European Journal of Molecular & Clinical Medicine

ISSN 2515-8260 Volume 07, Issue 08, 2020

# A Potential Association of Neonatal Outcome in Comparison Between Amniotic Fluid Index and Deepest Vertical Pocket in Supine and Left Lateral Position

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***ABSTRACT***

***BACKGROUND:The amniotic fluid plays an important role in fetal growth. Measurement of amniotic fluid volume can be made directly, indirectly, or estimated sonographically. Thetwo standardmethods of sonographic evaluation of amniotic fluid volume are single deepest pocket (SDP), and amniotic fluid index (AFI). We aimed to compare different methods of measuring AFI for increasing its accuracy and, subsequently neonatal outcome.***

***METHODS: A cross-sectional study was conducted at the Obstetric and gynecological departmentfrom May 2019 to February 2020. The study included 80 pregnant women (18-35) years old whose gestational age before 24 weeks of gestation and not hypertensive or diabetic. Women were assigned to AFI or SVDP measurement for estimation of amniotic fluid volume in lateral decubitus Position at 36 weeks, thenfollow-up measurements of AFI and SVDP were performed at 38 – 40 weeks of gestation at both postures.***

***RESULTS: At 36 weeks of gestation, there was a statistically significant increase in AFI and VDP values on maternal change position from supine to lateral decubitus.Also, a similar significant increase in AFI and VDP values on changing maternal position at 38-40 weeks of gestation.There was a significant increase in AFI values with the progress of gestation age at the supine position. Without significant difference at lateral decubitus position, but there was a significant increase in VDP values with the progress of gestation age at both positions.There was a significant negative correlation between AFImeasured on lateral decubitus position at 36 weeks and incidence of AF-stained meconium and need for NICU admission alsothe incidence of respiratory distress as well as there was a significant negative correlation between all VDP values and need for NICU admission and the incidence of respiratory distress.***

***CONCLUSION:We concluded that the VDP method is the favorable method to estimate amniotic fluid volume.***

***Keywords: AFI, amniotic fluid index, SVDP, pregnancy outcome, maternal position.***

## 1. Introduction

Amniotic fluid plays a vital role in fetal growth and serves several important functions during intra-uterine life as it surrounds the developing embryo through gestation, and it protects the

fetus and umbilical cord from trauma while allowing mobility to facilitate structural growth and development**[1].**

The evaluation of amniotic fluid volume is important during the routine ultra-sound evaluation of the fetus because variations above or below normal are associated with increase perinatal mortality and morbidity **[2-3].**

The quantity of amniotic fluidcan be measured by ultra-sound, including amniotic fluid index and vertical deepest pocket**[4].**Ultrasound provides us with a non-invasive and safe assessment of the amniotic fluid volume. The direct methods like dye dilution techniques and measurement of amniotic fluid volume at delivery are more accurate, but they are invasive and carry lit t le clinical significance. AFI and DVP are the most commonly used clinical tools for the assessment of amniotic fluid.

The amniotic fluid index is measured by dividing the uterine cavity into four equal quadrants by two imaginary lines perpendicular to each other and summation of the vertical diameter of thelargest pocket in each of the four quadrants, excluding fetal limbs or umbilical cord loops. Normally amniotic fluid index (5-25) cm **[4].**

The vertical deepest pocket is measured by identifying the largest pocket of amniotic fluid and taking her largest vertical measurement. Normally the vertical deepest pocket (2-8) cm**.**

Oligohydramnios correlates with amniotic fluid index less than 5 cm, vertical deepest pocket 2cm or less; Polyhydramnios correlates with an amniotic fluid index more than 24 cm, vertical deepest pocket 8 cm or more **[5-6].**To increase the accuracy of the amniotic fluid index, we theorize that maternal position changemight affect the amniotic fluid position (as it increases fetal urination), which would increasethe visual of amniotic fluid as well, and its relation to neonatal outcome **[7].**

The purpose of this study was to compare different methods of measuring amnioticfluid index for increasing its accuracy and, subsequently, neonatal outcome.

## 2. Patients and Methods

### 2.1.1. Research Design:

This was a cross-sectional prospective comparative study

**Administrative Design**:

This study was conducted at the Obstetric and gynecological department at the Faculty of Medicine, Zagazig University, in the period from May 2019 to February 2020.

Approval was obtained from the departmentof anesthesia & surgical intensive care and theInstitutional Review Board (IRB) at the Facultyof Medicine, Zagazig University. The workhas been carried out following TheCode of Ethics of the World MedicalAssociation (Declaration of Helsinki) forstudies involving humans.

**Written Informed Consent**:

Written informed consent was obtainedfrom all the patients' guardians**.**

### 2.1.2. Patients

This study included 80 pregnant women who were attending antenatal care at the outpatient clinic at the Obstetric and gynecological Zagazig University hospitals. All the women participating in this study were selected according to the following criteria:

### 2.1.3. Inclusion Criteria:

The Pregnant women (18-35) years old whose gestational age was confirmed by Ultrasound before 24 weeks of gestation and last menstrual period with Cephalic baby, not hypertensive or diabetic, singleton Pregnancy, or uncomplicated Pregnancy

### 2.1.4. Exclusion Criteria:

Pregnant women with multifetal pregnancy or have an underlying disease. A pregnant woman, her baby, has a fetal anomaly and hasmaternal or fetal complications as well as who has any known chronic maternal illness and intra-uterine growth restriction.

### 2.2. Methods:

**Full Medical History:**

Personal history as Name, Age, occupation, address, special habits, parity, No. of kids,etc Historyof parity, complications of pregnancy, or any medical disease can cause bleeding tendency.

### 2.2.1. Menstrual and Obstetric and history:

Age of menarche and Last menstrual period also Gravidity, parity, and pregnancy outcomes along with any complication during pregnancy, labor, or puerperium.

### 2.2.2. Full General Examination:

Including cardiological, chest, abdominal, and monitoring vital data (heart rate, systolic and diastolic blood pressure).

### 2.2.3. Obstetrical Examination:

Included Fundal level to correlate with GA, obstetric grip (fundal grip, umbilical grip, firstpelvic grip, and second pelvic grip and also obstetric Ultrasound for viability, fetal biometry,placentation, presentation, and position.

### 2.2.4. Ultrasonography Examination:

Ultrasonographic examination at 22 – 26 GA was done by one investigator using AB 2-7 Convexabdominal probe on Voluson 730 Pro Machine (**Ge Healthcare, Austria**).The examination included the Biometric measurements: to assess gestational age, fetal growth, andexpected fetal weight. Along withthe exclusion of fetal, umbilical, or placental anomalies.

### 2.2.5. Routine Preoperative Investigations:

The following laboratory investigations for all participants in the study; complete blood picture (CBC), random blood sugar, kidney function tests (Bl. Urea and S. Cr), liver function test (S. AST, S. ALT, S. albumin, Total bilirubin). Patients with abnormal kidney or liver functions or hidden general chronic medical diseases were excluded.

### 2.2.6. Assessment of Amniotic Fluid Volume at Supine Position at 36 weeks

#### 2.2.6.1. Amniotic Fluid Index

Amniotic Fluid Index was measured by placing the women in the supine position. The uterine cavity was divided into four quadrants. In each quadrant, the deepest, unobstructed, clear pocket of amniotic fluid was measured. The four measurements are added together, and the

sum represents the AFI.Values of Amniotic Fluid Index (cm) if <5 considered Oligohydramnios, between 5 and 8 is decreased Amniotic Fluid. While the range between 8.1 to 18 isnormal. But >18 is known asPolyhydramnios.

**2.2.6.2.Single Vertical Deepest Pocket:**

The ultrasound scan for measurement of AFV was performed with the patient in the supine position. The probe was held longitudinally and placed perpendicular to the examination tableon which the patient was lying. The probe was placed on all parts of the uterus until the deepestpocket of amniotic fluid was detected. The pocket must be free of any fetal part or umbilicalcord. By placing the electronic calipers in the upper and lower margins of the deepest pocket,the depth of the pocket was measured.

**2.2.7. Assessment of Amniotic Fluid Volume at lateral decubitus Position at 36 weeks**

After all sonographic examinations were performed in a semi-supine maternal position, themothers were instructed to lie and rest in the left lateral position for at least 1 hour. The motherswere, however, encouraged to keep the position for 2 hours. Any intake of foods or fluids wasavoided until the sonographic examination was repeated.

**2.2.8. Follow up measurement at 38 – 40 weeks**

Follow-up measurements of AFI and SVDP were performed at 38 – 40 weeks of gestation atboth supine and lateral decubitus positions.

**2.2.9. Assessment of Pregnancy Outcome:**

Assessment of Gestational age at the time of delivery, mode of delivery, meconium staining of amniotic fluid or not, birth weight, fetal respiratory distress, newborn examination for Apgar score at first & fifth minute neonatal, also ifneonatal admission to intensive care unit and perinatal death.

**2.2.10. Statistical Analysis**

Data were checked, entered, and analyzed using SPSS version 23 for data processing. Thefollowing statistical methods were used for the analysis of the results of the present study. Data wereexpressed as number and percentage for qualitative variables and mean + standard deviation(SD) for quantitative ones.Categorical data were compared using chi-square and calculated.The significance level was considered at P-value <0.05 for chi-square and when CI of OR notincluding 1 in its range.

## 3. RESULTS

The women age who participated in the study ranged between 18 to 35 years old, with a mean maternal age of 25.3 ± 4.03 years. Gravidity ranged between 2 – 3 times with a mean value of 2.35 ±0.48, while parity was ranging between 1 – 2 times with a mean value of 1.35 ± 0.48.According to the Amniotic fluid index at 36 weeks of gestation, there was a statistically significant increase in AFI values on maternal change position from supine to lateral decubitus with a p-value: <0.001 **(Table 1).** Also, a similar significant increase in AFI values on changing maternal position at 38-40 weeks of gestation with p-value: <0.001 **(Figure**

**1).**There was a significant increase in AFI values with the progress of gestation age at the supine position with p-value: 0.001 and 0.015, respectively. While no significant difference was observed at lateral decubitus position with a p-value: 0.101 **(Figure 2)**

According to the vertical deepest pocket at 36 weeks of gestation, there was a statistically significant increase in VDP values on maternal change position from supine to lateral decubitus with a p-value: 0.024. Also, a similar significant increase in VDP values on changing maternal position at 38 -40 weeks of gestation with p-value: <0.001 **(Table 2)(Figure 3).**There was a significant increase in VDP values with the progress of gestation age at both supine and lateral decubitus positions with p-value: 0.001 and 0.015, respectively **(Figure 4).**

According to maternal and fetal pregnancy outcomes, **(Table 3)** summarize the results and demonstrate a correlation between pregnancy outcomes and Amniotic fluid values measured at 36 and 38 - 40 weeks of gestation as there was a significant negative correlation between AFI measured on lateral decubitus position at 36 weeks and incidence of AF-stained meconium. Also, there was a significant negative correlation between AFI index measured on supine position and lateral decubitus position at 36 weeks and need for NICU admission and incidence of respiratory distress. There was a significant negative correlation between all VDP values and the need for NICU admission and incidence of respiratory distress.

## 4. DISCUSSION

Amniotic fluid volume is ultimately a gauge of fetal health, and there is no clear consensus on the best method to assess amniotic fluid adequacy. Assessing AFV during a sonographic examination for fetal anatomy and growth provides physicians with important information concerning fetoplacental functions as well as the structural integrity of the fetus **[8].**

Abnormally high or low amniotic fluid volumes have been shown to predict poor fetal outcomes; therefore, a normal amount of amniotic fluid volume is crucial to the healthy development of the fetus or embryo. So, amniotic fluid volume estimation has become an integral part of fetal evaluation **[9].**

Our results were in agreement with**Ülker et al.,[10]**who reported in their study on Fifty-four pregnant women with a normal amniotic fluid volume with gestational age between 26 and 40 weeks, that there was a statistically significant difference between AFI in the supine position and AFI in Lateral decubitus position. Also, they found that the mean initial and posttest fetal urine production rates were 73.7 ± 66.8 and 151.8 ± 119.9 mL/h, indicating a significant increase in the fetal urine production rate on change position from supine to lateral decubitus position ($P < 0.05$).

Regarding the effect of gestational age on AFI, our findings were in agreement with**Hebbar et al., [11]**by who found in their prospective estimation of AFI that was done in 50healthy pregnant women from 34 to 40 weeks at weekly intervals, that the AFI values differedthroughout the gestation and there was a gradual decline in the values as pregnancy advanced.And reported that amniotic fluid volume gradually increases till 32–34 weeks of gestation andthereafter there is a gradual reduction till term. Also, in agreement with these findings wereKhadilkar **et al., [12]; Hinh and Ladinsky, [13]; Machado et al., [14]and Singh et al., [15]**as they reported that from 34 weeks onward there is a gradual fall in AFI values.

Regarding the effect of gestational age on VDP, our findings were in agreement with **Rashid, [16]**who reported in their study on 744 pregnant women to assess amniotic fluid volume using the single deepest pocket technique in Bangladesh, and reported that at 16 weeks, gestational age mean SDP is 3 ± 0.33 cm (SD), at 20 weeks it is 4.2 ± 0.67 cm, at 26 weeks it is 5.2 ± 1.21 cm, and at 40 weeks it is 4.4 ± 1.78 cm and concluded that the SDP is maximum at26 weeks of gestational age, and then it gradually decreases up to the term.

Regarding maternal outcomes, our findings were in agreement with **Nabhan and Abdelmoula, [17]** who reported in their meta-analysis on four trials (3125 women) that the use of the AFI led to more diagnoses of Oligohydramnios, more inductions of labor, and cesarean deliveries for fetal distress without improving perinatal outcome. In contrast, the SDVP measurement appears to be the more appropriate method for assessing AFV during fetal surveillance.

Similar findings were reported by **Mukhopadhyay et al., [18]**in their study on hundred pregnant women at >28 weeks gestation that SDVP is a better choice for determining amniotic fluid to avoid unnecessary interventions without any significant improvement in peripartum outcome measures as the use of the AFI increases the rate of diagnosis of Oligohydramnios and consequently the rate of intervention in pregnancy without any significant improvement in peripartum morbidity.

**Kehl et al., [4]**reported in their multicenter randomized controlled trial including 1052 pregnant women with a term singleton pregnancy that the use of the AFI method in routine obstetric assessment resulted in more women being diagnosed with Oligohydramnios and being induced for an abnormal amniotic fluid volume without improving the perinatal outcome. The SDP method is therefore the favorable method to estimate amniotic fluid volume, especially in a population with many low-risk pregnancies.

## 5. CONCLUSION

From the results of this study, we can conclude that the VDP method is the favorable method to estimate amniotic fluid volume.

## DECLARATION OF INTEREST

The authors report no conflicts of interest. The authors alone are responsible for the content and writing of the paper.

## FUNDING INFORMATION

None declared

## REFERENCES

1. **Magann, E.F., Sandlin, A.T. and Ounpraseuth, S.T.** Amniotic Fluid and the Clinical Relevance of the Sonographically Estimated Amniotic Fluid Volume. Journal of Ultrasound in Medicine. 2011; 30: 1573-1585.
2. **Morris, R. K., Meller, C. H., Tamblyn, J., Malin, G. M., Riley, R. D., Kilby, M. D., & Khan, K. S.** Association and prediction of amniotic fluid measurements for adverse pregnancy outcome: systematic review and meta-analysis. BJOG: An International Journal of Obstetrics &Gynaecology. 2014; 121(6), 686-699.

3. **YAZSI, A**. The relation of intrapartum amniotic fluid index to perinatal outcomes. Kafkas J Med Sci, 2011; 1(1): 1-7.
4. **Kehl, S., Schelkle, A., Thomas, A., Puhl, A., Meqdad, K., Tuschy, B., &Sütterlin, M.** Single deepest vertical pocket or amniotic fluid index as evaluation test for predicting adverse pregnancy outcome (SAFE trial): a multicenter, open label, randomized controlled trial. Ultrasound in Obstetrics & Gynecology.2016; 47(6), 674-679.
5. **Silver, R. I., & Coleman, B. G.** Chapter 71 - Obstetric Ultrasound: Second-Trimester Imaging. In E. S. Pretorius & J. A. Solomon (Eds.), Radiology Secrets Plus (Third Edition). 2011, 503-509. Philadelphia: Mosby.
6. **Hamza, A., Herr, D., Solomayer, E. F., & Meyberg-Solomayer, G.** Polyhydramnios: Causes, Diagnosis and Therapy. Geburtshilfe und Frauenheilkunde.2013; 73(12), 1241-1246.
7. **Ulker, K., Temur, I., Karaca, M., Ersöz, M., Volkan, I., &Gül, A.** Effects of maternal left lateral position and rest on amniotic fluid index: a prospective clinical study. The Journal of reproductive medicine, 2012, 57.(5-6): 270-276.
8. **Coombe-Patterson J**. Amniotic Fluid Assessment: Amniotic Fluid Index Versus Maximum Vertical Pocket. Journal of Diagnostic Medical Sonography. 2017;33(4):280-283. doi:10.1177/8756479316687269
9. **Fitzsimmons ED.,&Bajaj T**. Embryology, Amniotic Fluid. [Updated 2020 Jul 1]. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2021 Jan-. Available from: https://www.ncbi.nlm.nih.gov/books/NBK541089/
10. **Ülker K, Çeçen K, Temur İ, Gül A, Karaca**M. Effects of the maternal position and rest on the fetal urine production rate: a prospective study conducted by 3-dimensional sonography using the rotational technique (virtual organ computer-aided analysis). J Ultrasound Med. 2011 Apr;30(4):481-6..
11. **Hebbar S, Rai L, Adiga P, Guruvare S.** Reference ranges of amniotic fluid index in late third trimester of pregnancy: what should the optimal interval between two ultrasound examinations be? J Pregnancy. 2015;2015:319204**.** .
12. **Khadilkar, S. S., Desai, S. S., Tayade, S. M., &Purandare, C. N.** Amniotic fluid index in normal pregnancy: an assessment of gestation specific reference values among Indian women. Journal of obstetrics and gynaecology research. 2003; 29(3), 136-141.
13. **Hinh, N. D., &Ladinsky, J. L.** Amniotic fluid index measurements in normal pregnancy after 28 gestational weeks. International Journal of Gynecology & Obstetrics 2005; 91(2), 132-136.
14. **Regina Machado, M., Guilherme Cecatti, J., Krupa, F., &Faundes, A**. Curve of amniotic fluid index measurements in low-risk pregnancy. Acta obstetricia et gynecologicaScandinavica. 2007; 86(1), 37-41.
15. **Singh, S. N., Srivastava, R., Singh, A., Tahazzul, M., Kumar, M., Kanta, C., & Chandra, S.** Respiratory distress including meconium aspiration syndrome in vigorous neonates born through meconium-stained amniotic fluid: incidence, onset, severity and predictors at birth. The Indian Journal of Pediatrics. 2013; 80(7), 538-543.
16. **Rashid SQ.** Amniotic Fluid Volume Assessment Using the Single Deepest Pocket Technique in Bangladesh. Journal of Medical Ultrasound. 2013; 21; 202-206.

17. **Nabhan, A. F., &Abdelmoula, Y. A.** Amniotic fluid index versus single deepest vertical pocket as a screening test for preventing adverse pregnancy outcome. Cochrane Database of Systematic Reviews2008; (3).
18. **Mukhopadhyay B, Ahmad SN, Shefali Agarwa S.**: Evaluation of feto-maternal outcome using AFI and SDVP for amniotic fluid assessment; Which is a better method? Int J Reprod Contracept Obstet Gynecol. 2017; 6; 7:3109-3112.