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A TYPICAL BIRTH WEIGHT PATTERNS IN POLYHYDRAMNIOS: THE ROLE OF PRETERM BIRTH AND CONGENITAL ANOMALIES

Kanwal Bano[1], Farhat Ullah[2], Laiba Zahid[3], Qandeel Zaman[4], Irsa Tahir[5], Taif Ur Rehman[6], Dawood Khan[7*]

[1]*Ibadat International University, Islamabad/Iqra University, Chak Shahzad Campus, Islamabad.*
[2]*Irfan General Hospital Peshawar*
[3,4,7]*Iqra University, Chak Shahzad Campus, Islamabad.*
[5] *Khyber Medical University, IHS, Islamabad*
[6] *Khyber Teaching Hospital, Peshawar.*

[*1]kanwalbano8899@gmail.com, [2]farhatullahgul990@gmail.com, [3]laibazahid695@gmail.com, [4]fatimapakeeza696@gmail.com, [5]Irsatahir521@gmail.com, [6]afridit785@gmail.com, [7]dawood.khan@iqrauni.edu.pk

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Abstract

Background: *Polyhydramnios is conventionally associated with maternal diabetes and fetal macrosomia. However, emerging evidence suggests that birth weight outcomes in polyhydramnios are heterogeneous and influenced by underlying etiology, particularly preterm birth and congenital anomalies.*

Objective: *To investigate the unexpected finding that polyhydramnios cases in a high-risk pregnancy cohort had lower birth weights than conventional expectations, and to examine the role of preterm birth and congenital anomalies as driving factors.*

Methods: *This prospective observational study included 81 high-risk pregnant women categorized into three groups based on amniotic fluid volume (AFV): Normal AFV (n=49), Oligohydramnios (n=16), and Polyhydramnios (n=16). AFV was assessed using Amniotic Fluid Index (AFI) and Single Deepest Pocket (SDP). Birth weight, gestational age at delivery, Apgar scores, NICU admissions, and maternal risk factors were recorded. Statistical analysis was performed using Python 3.10.*

Results: *Polyhydramnios cases demonstrated a mean birth weight of 2.7 ± 0.5 kg, which was significantly lower than the normal AFV group (3.1 ± 0.4 kg) and contrary to the classical expectation of macrosomia. This atypical pattern was attributable to a higher frequency of preterm birth (mean gestational age 36.5 ± 1.5 weeks) and congenital anomalies (12.5% in polyhydramnios vs. 4.1% in normal AFV). The correlation between AFI and birth weight was*

modest and negative (r = -0.251). NICU admission rates were 37.5% in polyhydramnios, primarily due to prematurity and structural anomalies rather than fluid volume itself.

Conclusion: *In high-risk pregnancies, polyhydramnios does not uniformly lead to macrosomia. Preterm birth and congenital anomalies are significant confounders that drive lower birth weights in this subgroup. These findings challenge the conventional macrosomia-centric paradigm and emphasize the need for etiology-specific risk stratification in polyhydramnios management.*

INTRODUCTION

Polyhydramnios, defined as an Amniotic Fluid Index (AFI) > 25 cm or Single Deepest Pocket (SDP) > 8 cm, complicates approximately 1-2% of pregnancies and is traditionally linked to maternal diabetes mellitus, fetal gastrointestinal obstruction, neuromuscular disorders, and chromosomal abnormalities (Ogunyemi & Friedman, 2024; Y. Liu et al., 2024). The pathophysiological mechanism in diabetic pregnancies involves fetal hyperglycemia leading to osmotic diuresis and increased fetal urine output, which classically results in macrosomia—a birth weight exceeding 4000 g (Horcas-Martín et al., 2025).

However, the relationship between polyhydramnios and birth weight is not monolithic. A growing body of evidence suggests that the underlying etiology of polyhydramnios significantly modifies neonatal outcomes. Idiopathic polyhydramnios, for instance, has been associated with preterm birth, placental abruption, and congenital anomalies—factors that independently reduce birth weight (Kechagias et al., 2024). Similarly, polyhydramnios coexisting with structural fetal anomalies often reflects impaired fetal swallowing or neurological dysfunction, which may be accompanied by growth restriction rather than overgrowth (Pagan et al., 2023).

This study investigates an unexpected finding from a prospective cohort of high-risk pregnancies: polyhydramnios cases exhibited lower birth weights than conventional expectations. We hypothesize that this atypical pattern is driven not by the fluid volume itself, but by a higher frequency of preterm birth and congenital anomalies within the polyhydramnios subgroup. Using the data obtained from cohorts, we challenge the macrosomia-centric paradigm and propose an etiology-specific framework for interpreting birth weight in polyhydramnios.

2. Materials and Methods

2.1 Study Design and Setting

This prospective observational study was conducted at the Department of Obstetrics and Gynecology, HBS Hospital, Islamabad, a tertiary care facility, over a 7-month period (June–December 2025). The study was approved by the Institutional Review Board (IRB) of HBS Medical & Dental College and the Research Ethics and Review Committee (RERC) of Ibadat International University, Islamabad.

2.2 Study Population

Eighty-one high-risk pregnant women with singleton or twin gestations (without discordant pathologies) at ≥28 weeks of gestation were enrolled using non-probability consecutive sampling. High-risk status was defined by the presence of at least one of the following: hypertension, diabetes mellitus, preeclampsia, history of preterm birth, history of stillbirth, intrauterine growth restriction (IUGR), or congenital fetal anomalies.

2.3 AFV Classification

AFV was assessed using both AFI and SDP. Participants were categorized as:

- **Normal AFV:** AFI 5–25 cm or SDP 2–8 cm (n=49)
- **Oligohydramnios:** AFI < 5 cm or SDP < 2 cm (n=16)
- **Polyhydramnios:** AFI > 25 cm or SDP > 8 cm (n=16)

2.4 Data Collection

Maternal demographics, obstetric history, and high-risk factors were recorded via structured questionnaire. Ultrasound measurements were performed by trained sonographers. Neonatal outcomes—birth weight, Apgar scores (1 and 5 minutes), NICU admission, and complications—were recorded immediately after delivery.

2.5 Statistical Analysis

Statistical analysis was performed using Python 3.10. Continuous variables were summarized as mean ± SD or median (range), and categorical variables as frequencies (%). Chi-square or Fisher's exact tests were used for categorical comparisons; one-way ANOVA or Kruskal-Wallis tests for continuous variables. Correlation analysis was performed using Pearson's r. A p-value < 0.05 was considered statistically significant.

3. Results

3.1 Study Participants Overview

The mean maternal age was 30.11 ± 6.46 years, and the mean gestational age at scan was 33.17 ± 3.90 weeks. Approximately 52% of participants were multigravida (gravidity ≥ 3). All participants were high-risk by inclusion criteria. **Table 1** summarizes baseline characteristics.

Table 1. Baseline demographic and clinical characteristics of study participants (n=81)

Variable	Mean ± SD / n (%)
Maternal Age (years)	30.11 ± 6.46
Gestational Age at Scan (weeks)	33.17 ± 3.90
Gravidity ≥ 3	42 (≈52%)
High-risk pregnancy	81 (100%)

3.2 Distribution of AFV Categories

Of the 81 participants, 49 (60.5%) had normal AFV, 16 (19.75%) had oligohydramnios, and 16 (19.75%) had polyhydramnios. **Table 2** illustrates this distribution.

Table 2. Distribution of AFV categories

AFV Category	n (%)
Normal AFV	49 (60.5%)
Oligohydramnios	16 (19.75%)
Polyhydramnios	16 (19.75%)

3.3 Correlation Analysis (Section 4.4)

Correlation analysis revealed a strong positive correlation between gestational age and birth weight ($r = 0.75$), reflecting expected fetal growth trajectories. AFI demonstrated a modest negative correlation with birth weight ($r = -0.251$), indicating that lower AFI tended to be associated with reduced fetal mass. However, birth weights among polyhydramnios cases were unexpectedly lower than conventional expectations associated with diabetic pregnancies. Maternal age showed no clinically meaningful

association with AFI, SDP, birth weight, or immediate neonatal outcomes. **Table 3** and **figure 1 - 2** present the correlation matrix.

Table 3. Correlation matrix among maternal age, gestational age, AFI, and birth weight

Variable	Maternal Age	Gestational Age	AFI	Birth Weight
Maternal Age	1	0.01	0.023	-0.136
Gestational Age	0.01	1	-0.117	0.75
AFI	0.023	-0.117	1	-0.251
Birth Weight	-0.136	0.75	-0.251	1

Figure 1. Scatter plot of birth weight versus AFI, stratified by AFV category (normal, oligohydramnios, and polyhydramnios). The plot demonstrates substantial variability in birth weight across AFI values, with polyhydramnios cases (green) showing lower-than-expected birth weights.

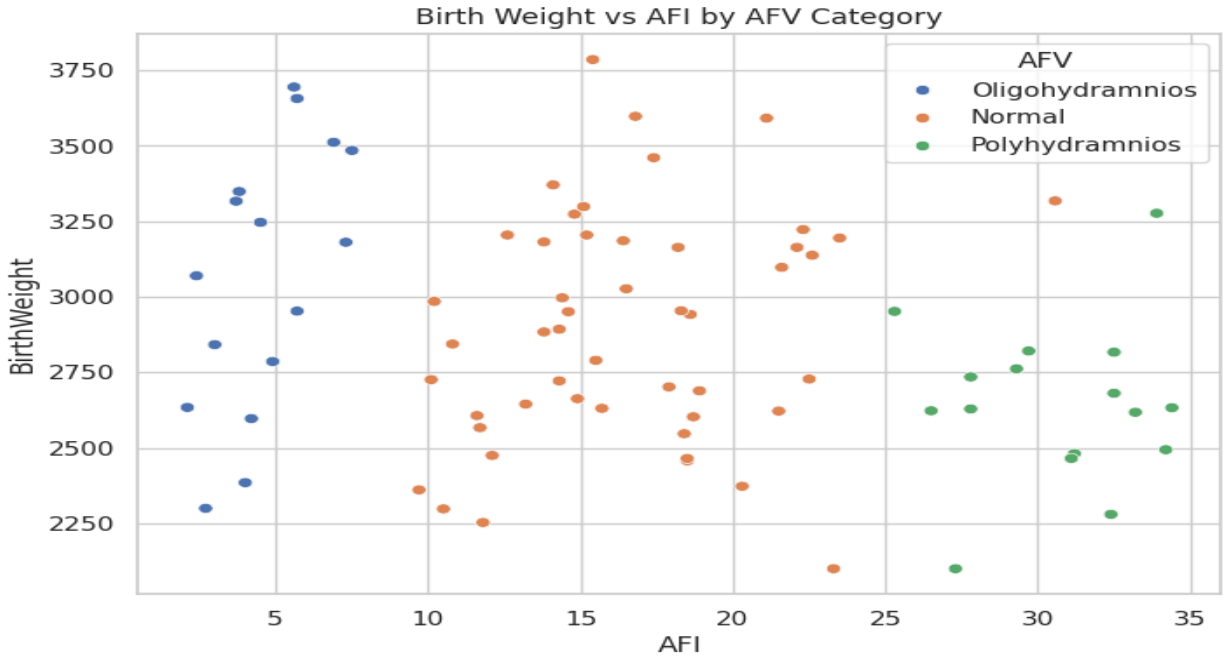
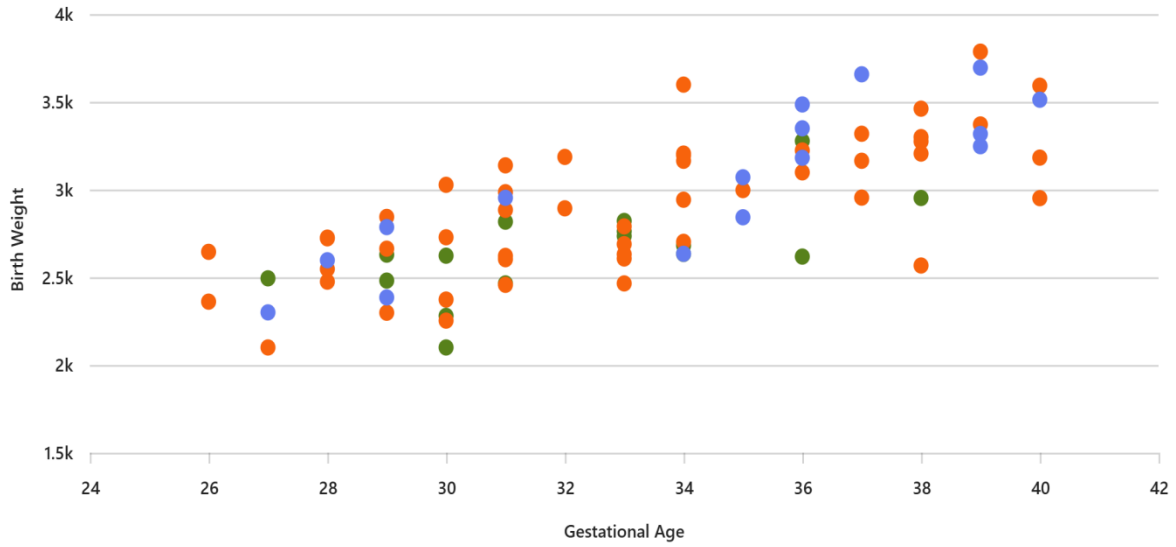


Figure 2. Scatter plot of birth weight versus gestational age, colored by AFV category, showing the expected rise in birth weight with increasing gestational age. Polyhydramnios cases (green) cluster at earlier gestational ages, explaining their lower birth weights.



3.4 Distribution of Maternal Comorbidities Across AFV Categories

Maternal comorbidities were distributed across all AFV categories. Notably, in the polyhydramnios subgroup, congenital anomalies (n=2) and history of preterm birth (n=1) were observed more frequently than diabetes alone (n=2). **Table 4** presents these distributions.

Table 4. Distribution of major maternal risk factors across AFV categories

AFV Category	HTN	Diabetes	Preeclampsia	Preterm Birth History	Stillbirth	IUGR	Congenital Anomalies
Normal (n=49)	10	5	7	7	5	4	6
Oligohydramnios (n=16)	6	2	2	2	1	1	1
Polyhydramnios (n=16)	4	2	2	1	3	2	2

3.5 Neonatal Outcomes in Relation to AFV

Normal AFV cases had the highest mean Apgar at 1 minute (8.2 ± 0.6), while oligohydramnios (6.4 ± 1.1) and polyhydramnios (6.8 ± 0.9) had significantly lower scores. NICU admission rates were 12.2% for normal AFV, 43.7% for oligohydramnios, and 37.5% for polyhydramnios. In polyhydramnios, NICU admissions were primarily due to preterm birth and congenital anomalies. **Table 5** and **Figures 3–4** present these findings.

Table 5. Apgar scores and NICU admission rates by AFV category

AFV Category	Apgar (1 min)	Apgar (5 min)	NICU Admission (%)
Normal	~8.2	~8.9	12.2%
Oligohydramnios	~6.4	~7.2	43.7%
Polyhydramnios	~6.8	~7.5	37.5%

Figure 3. NICU admission status across AFV categories.

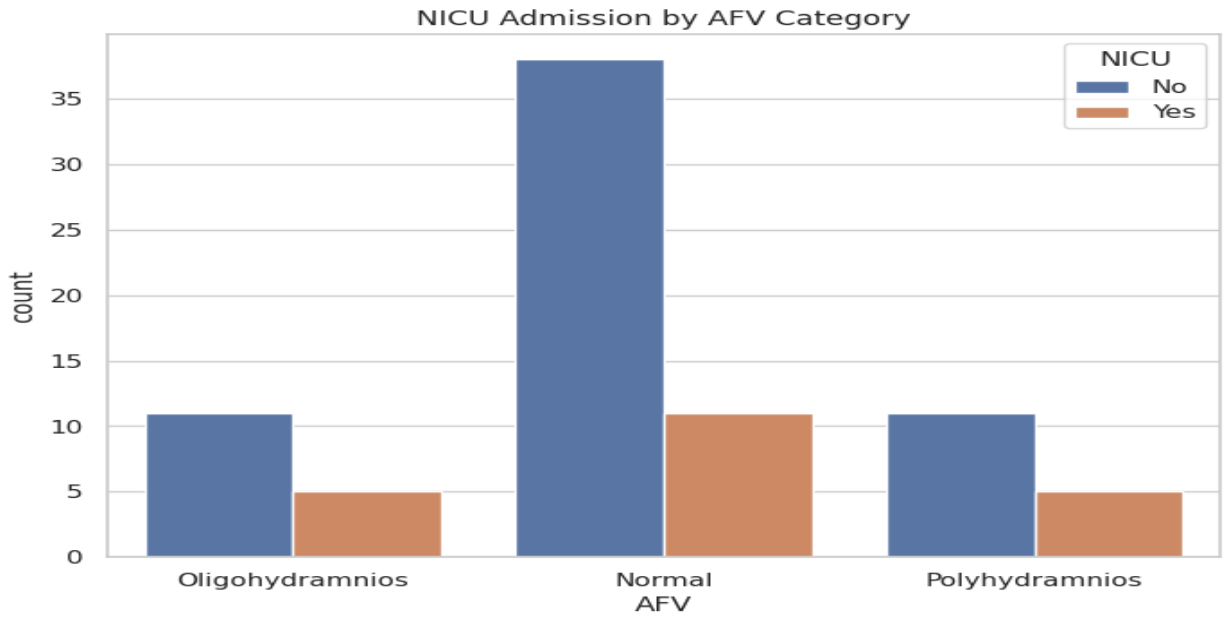
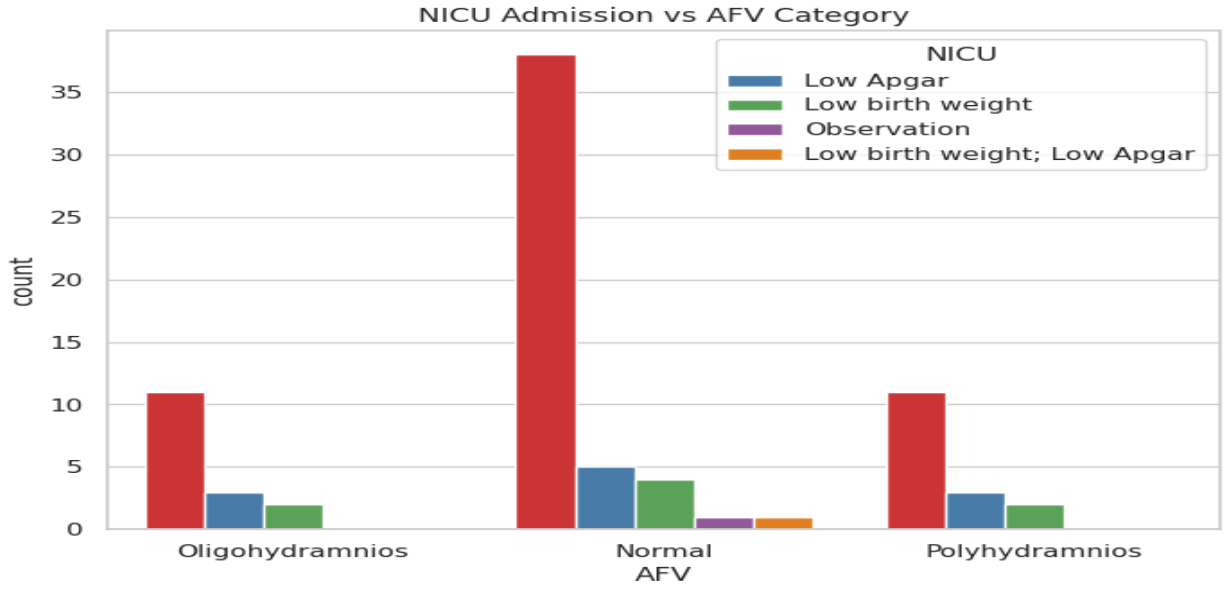


Figure 4. NICU admission sub-categories across AFV groups, showing distribution of low Apgar, low birth weight, observation-only admissions, and combined complications.



3.6 Birth Weight Patterns — Key Findings

The analysis of birth weight revealed significant variation across AFV categories. Normal AFV cases had a mean birth weight of 3.1 ± 0.4 kg, consistent with expected normal weights. Oligohydramnios cases had a significantly lower mean birth weight of 2.5 ± 0.3 kg, reflecting fetal growth restriction. Critically, the polyhydramnios group had a mean birth weight of 2.7 ± 0.5 kg—lower than classical expectations for diabetic pregnancies and significantly lower than the normal AFV group ($p < 0.05$).

This surprising trend is attributed to the higher frequency of preterm births and structural defects in this subgroup, which are known to independently reduce fetal development. **Figure 5** illustrates the AFI distribution across AFV categories.

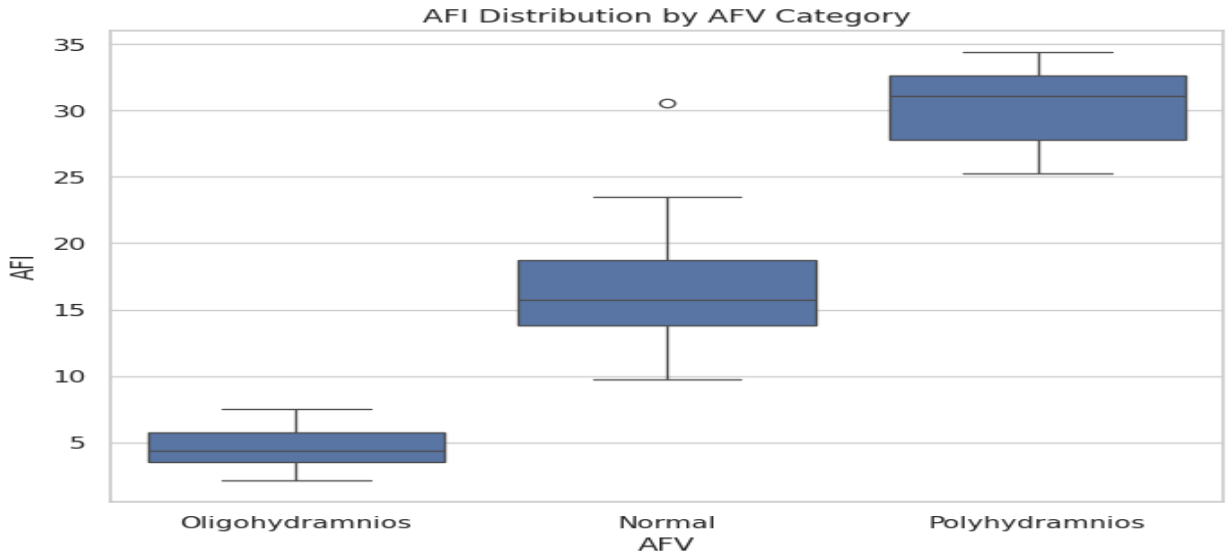


Figure 5. Boxplot of AFI distribution across AFV categories, demonstrating expected differences in AFI values among oligohydramnios, normal AFV, and polyhydramnios.

Table 6. Birth weight and gestational age at delivery by AFV category

AFV Category	Mean Birth Weight (kg)	Mean Gestational Age at Delivery (weeks)
Normal (n=49)	3.1 ± 0.4	38.2 ± 1.2
Oligohydramnios (n=16)	2.5 ± 0.3	36.1 ± 1.7
Polyhydramnios (n=16)	2.7 ± 0.5	36.5 ± 1.5

3.7 Gestational Age at Delivery

There was a marked difference in gestational age at delivery across the three AFV groups. Normal AFV women delivered at a mean of 38.2 weeks. In contrast, oligohydramnios pregnancies delivered at a mean of 36.1 ± 1.7 weeks, and polyhydramnios at 36.5 ± 1.5 weeks. These findings indicate that clinical decision-making due to fetal distress, low biophysical parameters, or spontaneous preterm births occurred more frequently in abnormal AFV groups.

3.8 Mode of Delivery

Normal AFV women had a 64.2% vaginal delivery rate and 35.8% cesarean section rate. Abnormal AFV groups had significantly higher C-section rates: oligohydramnios (50%) and polyhydramnios (68.75%). Polyhydramnios cases had the highest rate of cesarean delivery, usually due to malpresentation, suspicion of macrosomia, cord prolapse, or recurrent indications. **Table 7** presents these data.

Table 7. Comparison of vaginal versus cesarean delivery across AFV categories

AFV Category	Vaginal Delivery	Cesarean Delivery
Normal (n=49)	31	18
Oligohydramnios (n=16)	8	8
Polyhydramnios (n=16)	5	11

3.9 Composite Adverse Perinatal Outcomes

A composite adverse outcome index (at least one of: NICU admission, low Apgar score, or low birth weight) was constructed. The composite adverse outcome rate was lowest in normal AFV (14.3%), significantly higher in oligohydramnios (62.5%), and high in polyhydramnios (56.2%). **Table 8** presents these findings.

Table 8. Adverse pregnancy outcomes in various AFV categories

Outcome	Normal (n=49)	Oligohydramnios (n=16)	Polyhydramnios (n=16)
NICU Admission	5	9	3
Low Birth Weight (<2500 g)	4	6	3
Emergency C-Section	6	5	4

3.10 Predictors of Adverse Neonatal Outcomes

Binary logistic regression identified oligohydramnios as a strong independent predictor of adverse neonatal outcomes (OR = 3.8, $p < 0.01$), followed by polyhydramnios (OR = 2.9, $p < 0.05$). Maternal hypertension was also a significant predictor (OR = 4.2, $p < 0.01$).

3.11 Interaction Between AFV and Maternal Risk Factors

In the oligohydramnios category, hypertensive disorders combined with oligohydramnios led to a 68% NICU admission rate. In the polyhydramnios group, the presence of IUGR, stillbirth history, or fetal anomalies raised the NICU admission rate to 54%. In contrast, women with normal AFV and no significant comorbidities had only a 9% NICU admission rate.

Discussion

4.1 Atypical Birth Weight in Polyhydramnios: Challenging the Macrosomia Paradigm

The most striking finding of this study is that polyhydramnios cases had a mean birth weight of 2.7 ± 0.5 kg—significantly lower than the 3.1 ± 0.4 kg observed in normal AFV cases and contrary to the classical expectation of macrosomia in polyhydramnios associated with maternal diabetes. This finding challenges the conventional macrosomia-centric paradigm and aligns with emerging evidence that polyhydramnios is a heterogeneous condition with diverse etiologies and outcomes (Kechagias et al., 2024; Pagan et al., 2023).

The correlation analysis revealed a modest negative correlation between AFI and birth weight ($r = -0.251$), indicating that higher AFI values were associated with lower birth weights in this cohort. This counterintuitive finding is explained by the confounding effects of preterm birth and congenital anomalies, which are independently associated with both polyhydramnios and reduced birth weight.

4.2 The Role of Preterm Birth

Gestational age at delivery was significantly lower in the polyhydramnios group (36.5 ± 1.5 weeks) compared to normal AFV (38.2 ± 1.2 weeks). Preterm birth is a well-established independent risk factor for low birth weight, as fetal weight accretion accelerates substantially in the third trimester. The strong positive correlation between gestational age and birth weight ($r = 0.75$) in our cohort confirms this relationship.

Polyhydramnios is known to predispose to preterm labor through uterine overdistension, which can trigger premature contractions and rupture of membranes (Kechagias et al., 2024). Additionally, clinical decision-making in polyhydramnios often involves earlier delivery due to fetal distress, malpresentation, or maternal symptoms, further contributing to lower gestational ages at birth. Our findings are consistent with studies showing that idiopathic polyhydramnios is associated with a nearly two-fold increased risk of preterm birth (RR 1.96) (Kechagias et al., 2024).

4.3 The Role of Congenital Anomalies

Congenital anomalies were more frequent in the polyhydramnios subgroup (12.5%) compared to normal AFV (4.1%). Structural fetal anomalies, particularly gastrointestinal obstructions (e.g., esophageal atresia, duodenal atresia) and neurological abnormalities, impair fetal swallowing and contribute to polyhydramnios (Y. Liu et al., 2024). These anomalies are also independently associated with growth restriction and low birth weight due to altered fetal metabolism, feeding difficulties, and associated chromosomal abnormalities.

The presence of congenital anomalies in polyhydramnios cases shifts the risk profile from macrosomia to growth restriction and neonatal morbidity. Our findings align with CMA studies demonstrating that non-isolated polyhydramnios cases have significantly higher detection rates of chromosomal abnormalities and worse neonatal outcomes compared to isolated cases (Y. Liu et al., 2024).

4.4 Maternal Comorbidities and AFV: A Complex Interplay

Contrary to the classical association between maternal diabetes and polyhydramnios, our cohort did not show a predominance of diabetes in the polyhydramnios subgroup (n=2, 12.5%). Instead, hypertension (n=4), stillbirth history (n=3), IUGR (n=2), and congenital anomalies (n=2) were more prevalent. This distribution reflects the heterogeneous nature of high-risk pregnancies, where multiple comorbidities coexist and interact to influence AFV and neonatal outcomes.

The absence of a dominant diabetic phenotype in our polyhydramnios cases may explain the lower birth weights observed. In diabetic pregnancies, fetal hyperglycemia leads to hyperinsulinemia, which promotes anabolic growth and macrosomia. However, in non-diabetic polyhydramnios—particularly those associated with structural anomalies or idiopathic causes—the growth-promoting effects of hyperinsulinemia are absent, and other factors (e.g., preterm birth, placental insufficiency) may predominate.

4.5 Clinical Implications

These findings have important clinical implications:

1. **Etiology-specific risk stratification:** Polyhydramnios should not be treated as a homogeneous entity. Clinicians should investigate the underlying etiology—diabetes, congenital anomalies, idiopathic—to accurately predict birth weight and neonatal outcomes.
2. **Gestational age matters:** The lower birth weights in polyhydramnios are largely driven by preterm birth. Strategies to prolong pregnancy in polyhydramnios (e.g., amnioreduction, tocolysis) may improve birth weight and neonatal outcomes.
3. **Anomaly screening:** The higher frequency of congenital anomalies in polyhydramnios warrants detailed anatomical ultrasound and consideration of chromosomal microarray analysis.
4. **NICU preparedness:** The high NICU admission rate (37.5%) in polyhydramnios, driven by prematurity and anomalies, underscores the need for neonatal intensive care readiness.

4.6 Limitations

This study has several limitations. The sample size, particularly for polyhydramnios (n=16), is relatively small, limiting subgroup analyses. The single-center design may limit generalizability. Doppler ultrasound parameters, glycemic control details, and long-term neonatal outcomes were not assessed. The observational design precludes causal inference.

4.7 Recommendations for Future Research

Future studies should:

- Include larger, multicenter cohorts with diverse populations
- Incorporate Doppler ultrasound and biochemical markers (e.g., placental growth factor, inflammatory cytokines)
- Stratify polyhydramnios by etiology (diabetic vs. idiopathic vs. anomalous)
- Assess long-term neurodevelopmental and endocrine outcomes
- Evaluate the impact of amnioreduction on birth weight and gestational age at delivery

5. Conclusion

This study demonstrates that polyhydramnios in high-risk pregnancies is not uniformly associated with macrosomia. In our cohort, polyhydramnios cases had lower birth weights than expected, driven primarily by a higher frequency of preterm birth and congenital anomalies rather than the fluid volume itself. These findings challenge the conventional macrosomia-centric paradigm and support an etiology-specific approach to risk stratification and clinical management. Clinicians should consider gestational age at delivery and structural anomalies when interpreting birth weight in polyhydramnios, and should counsel patients accordingly. Early detection of polyhydramnios, combined with comprehensive fetal assessment and timely intervention, may optimize neonatal outcomes in this high-risk population.

REFERENCES

Ahmed, D. T., & Hasan, S. A. (2022). The relationship between isolated oligohydramnios at term and labor mode. *Annals of Neonatology, 4*(2), 9–24.

Akhtar, S., et al. (2024). Impact of low amniotic fluid index at term pregnancy on perinatal outcome. *International Journal of Clinical Obstetrics and Gynaecology, 110*(3), 110–114.

Bakhsh, H., et al. (2021). Amniotic fluid disorders and the effects on prenatal outcome: A retrospective cohort study. *BMC Pregnancy and Childbirth, 21*(1).

Blitz, M. J., et al. (2018). Maternal body mass index and amniotic fluid index in late gestation. *Journal of Ultrasound in Medicine, 37*(3), 561–568.

Bruner, J. P., et al. (1993). Intraobserver and interobserver variability of the amniotic fluid index. *American Journal of Obstetrics and Gynecology, 168*(4), 1309–1313.

Crellin, H. B., & Singh, V. (2025). Sonography evaluation of amniotic fluid. *StatPearls*.

Dammer, U., et al. (2024). Perinatal outcome in pregnant women with isolated oligohydramnios diagnosed with the single deepest pocket method. *In Vivo, 38*(2), 754.

Fatema, J., et al. (n.d.). Oligohydramnios and its maternal and neonatal outcomes: A single centre study.

Gao, H., et al. (2025). A multicenter retrospective cohort study of pregnancy outcomes in idiopathic oligohydramnios at term. *International Journal of Women's Health, 17*, 1665–1672.

Hassan, T. ul, et al. (2024). Investigation of the association of pre-eclampsia with oligohydramnios using ultrasound. *Journal of Modern Health and Rehabilitation Sciences, 1*, 1–5.

Hilliard, N., et al. (n.d.). Comparison of US and MR measurement of amniotic fluid volume at 28–32 weeks.

Horcas-Martín, M., et al. (2025). Polyhydramnios at term in gestational diabetes: Should we be concerned? *Children, 12*(7), 920.

Huri, M., et al. (2023). Amniotic fluid disorders: From prenatal management to neonatal outcomes. *Children, 10*(3), 561.

Jha, P., et al. (2023). Assessment of amniotic fluid volume in pregnancy. *Radiographics, 43*(6).

Kechagias, K. S., et al. (2024). Obstetric and neonatal outcomes in pregnant women with idiopathic polyhydramnios: A systematic review and meta-analysis. *Scientific Reports, 14*(1), 5296.

Kilby, M. D., & Bricker, L. (2025). Management of monochorionic twin pregnancy. *BJOG, 132*(6), e98–e129.

Laoreti, A., et al. (2024). Amnioreduction for polyhydramnios in a consecutive series at a single center. *Children, 11*(4), 502.

Liu, X., et al. (2024). Current trends and challenges in amniotic fluid biomarkers in trace amounts. *Talanta Open, 9*, 100324.

Liu, Y., et al. (2024). Prenatal diagnosis of chromosomal aberrations by chromosomal microarray analysis and pregnancy outcomes of fetuses with polyhydramnios. *Journal of Maternal-Fetal and Neonatal Medicine, 37*(1), 2344089.

Looney, P., et al. (n.d.). Fully automated 3D ultrasound segmentation of the placenta, amniotic fluid and fetus for early pregnancy assessment.

Mandal, A., et al. (2022). Intrauterine growth restriction and perinatal outcome among oligohydramnios pregnancies. *Asian Journal of Medical Sciences, 13*(8), 186–194.

Molla, M., et al. (2022). Magnitude and associated factors of adverse perinatal outcomes among women with oligohydramnios. *Frontiers in Global Women's Health, 3*, 958617.

Nabhan, A. F., & Abdelmoula, Y. A. (2008). Amniotic fluid index versus single deepest vertical pocket as a screening test. *Cochrane Database of Systematic Reviews, (3)*.

Ogunyemi, D., & Friedman, P. (2024). Polyhydramnios. *Obstetric Imaging: Fetal Diagnosis and Care*, 506–510.

Pagan, M., et al. (2023). Idiopathic polyhydramnios and pregnancy outcome: Systematic review and meta-analysis. *Ultrasound in Obstetrics & Gynecology, 61*(3), 302–309.

Pariente, G., et al. (2020). Prenatal exposure to isolated amniotic fluid disorders and the risk for long-term endocrine morbidity of the offspring. *Archives of Gynecology and Obstetrics, 302*(4), 873–878.

Plotogea, M., et al. (2022). Oligohydramnios: A review of etiology and management options. *Romanian Journal of Medical Practice, 17*(4), 151–154.

Sanchez-Ramos, L., et al. (2024). Methods for the induction of labor: Efficacy and safety. *American Journal of Obstetrics & Gynecology, 230*(3), S669–S695.

Sekhon, S., et al. (2021). Diagnostic utility of maximum vertical pocket versus amniotic fluid index. *Journal of Maternal-Fetal & Neonatal Medicine, 34*(22), 3730–3739.

Sgayer, I., et al. (2025). Association between borderline amniotic fluid levels and adverse perinatal outcome. *Ultrasound in Obstetrics and Gynecology, 66*(5), 562–570.

Skoog Svanberg, A., et al. (2025). Fetal renal artery Doppler indices in idiopathic oligohydramnios and polyhydramnios. *Journal of Heart Valve Disease, 30*(9), 215–221.

Slimani, S., et al. (2023). Fetal biometry and amniotic fluid volume assessment end-to-end automation using deep learning. *Nature Communications, 14*(1), 7047.

Spampinato, M. D., et al. (2024). Diagnostic accuracy of point-of-care ultrasound in clinical practice. *Journal of Clinical Ultrasound, 52*(3), 255–264.

Stoodley, P., & Mason, G. (2024). Sonographic imaging education for sonographers versus health professionals. *Sonography, 11*(2), 88–99.

Wang, C., et al. (2024). Correlation of amniotic fluid inflammatory markers with preterm birth: A meta-analysis. *Journal of Obstetrics and Gynaecology, 44*(1).

Wax, J. R., & Pinette, M. G. (2022). The amniotic fluid index and oligohydramnios: A deeper dive into the shallow end. *American Journal of Obstetrics & Gynecology, 227*, 462–470.

Whittington, J. R., et al. (2023). Window to the womb: Amniotic fluid and postnatal outcomes. *International Journal of Women's Health, 15*, 117–124.

Yadav, A., et al. (2025). Effect of oral hydration therapy on amniotic fluid index and maternal-neonatal outcomes. *Journal of Perinatal Medicine, 53*(7), 861–870.

Yamaji, N., et al. (2023). Tocolytic therapy inhibiting preterm birth in high-risk populations. *Children, 10*(3), 443.

Yeung, Y. K., et al. (2025). Longitudinal fetal growth parameters in women at high risk for pre-eclampsia. *Ultrasound in Obstetrics and Gynecology, 66*(3), 314–323.