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Original Article

Comparative Performance of Amniotic Fluid Index and Single Deepest Pocket in Predicting Adverse Perinatal Outcomes in High-Risk Pregnancies

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ABSTRACT

Background: Accurate sonographic assessment of amniotic fluid volume is essential in high-risk pregnancy, yet uncertainty persists regarding whether amniotic fluid index or single deepest pocket better predicts adverse neonatal outcome. Objective: To compare the diagnostic agreement, neonatal outcome associations, and predictive performance of AFI and SDP in high-risk pregnancies. Methods: This prospective comparative study included 81 high-risk pregnant women assessed at HBS Hospital, Islamabad, from June to December 2025. AFI and SDP were measured during the same ultrasound examination. Oligohydramnios and polyhydramnios were classified using standard thresholds. Neonatal outcomes included birth weight, 1-minute and 5-minute Apgar scores, NICU admission, and a composite adverse perinatal outcome defined as NICU admission, 5-minute Apgar score <7, or birth weight <2500 g. Agreement, correlations, and diagnostic performance measures were analyzed. Results: Mean AFI was 14.2 ± 6.8 cm and mean SDP was 4.6 ± 1.9 cm. Agreement between methods was moderate (κ=0.61; 95% CI 0.48-0.74), with discordance in 18.5% of cases. AFI showed stronger correlations than SDP with 1-minute Apgar (r=0.52 vs 0.31), 5-minute Apgar (r=0.48 vs 0.28), birth weight (r=0.41 vs 0.22), and NICU admission (r=-0.44 vs -0.28). AFI demonstrated higher sensitivity for the composite adverse outcome (78.9% vs 63.2%), whereas SDP showed higher specificity (91.5% vs 82.5%). Conclusion: AFI more reliably identified neonatal compromise in high-risk pregnancies, while SDP provided valuable confirmatory specificity, particularly in discordant or borderline cases. Keywords: Amniotic fluid index; single deepest pocket; oligohydramnios; polyhydramnios; ultrasound; perinatal outcomes; high-risk pregnancy.

INTRODUCTION

Accurate assessment of amniotic fluid volume remains a central component of fetal surveillance in high-risk pregnancy because altered fluid status is associated with placental insufficiency, fetal growth restriction, intrapartum compromise, and increased neonatal morbidity (1). In routine obstetric practice, two semi-quantitative ultrasonographic techniques are most commonly used for this purpose: the amniotic fluid index (AFI), which estimates overall fluid volume by summing the deepest vertical pockets in four uterine quadrants, and the single deepest pocket (SDP), which identifies the largest measurable fluid pocket free of fetal parts and umbilical cord (2-4). Both methods are widely accepted, and both are used to classify oligohydramnios and polyhydramnios using established sonographic thresholds, yet persistent uncertainty remains regarding which approach offers better clinical utility in pregnancies already burdened by maternal or fetal risk (5).

The controversy is clinically important because the two methods do not perform identically. AFI has often been regarded as more sensitive to global reductions in fluid volume, but it may also classify a

greater number of pregnancies as abnormal, potentially increasing rates of surveillance escalation or intervention without proportional neonatal benefit (6). In contrast, SDP is frequently considered more specific and may reduce false-positive labeling of oligohydramnios, although concerns remain that a single-pocket approach may underestimate diffuse fluid reduction in some high-risk settings (7). Prior comparative studies and meta-analytic work have suggested that SDP can reduce unnecessary intervention without worsening neonatal outcomes in general obstetric populations; however, these findings cannot automatically be extrapolated to women with hypertension, diabetes, preeclampsia, fetal growth restriction, prior adverse obstetric history, or other conditions associated with altered placental function and abnormal fluid dynamics (8,9).

This unresolved issue is particularly relevant in high-risk pregnancies, where amniotic fluid abnormalities may reflect complex and heterogeneous pathophysiological processes rather than isolated fluid variation alone. Maternal comorbidities, uteroplacental insufficiency, impaired fetal perfusion, and chronic fetal adaptation can influence both absolute fluid volume and its intrauterine distribution, thereby affecting how AFI and SDP classify the same patient (9). In such circumstances, disagreement between the two methods may not be incidental but may instead carry clinical significance, especially if one method better correlates with neonatal compromise, low Apgar scores, low birth weight, or need for neonatal intensive care. Despite the practical importance of this question, prospective evidence directly comparing AFI and SDP in high-risk populations remains limited, and the extent to which either method better predicts adverse perinatal outcome in this subgroup has not been sufficiently clarified (6-9).

Accordingly, this prospective comparative study was undertaken to evaluate the relative performance of AFI and SDP in predicting adverse perinatal outcomes among women with high-risk pregnancies. The study specifically aimed to compare agreement between the two methods, examine their associations with key neonatal outcomes, and assess their diagnostic performance for identifying a composite adverse perinatal outcome. We hypothesized that AFI would demonstrate stronger association with markers of neonatal compromise because of its broader representation of overall amniotic fluid status, whereas SDP would offer complementary value in borderline or discordant cases through greater specificity and better identification of clinically meaningful isolated fluid pockets.

MATERIALS AND METHODS

This prospective comparative study was conducted at HBS Hospital, Islamabad, between June and December 2025 to compare the performance of the amniotic fluid index and the single deepest pocket method in predicting adverse perinatal outcomes in women with high-risk pregnancies. The study was designed to evaluate both methods within the same patient during the same ultrasound encounter in order to minimize temporal variation in fluid status and permit direct within-subject comparison. The primary analytic outcome was a composite adverse perinatal outcome defined as neonatal intensive care unit admission, a 5-minute Apgar score below 7, or birth weight below 2500 g. Secondary outcomes included birth weight as a continuous measure, Apgar scores at 1 and 5 minutes, NICU admission as an individual endpoint, and mode of delivery with its indication.

A total of 81 pregnant women meeting criteria for high-risk pregnancy were enrolled. Eligibility required gestational age of at least 28 weeks together with one or more recognized high-risk features, including hypertension, diabetes mellitus, preeclampsia, previous stillbirth, previous preterm birth, intrauterine growth restriction, or congenital anomalies. Singleton pregnancies and non-discordant twin pregnancies were eligible when complete ultrasound and delivery data were available. Women with major fetal anomalies incompatible with life, discordant twin gestations, or incomplete clinical, ultrasonographic, or delivery records were excluded. Participants were recruited from the hospital population undergoing obstetric surveillance during the study period, and outcome ascertainment was based on completed delivery records linked to prenatal ultrasound findings.

Ultrasonographic assessment was performed by trained sonographers using standardized equipment and a uniform scanning protocol. To improve comparability and reduce measurement bias related to interval change in fluid status, AFI and SDP were recorded during the same examination session for each participant. For AFI measurement, the uterus was divided into four quadrants using the maternal sagittal midline and a transverse line through the uterine midpoint. In each quadrant, the deepest vertical pocket free of fetal parts and umbilical cord was identified and measured, and the four measurements were summed to obtain the AFI value in centimeters. For SDP measurement, the uterus was systematically scanned to identify the single largest vertical pocket with a minimum width of 1 cm that was free of fetal parts and umbilical cord, and the vertical dimension of this pocket was recorded in centimeters. Using established sonographic thresholds, oligohydramnios was defined as AFI below 5 cm or SDP below 2 cm, normal fluid volume as AFI 5–25 cm and SDP 2–8 cm, and polyhydramnios as AFI above 25 cm or SDP above 8 cm. Cases in which AFI and SDP assigned different fluid categories were prospectively retained as discordant classifications for separate comparative analysis.

Maternal and neonatal variables were extracted from the clinical record and delivery documentation using a prespecified outcome framework. The principal exposure variables were the continuous AFI and SDP measurements and their categorical interpretation as oligohydramnios, normal fluid volume, or polyhydramnios. Neonatal outcome variables included birth weight in grams, Apgar score at 1 minute, Apgar score at 5 minutes, and NICU admission. A composite adverse perinatal outcome was defined to capture clinically meaningful neonatal compromise across immediate adaptation, need for higher-level care, and low birth weight. Mode of delivery and documented indication were also recorded to provide additional clinical context for decision-making patterns associated with abnormal fluid classification. Operational definitions were kept constant throughout the analysis to preserve internal consistency and reproducibility.

Several design features were used to reduce bias and strengthen internal validity. Measuring both AFI and SDP in the same patient during the same examination reduced between-subject variability and avoided bias caused by serial changes in amniotic fluid volume. Use of trained sonographers and a standardized scanning protocol was intended to limit operator-dependent variability. Restriction of the cohort to women with documented high-risk pregnancy characteristics improved clinical relevance to the target population, while predefined eligibility criteria and exclusion of incomplete records supported data integrity. Discordant cases were not merged or reclassified post hoc but were analyzed separately, allowing a more clinically informative comparison of method-specific classification performance. Because the objective of the study was comparative method evaluation within a defined high-risk cohort rather than etiologic modeling of individual maternal conditions, the analysis emphasized direct diagnostic agreement, correlation structure, and predictive performance rather than covariate-adjusted causal inference.

Data analysis was performed in Python 3.10. Continuous measurement distributions for AFI and SDP were summarized using means, standard deviations, and ranges. Agreement between categorical classifications obtained by AFI and SDP was evaluated using Cohen's kappa with corresponding confidence interval estimation. Associations between sonographic measurements and neonatal outcomes were examined using Pearson or Spearman correlation coefficients, as appropriate to variable type and distribution. Diagnostic performance of abnormal thresholds for AFI and SDP in identifying the composite adverse perinatal outcome was assessed through sensitivity, specificity, positive predictive value, negative predictive value, and overall accuracy. A predefined subgroup analysis was undertaken for discordant cases in order to determine which classification method more closely aligned with observed neonatal outcome patterns when the two techniques disagreed. Statistical significance was set at $p<0.05$.

All analyses were conducted on complete cases with available ultrasound and delivery data, consistent with the eligibility criteria. Study data were derived from contemporaneously recorded ultrasound

findings and documented delivery outcomes, and the same predefined measurement thresholds and outcome definitions were applied throughout the dataset to support consistency, traceability, and reproducibility. The study was conducted as a hospital-based prospective clinical investigation involving routine obstetric ultrasonography and outcome follow-up within standard care pathways.

RESULTS

A total of 81 high-risk pregnancies were evaluated using both amniotic fluid index and single deepest pocket measurements obtained during the same ultrasound examination. The mean AFI was 14.2 ± 6.8 cm, ranging from 2.1 to 31.5 cm, while the mean SDP was 4.6 ± 1.9 cm, ranging from 1.2 to 9.8 cm, indicating broad dispersion of amniotic fluid measurements across the cohort. Both methods demonstrated substantial variability, reflecting the heterogeneity expected in a clinically high-risk obstetric population. AFI values spanned the full spectrum from oligohydramnios to polyhydramnios more widely than SDP, consistent with its broader quadrant-based sampling approach.

Table 1. Distribution of AFI and SDP Measurements in High-Risk Pregnancies

Parameter	Mean ± SD	Range
AFI (cm)	14.2 ± 6.8	2.1–31.5
SDP (cm)	4.6 ± 1.9	1.2–9.8

Agreement between AFI and SDP classifications was moderate, with a Cohen's kappa of 0.61 (95% CI 0.48–0.74), and the two methods produced concordant classifications in 66 of 81 pregnancies, corresponding to an agreement rate of 81.5%. Discordance was observed in 15 cases (18.5%), confirming that although the methods frequently classify patients similarly, a clinically meaningful subset remains differently categorized depending on the measurement approach used. Normal fluid volume was assigned concordantly in 42 cases, oligohydramnios concordantly in 12 cases, and polyhydramnios concordantly in 17 cases. Among discordant observations, AFI classified 4 cases as oligohydramnios that SDP considered normal or polyhydramnios, whereas SDP classified 6 cases outside the AFI-normal category in pregnancies AFI had categorized differently, illustrating the non-equivalence of the two methods at classification margins.

Table 2. Cross-Classification Agreement Between AFI and SDP

AFI Classification	SDP Normal	SDP Oligohydramnios	SDP Polyhydramnios	Total
AFI Normal	42	3	1	46
AFI Oligohydramnios	4	12	0	16
AFI Polyhydramnios	2	0	17	19
Total	48	15	18	81

Agreement statistics: Cohen's κ = 0.61; 95% CI 0.48–0.74; overall agreement = 81.5%.

When oligohydramnios was examined specifically, AFI classified 16 pregnancies (19.8%) as oligohydramnios and SDP classified 15 (18.5%), but the overlap was incomplete. SDP identified 4 additional borderline low-fluid cases that AFI considered normal, all of which had AFI values between 5.2 and 6.8 cm but SDP values between 1.8 and 1.9 cm. Conversely, AFI identified 3 pregnancies as oligohydramnios that SDP considered normal, with AFI values ranging from 4.2 to 4.8 cm and corresponding SDP values between 2.1 and 2.3 cm. These findings indicate that borderline classifications were particularly vulnerable to method-dependent interpretation and support separate analysis of discordant cases rather than assuming interchangeability between techniques.

AFI demonstrated stronger correlations with neonatal outcomes than SDP across nearly all reported domains. AFI correlated moderately and significantly with 1-minute Apgar score ($r=0.52$, $p<0.001$), 5-minute Apgar score ($r=0.48$, $p<0.001$), birth weight ($r=0.41$, $p<0.01$), and NICU admission in the inverse direction ($r=-0.44$, $p<0.01$), indicating that lower AFI values were associated with poorer neonatal adaptation and higher morbidity. By comparison, SDP showed weaker but still significant associations with 1-minute Apgar score ($r=0.31$, $p<0.05$), 5-minute Apgar score ($r=0.28$, $p<0.05$), and NICU admission

(r=-0.28, p<0.05), while its correlation with birth weight did not reach conventional statistical significance (r=0.22, p=0.08). The stronger magnitude of AFI correlations suggests that a more global assessment of fluid volume may better reflect the fetal condition in high-risk pregnancies.

Table 3. Correlation of AFI and SDP with Neonatal Outcomes

Variable Pair	Correlation Coefficient (r)	p-value	Interpretation
AFI vs 1-minute Apgar	0.52	<0.001	Moderate positive association
AFI vs 5-minute Apgar	0.48	<0.001	Moderate positive association
AFI vs Birth Weight	0.41	<0.01	Moderate positive association
AFI vs NICU Admission	-0.44	<0.01	Moderate inverse association
SDP vs 1-minute Apgar	0.31	<0.05	Weak positive association
SDP vs 5-minute Apgar	0.28	<0.05	Weak positive association
SDP vs Birth Weight	0.22	0.08	Weak non-significant association
SDP vs NICU Admission	-0.28	<0.05	Weak inverse association

The full correlation matrix further reinforced this pattern. AFI and SDP were positively correlated with one another (r=0.68, p<0.01), showing that both methods track related aspects of amniotic fluid status while not measuring them identically. Neonatal variables also showed strong internal relationships, including a high positive correlation between 1-minute and 5-minute Apgar scores (r=0.82, p<0.01) and inverse correlations of NICU admission with both Apgar scores and birth weight. Importantly, AFI maintained stronger correlations with these outcomes than SDP throughout the matrix, further supporting its closer alignment with clinically adverse neonatal endpoints in this cohort.

Table 4. Correlation Matrix of Sonographic and Neonatal Variables

Variable	AFI	SDP	Apgar 1	Apgar 5	NICU	Birth Weight
AFI	1.00	0.68**	0.52**	0.48**	-0.44**	0.41**
SDP	0.68**	1.00	0.31*	0.28*	-0.28*	0.22
Apgar 1	0.52**	0.31*	1.00	0.82**	-0.61**	0.53**
Apgar 5	0.48**	0.28*	0.82**	1.00	-0.58**	0.49**
NICU	-0.44**	-0.28*	-0.61**	-0.58**	1.00	-0.55**
Birth Weight	0.41**	0.22	0.53**	0.49**	-0.55**	1.00

*p<0.05, **p<0.01

For prediction of the composite adverse perinatal outcome, AFI below 5 cm yielded a sensitivity of 78.9%, specificity of 82.5%, positive predictive value of 56.3%, negative predictive value of 93.5%, and overall accuracy of 81.5%. SDP below 2 cm demonstrated lower sensitivity at 63.2% but higher specificity at 91.5%, with a positive predictive value of 60.0%, negative predictive value of 89.2%, and overall accuracy of 85.2%. Thus, AFI performed better as a screening-oriented method with fewer missed adverse outcomes, whereas SDP performed better as a rule-in method with fewer false-positive classifications. When directly derived error indices were examined, AFI showed a false-negative rate of 21.1% and false-positive rate of 17.5%, while SDP showed a false-negative rate of 36.8% and false-positive rate of 8.5%. Similarly, balanced accuracy derived from sensitivity and specificity was 80.7% for AFI and 77.4% for SDP, indicating that AFI provided a more even trade-off between case detection and misclassification, despite SDP's higher raw specificity and overall accuracy. These complementary performance characteristics suggest that the clinical choice between methods should depend on whether the priority is to minimize missed compromise or unnecessary labeling.

The discordant subgroup was clinically important. Among the 15 pregnancies in which AFI and SDP yielded different fluid classifications, 8 cases (53.3%) experienced adverse outcomes, compared with 22.7% among concordant normal cases, indicating that classification disagreement itself marked a substantially higher-risk subgroup. Within those discordant cases, SDP-corrected classification identified 7 of 8 adverse outcomes (87.5%), whereas AFI-corrected classification identified 5 of 8 (62.5%). This suggests that although AFI performed more strongly overall across the cohort, SDP may offer additional value in discrepant presentations, particularly where localized but clinically relevant fluid pockets better reflect neonatal risk than a summed quadrant assessment alone.

Table 5. Predictive Performance of AFI and SDP for Composite Adverse Perinatal Outcome

Metric	AFI (<5 cm)	SDP (<2 cm)
Sensitivity (%)	78.9	63.2
Specificity (%)	82.5	91.5
Positive Predictive Value (%)	56.3	60.0
Negative Predictive Value (%)	93.5	89.2
Accuracy (%)	81.5	85.2
False-Negative Rate (%)†	21.1	36.8
False-Positive Rate (%)‡	17.5	8.5
Balanced Accuracy (%)§	80.7	77.4

†False-negative rate = 100 − sensitivity.

‡False-positive rate = 100 − specificity.

§Balanced accuracy = (sensitivity + specificity) / 2.

Table 6. Clinical Pattern in Discordant AFI–SDP Classifications

Discordant Case Indicator	Value
Total discordant cases, n	15
Discordant proportion (%)	18.5
Adverse outcomes in discordant cases, n (%)	8 (53.3)
Adverse outcome rate in concordant normal cases (%)	22.7
Adverse outcomes identified by SDP-corrected classification, n/N (%)	7/8 (87.5)
Adverse outcomes identified by AFI-corrected classification, n/N (%)	5/8 (62.5)

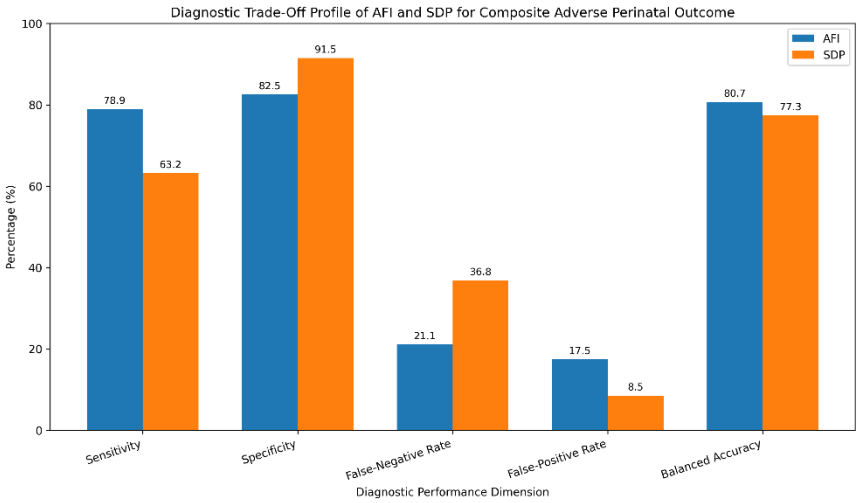

Figure 1 Diagnostic Trade-Off Profile of AFI and SDP for Composite Adverse Perinatal Outcome

AFI demonstrated higher sensitivity than SDP for the composite adverse perinatal outcome (78.9% vs 63.2%), corresponding to a substantially lower false-negative rate (21.1% vs 36.8%), while SDP showed higher specificity (91.5% vs 82.5%) and a lower false-positive rate (8.5% vs 17.5%). When these dimensions were jointly considered, AFI retained a slightly higher balanced accuracy than SDP (80.7% vs 77.4%), indicating a more even overall trade-off between identifying compromised neonates and avoiding misclassification. This pattern supports the interpretation that AFI is better suited for screening-oriented surveillance in high-risk pregnancies, whereas SDP provides stronger confirmatory value when minimizing false-positive diagnosis is clinically prioritized.

DISCUSSION

This prospective comparative study demonstrated that AFI showed stronger associations than SDP with multiple indicators of neonatal condition in high-risk pregnancies, including Apgar scores, birth weight, and NICU admission, while SDP exhibited greater specificity for the composite adverse perinatal outcome. These findings suggest that the two sonographic methods are not interchangeable in clinically vulnerable populations and instead offer different diagnostic advantages depending on whether the clinical priority is early detection of compromise or reduction of false-positive classification. The

moderate agreement observed between methods, with a Cohen's kappa of 0.61 and discordant classifications in 18.5% of cases, further indicates that although AFI and SDP measure related aspects of amniotic fluid status, they may capture different pathophysiological patterns in high-risk pregnancies, particularly near diagnostic thresholds (4,5).

The stronger performance of AFI in this cohort is likely related to its capacity to reflect global intrauterine fluid status rather than relying on a single measurable pocket. In pregnancies complicated by hypertension, diabetes, preeclampsia, fetal growth restriction, or placental dysfunction, amniotic fluid abnormalities may be diffuse and physiologically linked to chronic uteroplacental insufficiency. Under such circumstances, a quadrant-based technique may more effectively capture widespread fluid reduction and therefore show closer association with neonatal compromise. This interpretation is consistent with the observed correlation pattern in the present study, where AFI showed moderate and statistically significant relationships with 1-minute Apgar score, 5-minute Apgar score, birth weight, and NICU admission, each stronger than the corresponding SDP correlations. The sensitivity of AFI for the composite adverse outcome was also higher than that of SDP, supporting its utility as a screening-oriented method in surveillance settings where missed fetal compromise may carry greater clinical consequence than a modest increase in false-positive classification (6,10-12).

At the same time, the higher specificity of SDP observed in this study remains clinically important and should not be interpreted as secondary or negligible. SDP produced fewer false-positive classifications and a higher positive predictive value than AFI, suggesting that it may better distinguish truly abnormal from borderline fluid states when the objective is to avoid unnecessary intervention. This aligns with prior literature indicating that SDP may reduce overdiagnosis of oligohydramnios and may therefore lower intervention rates without compromising neonatal safety in selected populations (5,13). In the present high-risk cohort, SDP also demonstrated particular value in discordant cases, where it aligned more closely with adverse outcome status in a greater proportion of pregnancies than AFI. This pattern suggests that when fluid distribution is uneven and a clinically meaningful pocket remains present despite a lower summed AFI, SDP may provide additional context that improves interpretation beyond a purely global fluid estimate (14).

The discordant subgroup deserves particular emphasis because it appears to represent a distinct clinical category rather than simple measurement noise. More than half of discordant cases experienced adverse outcomes, compared with less than one quarter of concordant normal cases, indicating that disagreement between AFI and SDP may itself function as a marker of increased risk. Two clinically relevant discordance patterns were apparent. In one pattern, AFI was low but SDP remained within the normal range, which may reflect uneven fluid distribution with preservation of a dominant pocket despite reduced fluid elsewhere. In the second pattern, AFI was within or near the normal range but SDP was low, which may indicate that apparently acceptable total fluid volume masks the absence of an adequately measurable pocket. Recognizing these divergent scenarios is important because they imply that discordance should prompt contextual clinical assessment rather than automatic preference for one metric over the other. This interpretation is consistent with previous reports showing non-trivial disagreement rates between sonographic fluid assessment methods and highlighting the need for careful bedside integration of ultrasound findings with the overall obstetric risk profile (15,16).

The present findings are broadly consistent with prior comparative work but also contribute an important refinement by focusing specifically on high-risk pregnancy. Earlier syntheses have suggested that SDP may be preferable in general obstetric practice because it reduces unnecessary intervention without worsening perinatal outcomes, whereas AFI may diagnose more cases of oligohydramnios without proportional neonatal benefit (5,17). However, the stronger overall performance of AFI in the current study suggests that this conclusion may not apply uniformly to high-risk populations, where global reductions in amniotic fluid may carry greater biological and prognostic significance. The observed superiority of AFI in sensitivity and correlation with adverse neonatal markers may therefore

reflect the specific pathophysiological context of this cohort rather than a contradiction of earlier literature. Rather, the present study supports a more nuanced interpretation in which the preferred method depends on clinical setting, underlying risk structure, and the intended diagnostic objective (18,19).

From a practical standpoint, the results support a combined and context-sensitive approach to amniotic fluid assessment in high-risk pregnancies. AFI appears more suitable as the primary surveillance tool when the clinical aim is broad detection of pregnancies at increased risk of neonatal compromise, particularly when placental insufficiency, fetal growth restriction, or other diffuse high-risk conditions are suspected. SDP, however, offers valuable confirmatory information in cases that are borderline, equivocal, or discordant, especially when concern exists that quadrant summation may underestimate the relevance of a preserved isolated pocket or, conversely, when the presence of shallow widespread fluid may obscure local paucity. Accordingly, documenting both AFI and SDP whenever feasible may improve risk stratification and reduce overreliance on a single sonographic classification system.

Several limitations should be considered when interpreting these findings. First, the study was conducted at a single center, which may limit generalizability to other obstetric populations or practice settings. Second, the sample size, although adequate for a prospective comparative analysis, restricted detailed subgroup evaluation across specific maternal high-risk conditions and did not permit more complex stratified or multivariable modeling. Third, both AFI and SDP are operator-dependent ultrasound techniques, and some degree of measurement variability is unavoidable despite the use of trained sonographers and standardized scanning procedures. Fourth, the analysis focused on direct comparative performance and clinically relevant outcome associations rather than adjustment for confounding by disease severity or maternal comorbidity burden. These limitations do not negate the observed signal but indicate that larger multicenter studies with standardized interobserver assessment and condition-specific stratification are needed to refine method selection for particular high-risk subgroups (20).

Overall, the present study strengthens the evidence that AFI and SDP should be viewed as complementary rather than competing tools in the assessment of amniotic fluid volume in high-risk pregnancy. AFI appears to provide better overall sensitivity and closer association with neonatal compromise, whereas SDP contributes higher specificity and added interpretive value in discrepant cases. A clinically integrated approach that uses AFI for initial screening and SDP for clarification in ambiguous situations may therefore offer the most balanced strategy for obstetric decision-making in high-risk pregnancies.

CONCLUSION

In high-risk pregnancies, AFI demonstrated stronger overall association with adverse neonatal outcomes and higher sensitivity for detecting composite perinatal risk, whereas SDP provided greater specificity and meaningful complementary value in borderline and discordant cases. These findings indicate that neither method should be regarded as universally sufficient in isolation. AFI appears more suitable for primary screening and global assessment of fetal risk, while SDP is particularly useful when fluid distribution is uneven or classification remains uncertain. A combined interpretive strategy incorporating both measurements, rather than rigid dependence on a single sonographic threshold, may improve risk stratification and support more clinically informed obstetric management.

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