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COMPARISON OF SONOGRAPHIC AMNIOTIC FLUID INDEX AND SINGLE DEEPEST POCKET IN ANTENATAL PATIENTS FOR EVALUATING PERINATAL OUTCOMES

Obstetrics & Gynaecology

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ABSTRACT

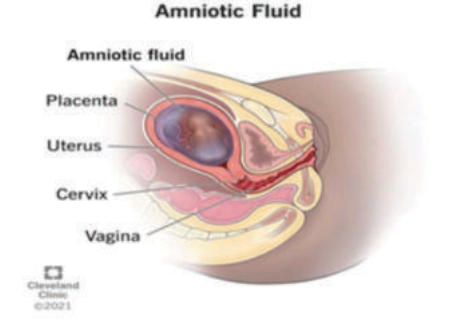
Background and Aims: Amniotic fluid assessment is vital in obstetric care for predicting perinatal outcomes. Two sonographic techniques—Amniotic Fluid Index (AFI) and Single Deepest Pocket (SDP)—are widely used, but their clinical utility remains debated. AFI may overdiagnose oligohydramnios, leading to more interventions, while SDP is considered more conservative. This study aimed to compare AFI and SDP in evaluating perinatal outcomes. **Methods:** A prospective observational study was conducted on 100 antenatal women at SRMS Institute of Medical Sciences, Bareilly. Participants were divided into two groups (AFI and SDP, 50 each). Outcome measures included mode of delivery, meconium-stained liquor, neonatal APGAR scores, and NICU admissions. Statistical significance was set at $p<0.05$. **Results:** AFI significantly overestimated oligohydramnios, leading to higher cesarean rates (68% vs. 56%),more number of obstetrical intervention like inductiof of labor , lower APGAR scores, and increased NICU admissions (26% vs. 10%) compared to SDP ($p<0.05$). SDP resulted in fewer unnecessary interventions while maintaining optimal neonatal outcomes. **Conclusion:** SDP is a more reliable method, reducing unnecessary interventions while maintaining favorable neonatal outcomes.

KEYWORDS

Amniotic Fluid Index, Single Deepest Pocket, Oligohydramnios, Perinatal Outcome, Ultrasonography

INTRODUCTION

Amniotic fluid (AF) plays a vital role in fetal development by providing a cushioning environment, facilitating biochemical exchanges, and preventing cord compression, thereby maintaining stable intrauterine conditions (1–3). Its volume varies throughout pregnancy, and accurate assessment is essential for guiding obstetric management and predicting perinatal outcomes (4).



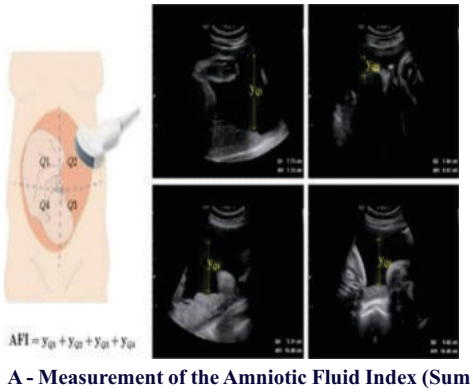
Ultrasound-based methods such as the Amniotic Fluid Index (AFI) and Single Deepest Pocket (SDP) are commonly used. AFI, introduced by Phelan et al. (1987) (3), measures the sum of the largest vertical pockets across four uterine quadrants. Though widely used, AFI has been linked to increased false-positive diagnoses of oligohydramnios and higher rates of interventions such as labor induction and cesarean section (5). SDP, recommended by RCOG and ACOG, assesses the single largest pocket free of fetal parts or umbilical cord (5–7), and is associated with fewer unnecessary interventions in low-risk pregnancies (7). However, it may miss subtle fluid variations (8). This study aims to compare AFI and SDP in predicting adverse perinatal outcomes to support evidence-based clinical decisions.

MATERIAL AND METHODS

This prospective observational study was conducted in the Department of Obstetrics and Gynaecology at SRMS Institute of Medical Sciences, Bareilly, over 18 months (May 2023 to October 2024). A total of 100 antenatal women between 28 weeks gestation and term with singleton pregnancies and intact membranes were enrolled. Participants were randomly allocated into two groups of 50 each: Group A (AFI) and Group B (SDP).

Inclusion criteria comprised normal AFI (5–25 cm), oligohydramnios (AFI <5 cm), and polyhydramnios (AFI >24 cm) confirmed on ultrasound. Exclusion criteria included twin pregnancies, PROM, Rh-immunization, early gestation, lactational amenorrhea conceptions, unwillingness to participate, and bad obstetric history.

Group A underwent AFI measurement (sum of deepest vertical pockets in four quadrants), while Group B underwent SDP measurement (single largest vertical pocket free of fetal parts/cord). All assessments were performed using the Voluson P8 BT 22 machine. Participants were followed until delivery, and perinatal outcomes were recorded.



Group A - Measurement of the Amniotic Fluid Index (Sum of All Quandrants)

Group B - Measurement of the Single Deepest Vertical Pocket

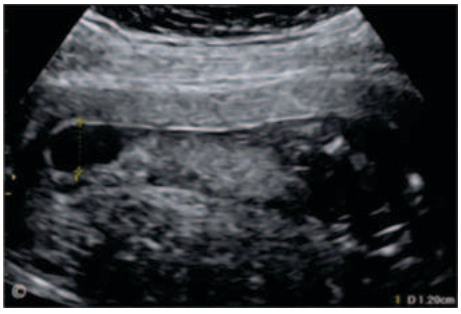


Figure 1 : Oligohydramnios Diagnosed by the Single Deepest Vertical Pocket Method.

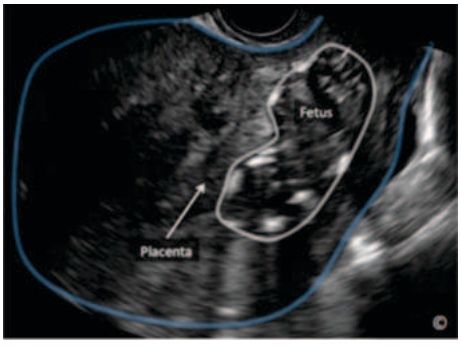


Figure 2 : Anhydramnios in a Fetus with Bilateral Renal Agenesis.

Figure 3 : Polyhydramnios

Ethical approval was obtained from the Scientific and Ethics Committee of SRMS Institute of Medical Sciences, Bareilly. Written informed consent was secured from all participants after explaining the study protocol. A pilot study on 10 patients (10% of the sample size) was conducted to assess feasibility, refine methodology, and ensure logistical adequacy.

Clinical parameters were selected based on expert input and established literature. As the study involved clinical and ultrasound assessments, Cronbach's alpha reliability was not applicable.

AFI (Group A) was measured by summing the deepest vertical pockets in four uterine quadrants, while SDP (Group B) involved measuring the single largest vertical pocket. All patients were followed through delivery. Perinatal outcomes assessed included gestational age at delivery, intrapartum fetal distress, mode of delivery, meconium-stained liquor, live birth or stillbirth, congenital anomalies, APGAR scores, birth weight, and NICU admission.

Data were analyzed using Microsoft Excel 2010 with appropriate statistical tests to evaluate the clinical relevance of AFI vs. SDP.

RESULTS

In our study,the majority of participants in both groups belonged to the 20-30 years age range and had gestational ages between 32-40 weeks. Socioeconomically, most participants belonged to the lower or lower-middle class, with no statistically significant difference observed across groups ($p>0.05$). This indicates that both study groups were demographically well-matched.

TABLE: 1 Distribution of Antenatal Women in Two Groups A and B Based on the Comparison of AFI vs SDP into Different Categories.

Parameter	Group A (AFI Assessment)	Group B (SDP Assessment)	Odd's Ratio	p-value
<5 cm (AFI) / <2 cm (SDP)	10 (20%)	6 (12%)	1.83	0.032
5-15 cm (AFI) / 2-4 cm (SDP)	37 (74%)	20 (40%)	4.27	0.001
15-25 cm (AFI) / 4-8 cm (SDP)	3 (6%)	18 (36%)	0.11	0.001
>25 cm (AFI) / >8 cm (SDP)	0 (0.0%)	6 (12%)	0.0	0.027

Table 2: Distribution of the Antenatal Women into Two Groups A and B Based on the Liquor Assessment.

Liquor Volume	Group A (AFI Assessment)	Group B (SDP Assessment)	p-value
Polyhydramnios (increased volume)	0 (0.0%)	6 (12.0%)	0.0079
Oligohydramnios (decreased volume)	10 (20.0%)	6 (12.0%)	
Normal volume	40 (80.0%)	38 (76.0%)	
Total	50 (100.0%)	50 (100.0%)	

Table: 3 Comparison of Delivery Mode, Liquor Status, Amnioinfusion, and Birth Weight in Both Groups

Parameter	Group A (AFI Assessment)	Group B (SDP Assessment)	p-value
Mode of Delivery			
Spontaneous Vaginal Delivery	5 (10%)	10 (20%)	0.034
Induced Vaginal Delivery	11 (22%)	12 (24%)	
Total Vaginal Deliveries	16 (32%)	22 (44%)	
Cesarean Section (Non-Reassuring Fetal Status)	24 (48%)	15 (30%)	0.004
Cesarean Section (Other Reasons)	10 (20%)	13 (26%)	
Total Cesarean Deliveries	34 (68%)	28 (56%)	
Liquor Status			
Clear Liquor	28 (56%)	31 (62%)	0.086
Meconium-Stained Liquor	19 (38%)	14 (28%)	
Blood-Stained Liquor	1 (2%)	1 (2%)	
Amnioinfusion Performed (Meconium Cases)			
Yes	7 (14%)	8 (16%)	0.124
No	43 (86%)	42 (84%)	
Birth Weight (kg)			
<1.5 kg	3 (6%)	1 (2%)	0.673
1.5 - 2.5 kg	21 (42%)	25 (50%)	
2.5 - 3.5 kg	24 (48%)	23 (46%)	
>3.5 kg	2 (4%)	1 (2%)	
Total	50 (100%)	50 (100%)	

Table: 4 Comparison of APGAR Scores and NICU Admission Between Group A (AFI) and Group B (SDP)

Parameter	Group A (AFI Assessment)	Group B (SDP Assessment)	Total	Odds Ratio	p-value
APGAR Score at 1 Minute					
Low (≤7)	18 (36%)	10 (20%)	28 (28%)	4.16	0.028
Normal (8–10)	32 (64%)	40 (80%)	72 (72%)		
APGAR Score at 5 Minutes					
Low (≤7)	13 (26%)	4 (8%)	17 (17%)	4.04	0.017
Normal (8–10)	37 (74%)	46 (92%)	83 (83%)		

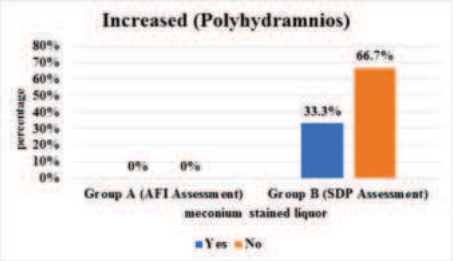


Figure 4: Distribution of Antenatal Women with Increased Liquor Having Meconium Stained Liquor During Intra Partum Assessment in Both Groups A and B

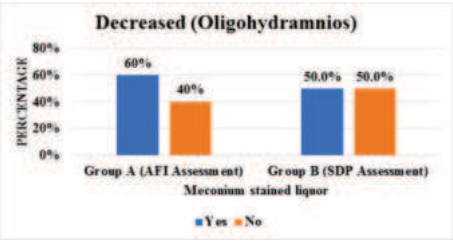


Figure 5: Distribution of Antenatal Women with Decreased Liquor Having Meconium Stained Liquor During Intra Partum Assessment in Both Groups A and B

Figure 6: Distribution of Antenatal Women with Normal Liquor Having Meconium Stained Liquor During Intra Partum Assessment in Both Groups A and B

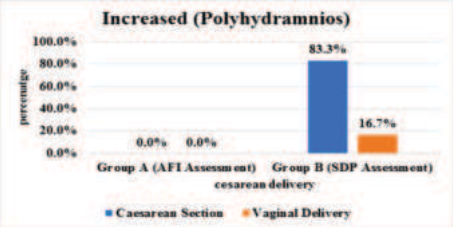


Figure 7 : Distribution of Antenatal Women with Increased Liquor With Caesarean Section Delivery in Both the Groups A and B

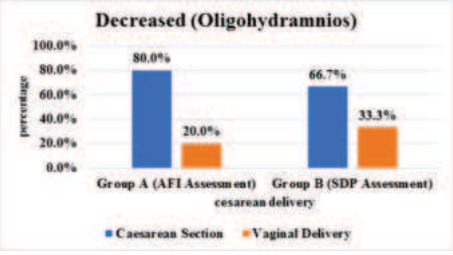


Figure 8: Distribution of Antenatal Women with Decreased Liquor With Caesarean Section Delivery In Both The Groups A And B

Figure 9: Distribution Of Antenatal Women With Normal Liquor With Caesarean Section Delivery in Both the Groups A and B

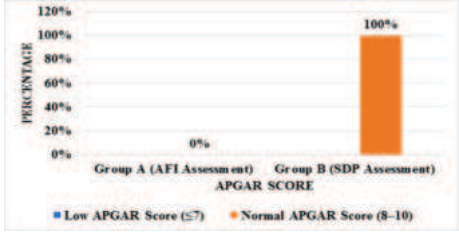


Figure 10: Distribution of Antenatal Women with Increased Liquor had Low APGAR in Both Groups A and B

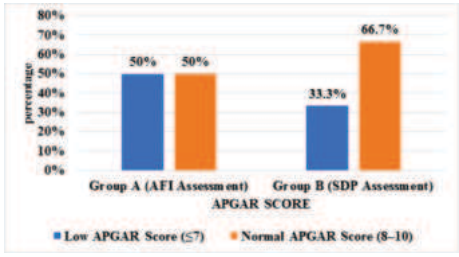


Figure 11: Distribution of the Antenatal Patients with Decreased Liquor Having Low APGAR Score in Both the Groups A and B

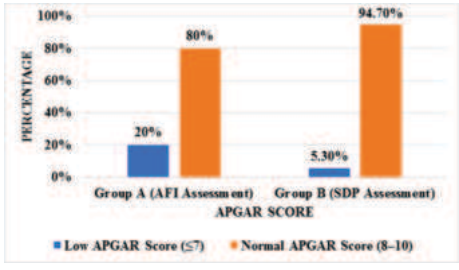


Figure 12: Distribution of Antenatal Women with Normal Liquor had Low APGAR in Both Groups A and B

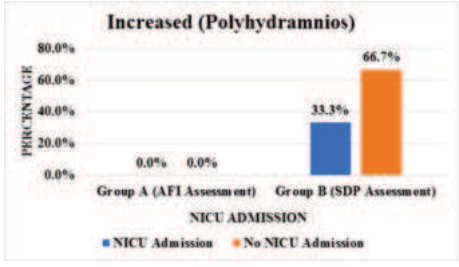


Figure 13: Distribution of Antenatal Women with Increased Liquor Having NICU Admission in Both Groups

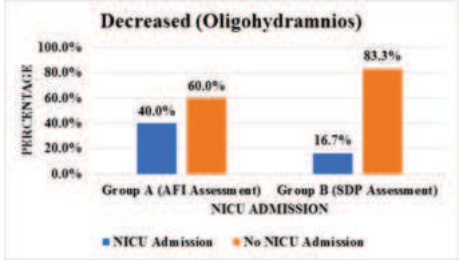


Figure 14: Distribution of Antenatal Women with Decreased Liquor Having NICU Admission in Both Groups

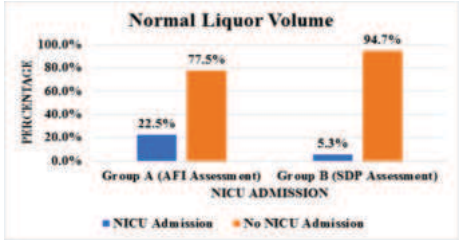


Figure 15: Distribution of Antenatal Women with Normal Liquor Having NICU Admission in Both Groups

DISCUSSION

Our study compared AFI and SDP in assessing amniotic fluid volume and their influence on perinatal outcomes. The age and gestational profiles were comparable between groups ($p>0.05$), aligning with findings from Moses et al. (2004) and Kehl et al. (2016) who reported slightly higher maternal ages and gestational weeks (9,10).

AFI overdiagnosed oligohydramnios (20%) more than SDP (12%), with polyhydramnios observed only in SDP (12%) ($p=0.0079$). This supports Nabhan et al. (2008), who found AFI significantly overdiagnosed oligohydramnios (RR 2.39, CI 1.73–3.28) (11), and Rosati et al. (2015), who linked AFI to unnecessary inductions (12).

Vaginal deliveries were significantly higher in the SDP group (44% vs. 32%; $p=0.034$), while cesarean rates were greater in the AFI group (68% vs. 56%; $p=0.004$), similar to Kehl et al. (2016) and Hansadah et al. (2017) (10,13).

Non-reassuring fetal status was higher in AFI (16%) than SDP (10%) ($p=0.046$). Meconium-stained liquor was more frequent in AFI (38% vs. 28%), though not statistically significant. Prior studies by Rutherford et al. (1987), Sarno et al. (1989), and Gunasingha et al. (2022) have similarly linked AFI to fetal distress but varied on meconium-stained liquor risk (4,8,14).

Low APGAR scores at 1 and 5 minutes were significantly more in the AFI group (36% and 26%) compared to SDP (20% and 8%) ($p=0.028$, $p=0.017$). NICU admissions were also higher in AFI (26% vs. 10%) ($p=0.037$). Moses et al. (2004) and Chauhan et al. (1995), however, found no significant difference in APGAR scores between methods (9,15).

Low birth weight was slightly higher in SDP (50%) vs. AFI (42%) but not statistically significant. Similar findings were reported by Gunasingha et al. (2022) and Kehl et al. (2016) (10,14).

CONCLUSION

We concluded that Single Deepest Vertical Pocket (SDP) is a more reliable method than Amniotic Fluid Index (AFI) for assessing amniotic fluid. AFI tended to overestimate oligohydramnios, resulting in more interventions, including cesarean deliveries and NICU admissions. SDP offered a more accurate evaluation, reducing unnecessary interventions while maintaining favorable perinatal outcomes.

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Ethical Approval: Obtained.
Consent: Written consent secured.

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