramnios n=35	Polyhydramnios n=25	Normal n=40	Total
Primigravida	16 (45.7%)	12 (48.0%)	19 (47.5%)	47 (47.0%)
Multigravida	19 (54.3%)	13 (52.0%)	21 (52.5%)	53 (53.0%)
Total	35 (100%)	25 (100%)	40 (100%)	100 (100%)

Multigravida women constituted 53.0% of the overall study population.

Table 4. Gestational Age at Delivery

Gestational age	Oligohydramnios n=35	Polyhydramnios n=25	Normal n=40
<37 weeks	12 (34.3%)	7 (28.0%)	6 (15.0%)
37–39 weeks	17 (48.6%)	12 (48.0%)	22 (55.0%)
≥40 weeks	6 (17.1%)	6 (24.0%)	12 (30.0%)
Total	35 (100%)	25 (100%)	40 (100%)

Preterm delivery was more frequently observed among women with **oligohydramnios (34.3%)** compared with polyhydramnios and normal amniotic fluid groups.

Table 5. Mode of Delivery

Mode of delivery	Oligohydramnios n=35	Polyhydramnios n=25	Normal n=40
Vaginal delivery	16 (45.7%)	14 (56.0%)	27 (67.5%)
Caesarean section	19 (54.3%)	11 (44.0%)	13 (32.5%)
Total	35 (100%)	25 (100%)	40 (100%)

Caesarean delivery was most frequently observed in the **oligohydramnios group (54.3%)**, whereas vaginal delivery was predominant among pregnancies with normal amniotic fluid volume.

Table 6. Maternal Complications

Maternal complication	Oligohydramnios n=35	Polyhydramnios n=25	Normal n=40
Preeclampsia/PIH	7 (20.0%)	4 (16.0%)	3 (7.5%)
Postpartum haemorrhage	3 (8.6%)	4 (16.0%)	2 (5.0%)
Placental complications	2 (5.7%)	2 (8.0%)	1 (2.5%)
Maternal infection	2 (5.7%)	1 (4.0%)	1 (2.5%)
No major complication	21 (60.0%)	14 (56.0%)	33 (82.5%)

Preeclampsia/PIH was more frequently observed in the oligohydramnios group, while postpartum haemorrhage was relatively more frequent among women with polyhydramnios.

Table 7. Distribution According to Birth Weight

Birth weight	Oligohydramnios n=35	Polyhydramnios n=25	Normal n=40
<1.5 kg	3 (8.6%)	2 (8.0%)	1 (2.5%)
1.5–1.99 kg	7 (20.0%)	4 (16.0%)	3 (7.5%)
2.0–2.49 kg	14 (40.0%)	8 (32.0%)	10 (25.0%)
≥2.5 kg	11 (31.4%)	11 (44.0%)	26 (65.0%)
Total	35 (100%)	25 (100%)	40 (100%)

Low birth weight was more frequently observed among neonates born to mothers with **oligohydramnios**, whereas ≥2.5 kg birth weight was most common in the normal amniotic fluid group.

Table 8. APGAR Score at 1 and 5 Minutes

APGAR score	Oligohydramnios	Polyhydramnios	Normal
At 1 minute			
<4	4 (11.4%)	2 (8.0%)	1 (2.5%)
4–6	12 (34.3%)	7 (28.0%)	6 (15.0%)
≥7	19 (54.3%)	16 (64.0%)	33 (82.5%)
At 5 minutes			
<4	1 (2.9%)	1 (4.0%)	0
4–6	6 (17.1%)	4 (16.0%)	3 (7.5%)
≥7	28 (80.0%)	20 (80.0%)	37 (92.5%)

A five-minute APGAR score of ≥7 was observed in **92.5%** of neonates in the normal amniotic fluid group compared with 80.0% in both abnormal amniotic fluid groups.

Table 9. Neonatal Complications

Neonatal complication	Oligohydramnios n=35	Polyhydramnios n=25	Normal n=40
Respiratory distress	9 (25.7%)	7 (28.0%)	4 (10.0%)
Neonatal sepsis	6 (17.1%)	4 (16.0%)	3 (7.5%)
Neonatal jaundice	5 (14.3%)	4 (16.0%)	4 (10.0%)
NICU-related complications	3 (8.6%)	2 (8.0%)	2 (5.0%)
No major complication	12 (34.3%)	8 (32.0%)	27 (67.5%)

Respiratory distress was the most frequently observed neonatal complication in both abnormal amniotic fluid groups.

Table 10. NICU Admission

NICU admission	Oligohydramnios n=35	Polyhydramnios n=25	Normal n=40
Required	15 (42.9%)	11 (44.0%)	8 (20.0%)
Not required	20 (57.1%)	14 (56.0%)	32 (80.0%)
Total	35 (100%)	25 (100%)	40 (100%)

NICU admission was required in **42.9%** of neonates in the oligohydramnios group and 44.0% in the polyhydramnios group, compared with 20.0% in the normal amniotic fluid group.

Table 11. Neonatal Outcome

Neonatal outcome	Oligohydramnios n=35	Polyhydramnios n=25	Normal n=40
Discharged alive	33 (94.3%)	23 (92.0%)	39 (97.5%)
Neonatal mortality	2 (5.7%)	2 (8.0%)	1 (2.5%)
Total	35 (100%)	25 (100%)	40 (100%)

Neonatal mortality was observed in **5.7%** of oligohydramnios cases and **8.0%** of polyhydramnios cases, compared with 2.5% among pregnancies with normal amniotic fluid volume.

Table 12. Comparison of Major Maternal and Neonatal Outcomes

Outcome	Oligohydramnios n=35	Polyhydramnios n=25	Normal n=40
Preterm delivery	12 (34.3%)	7 (28.0%)	6 (15.0%)
Caesarean delivery	19 (54.3%)	11 (44.0%)	13 (32.5%)
Maternal complications	14 (40.0%)	11 (44.0%)	7 (17.5%)
Birth weight <2.5 kg	24 (68.6%)	14 (56.0%)	14 (35.0%)
NICU admission	15 (42.9%)	11 (44.0%)	8 (20.0%)
Neonatal complications	23 (65.7%)	17 (68.0%)	13 (32.5%)
Neonatal mortality	2 (5.7%)	2 (8.0%)	1 (2.5%)

DISCUSSION

The present prospective comparative observational study included 100 pregnant women and compared maternal and neonatal outcomes among pregnancies with oligohydramnios, polyhydramnios, and normal amniotic fluid volume. The findings demonstrated differences in several important obstetric and neonatal outcomes between pregnancies with abnormal and normal amniotic fluid volume.

The majority of women in the study were aged 25–29 years, and multigravida women constituted a slightly greater proportion of the study population. The broadly comparable demographic distribution among the three groups suggests that the observed differences in outcomes were more likely related to pregnancy characteristics and associated complications rather than major differences in maternal age or parity.

In the present study, preterm delivery was more frequent in the oligohydramnios group, followed by the polyhydramnios group, compared with pregnancies having normal amniotic fluid volume. Oligohydramnios may occur in association with placental insufficiency, fetal growth restriction, hypertensive disorders, or membrane rupture, all of which may contribute to earlier delivery [6]. Polyhydramnios has also been associated with increased risk of preterm birth, particularly when an underlying maternal or fetal disorder is present [7,8]. The findings of the present study are therefore consistent with the recognized association between abnormal amniotic fluid volume and adverse pregnancy outcomes.

A higher proportion of caesarean delivery was observed among women with oligohydramnios, while vaginal delivery was more frequent in the normal amniotic fluid group. Reduced amniotic fluid may increase the possibility of umbilical cord compression and non-reassuring fetal heart rate patterns, which can contribute to operative delivery [6]. However, the relationship between oligohydramnios and caesarean delivery should be interpreted cautiously because clinical management and the underlying indication for reduced fluid may also influence the route of delivery.

The polyhydramnios group also showed a considerable proportion of caesarean deliveries. Excessive amniotic fluid may be associated with fetal malpresentation, dysfunctional labour, and other intrapartum complications [8]. A recent systematic review and meta-analysis of idiopathic polyhydramnios reported increased risks of caesarean delivery and other adverse obstetric outcomes, supporting the pattern observed in the present study [7].

Maternal complications were more frequent in the abnormal amniotic fluid groups than in the normal group. Preeclampsia/pregnancy-induced hypertension was more frequently observed in the oligohydramnios group, whereas postpartum haemorrhage was relatively more frequent among women with polyhydramnios. Oligohydramnios may coexist with placental insufficiency and hypertensive disorders, while uterine overdistension associated with polyhydramnios may predispose to ineffective uterine contraction and postpartum haemorrhage [6,8].

The present study demonstrated a greater proportion of low birth weight among neonates born to mothers with abnormal amniotic fluid volume, particularly oligohydramnios. Reduced amniotic fluid may be associated with placental insufficiency and fetal growth restriction, contributing to lower birth weight [6]. In polyhydramnios, low birth weight may be related to prematurity or underlying fetal conditions rather than the increased fluid volume itself.

Differences were also observed in APGAR scores. A five-minute APGAR score of ≥ 7 was more frequently observed among neonates from pregnancies with normal amniotic fluid volume. Lower APGAR scores in abnormal-fluid groups may reflect prematurity, intrapartum fetal compromise, or associated maternal and fetal pathology. Evidence has also identified lower APGAR scores among some pregnancies complicated by polyhydramnios [7]. However, APGAR score is influenced by multiple factors and should not be interpreted independently of gestational age and the newborn's clinical condition.

Respiratory distress was the most frequently observed neonatal complication in both abnormal amniotic fluid groups. This finding may partly be explained by the greater frequency of preterm delivery in these groups. Prematurity remains an important determinant of neonatal respiratory morbidity, while associated fetal and maternal disorders may further contribute to neonatal complications [7,8].

Neonatal sepsis was also more frequent in the abnormal amniotic fluid groups than in the normal group. This association may be influenced by underlying obstetric conditions, prematurity, and other maternal or fetal risk factors rather than representing a direct consequence of altered amniotic fluid volume. Therefore, neonatal outcomes should be interpreted in the context of the clinical cause and severity of the amniotic fluid abnormality.

NICU admission was required in 42.9% of neonates in the oligohydramnios group and 44.0% in the polyhydramnios group, compared with 20.0% in the normal amniotic fluid group. The increased requirement for neonatal intensive care may be related to prematurity, low birth weight, respiratory distress, fetal compromise, or associated congenital and maternal conditions. Published evidence similarly indicates that pregnancies with abnormal amniotic fluid volume may have increased neonatal morbidity and healthcare requirements [7,8].

Ultrasound-based classification of amniotic fluid volume is an important component of antenatal management. Randomized evidence comparing AFI with SDP has shown that AFI may result in more frequent diagnoses of oligohydramnios and greater intervention without consistent improvement in perinatal outcomes [3,4,10,11]. These findings support careful interpretation of amniotic fluid measurements rather than considering an isolated numerical value as the sole determinant of intervention.

The present findings also have relevance for antenatal surveillance. ACOG recommends consideration of antenatal fetal surveillance for selected pregnancies complicated by oligohydramnios and moderate or severe polyhydramnios, depending on the clinical circumstances [9]. This approach allows fetal wellbeing to be monitored while taking into account gestational age, severity of the abnormality, and associated maternal or fetal conditions.

Maternal hydration has been studied particularly in oligohydramnios. Previous evidence indicates that oral or intravenous maternal hydration can increase amniotic fluid volume, although evidence regarding improvement in clinically important perinatal outcomes is limited [12]. Thus, increasing amniotic fluid volume alone should not be considered equivalent to improving overall pregnancy outcome.

Neonatal mortality in the present study was relatively higher in both abnormal amniotic fluid groups than in the normal group, although the number of deaths was small. Abnormal amniotic fluid volume may act as a marker of underlying placental, fetal, or maternal pathology, and these associated conditions may contribute to adverse neonatal outcomes. In polyhydramnios, increased perinatal risk has been reported even in apparently idiopathic cases [7], while oligohydramnios has long been recognized as a marker of pregnancies requiring closer fetal assessment [6,9].

Overall, the present study demonstrates that abnormal amniotic fluid volume was associated with a greater frequency of adverse maternal and neonatal outcomes compared with normal amniotic fluid volume. Oligohydramnios was associated particularly with preterm delivery, caesarean delivery, hypertensive complications, and low birth weight, whereas

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polyhydramnios showed notable maternal and neonatal morbidity, including postpartum haemorrhage, neonatal complications, and NICU admission. These findings emphasize the importance of identifying the underlying cause, appropriate ultrasonographic assessment, antenatal surveillance, and individualized obstetric and neonatal management.

CONCLUSION

Abnormal amniotic fluid volume was associated with increased maternal and neonatal morbidity compared with normal amniotic fluid volume. Oligohydramnios was particularly associated with preterm delivery, caesarean delivery, hypertensive complications, and low birth weight, while polyhydramnios showed increased postpartum haemorrhage, neonatal complications, and NICU admission. Early identification, appropriate antenatal surveillance, timely obstetric management, and adequate neonatal care are essential to improve pregnancy and neonatal outcomes.

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