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Investigation of the Sonographic Association between Amniotic Fluid Volume and Fetal Movements in the Third Trimester of Pregnancy: A Cross-sectional Study

Bilal Bashir[1], Dr. Sunil Kumar[2], Dr. Renuka Kattimani[3], Muhammad Asad Akhlaq[4], Abdullah Amir[5], Abdulrazaq Zubair[6], Ayesha Momin[7], Noor Fatima[8]

[1]University of Electronic Science and Technology of China (UESTC), Chengdu, Sichuan, China
[2]Associate Professor, Dept.of General Surgery, AIIMS Bibinagar, Hyderabad Metropolitan Region-Telangana, India, Orcid Id- 0000-0002-9148-2660
[3]Assistant Professor, Dept.of Ophthalmology, ESIC Medical College, Kalaburagi, Karnataka, India, Orcid Id -0000-0001-8594-4585
[4]Sharif medical and dental college lahore
[5]University of saskatchewan, Canada
[6]Medical Radiography Department, Federal University Dutsinma, Nigeria
[7]Department of Research, Medical Research Circle, Bukva, DR Congo
***Corresponding Author:**
Abdullah Amir
Email ID: Abdullahamir1481@gmail.com

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ABSTRACT

Background and Aim: Amniotic fluid volume (AFV) dynamics and foetal movements are crucial throughout the third trimester of pregnancy, a crucial time for foetal development. Comprehending the correlations among these variables and their influence on the health of both the mother and the foetus is crucial for efficient prenatal care.

Methods: Using ultrasound, 140 pregnant women in the third trimester were evaluated in order to measure AFV, evaluate foetal movements, and gather pertinent information. ANOVA, t-tests, and chi-square tests were among the statistical techniques used to examine the connections between AFI, maternal nutritional status, foetal movement intensity, and gestational age.

Results: The results corroborate the known relationship between gestational age and AFV, showing that higher gestational ages have a beneficial effect on amniotic fluid levels. Interestingly, a two-way link between foetal movements and amniotic fluid volume (AFV) was found, suggesting that foetal activity may have an impact on the dynamics of amniotic fluid. The impact of mother nutritional status on AFV was shown to be significant, highlighting the significance of maternal health throughout pregnancy. Our research, however, indicated a contradiction concerning the number of foetal movements and their effect on AFI, indicating the necessity for additional study.

Conclusion: The study has validated the reciprocal association between foetal movements and amniotic fluid as well as the impact of gestational age on amniotic fluid content. According to the study, AFV rises with gestational age. Foetal motions were found to have a substantial positive connection with AFV, indicating that they could be a valuable indicator of AFV status. Furthermore, the significance of maternal nutrition during pregnancy was highlighted by the fact that participants with normal nutritional status were more likely to have appropriate AFV.

Keywords: *Amniotic fluid volume, Fetal Movement, Third trimester, Gestational age, Ultrasonography*

1. INTRODUCTION

Amniotic fluid is a clear, slightly yellow, multifunctional medium that envelops the fetus within the amniotic sac and sustains a stable intrauterine environment. It cushions the fetus against external trauma and prevents umbilical cord compression, while its bacteriostatic properties help protect against infection [1, 2]. By providing nutrients and creating a buoyant space for foetal movement, amniotic fluid facilitates neuromusculoskeletal maturation and prevents pressure injuries [3]. It is also indispensable for foetal pulmonary and gastrointestinal tract development [4]. Clinically, sonographic estimation of amniotic fluid volume serves as a vital component of fetal well-being assessment [4, 5]. Deviations from normal fluid levels often

arising from deregulation within the maternal fetal placental triad are linked to adverse perinatal outcomes in the third trimester[3]. Abnormalities such as oligohydramnios or Polyhydramnios may signal underlying maternal or fetal complications and are associated with increased risk of adverse pregnancy outcomes [2, 3, 4]. Ultrasound is the standard method for assessing amniotic fluid volume, most commonly through the Amniotic Fluid Index (AFI).

Maternal perception of decreased fetal movements (FMs) including kicks, rolls, and stretches is a frequent cause of antenatal clinic and delivery-room visits and a well-established marker of fetal well-being [6, 12]. Normally, foetal movements follow a predictable pattern, particularly in the third trimester, but several studies have demonstrated that a reduction or cessation of these movements is associated with adverse pregnancy outcomes and heightened perinatal morbidity and mortality [6, 7, 8]. Specifically, diminished foetal movements have been linked to placental insufficiency, preterm delivery, low birth weight (< 2500 g) [8], small for gestation infants, congenital anomalies, respiratory distress, and neonatal hypoglycemia [9, 10]. Such findings underscore the need for prompt evaluation whenever reduced foetal movements are reported.

Understanding the association between amniotic fluid volume and fetal movement is essential for timely detection of potential complications [11, 14]. These two parameters may influence each other, and their combined assessment can enhance the accuracy of prenatal evaluations [14, 15]. This study aims to explore the relationship between amniotic fluid volume and fetal movements in the third trimester of pregnancy, while also considering the impact of maternal nutritional status and gestational age.

2. MATERIALS AND METHODS

Study Design and Sampling Technique

This cross-sectional study was conducted over a seven-month period at the Ultrasound Lab of a Tertiary Care Hospital in DR. Congo from May 2024 to November 2024. A total of 140 pregnant women in their third trimester were included using a convenient sampling technique. The study focused on evaluating the relationship between amniotic fluid volume and fetal movements during late pregnancy using sonographic assessment.

Inclusion and Exclusion Criteria

Participants were selected based on clearly defined inclusion and exclusion criteria. Pregnant women in their third trimester, regardless of age, who presented for routine obstetrical ultrasound were eligible for inclusion. Exclusion criteria included cases of multiple gestation, intrauterine fetal anomalies, fetal demise, ruptured membranes, placental abruption, or gestational hypertension, as these conditions could confound the relationship between amniotic fluid volume and fetal activity.

Imaging Protocol

Ultrasound examinations were performed using a TOSHIBA XARIO (SSA-660A) machine equipped with a 3–5 MHz convex transducer. A transabdominal approach was employed, with participants positioned supine during the scan to facilitate optimal image acquisition. Standardised sonographic techniques were used to assess amniotic fluid volume and fetal movements, ensuring consistency across all evaluations.

Data Collection

Following ethics committee permission from the hospital, patients were selected for the study according to predetermined inclusion and exclusion criteria. Every participant gave their informed consent, attesting to their knowledge of the study's possible advantages and anticipated dangers. Basic clinical and demographic data were directly entered by the researcher on a pre-made data collecting sheet. The Toshiba Xario Prime ultrasound machine was used to examine individuals in the third trimester of pregnancy utilising a transabdominal technique as part of the data gathering method. In order to guarantee adequate penetration and resolution, an abdomen convex transducer operating at 3 to 5 MHz was employed. On an examination table, patients were placed supine and given a small amount of gel to the abdomen to help transmit sound waves. The study included all patients scheduled for obstetrical ultrasonography in the third trimester. Accurate patient data, such as the volume of amniotic fluid and foetal movements, were documented during the examination procedure.

Statistical Analysis

For analysis, the gathered data were loaded into SPSS (version 27). The study sample's characteristics, such as the count of foetal movements, the strength of the movements, the assessment of the amniotic fluid index (AFI), the mother's nutritional state, and the gestational age, were summarised using descriptive statistics. These statistics provided a detailed summary of the third trimester pregnancy profiles of the participants. To examine the relationships between AFI, foetal movement count, and intensity, chi-square tests were employed. The findings of the chi-square tests showed that there were significant relationships between AFI and the quantity (Pearson Chi-Square = 26.933, p <.001) and intensity (Pearson Chi-Square = 15.711, p =.003) of foetal movements. Additionally, a highly significant link was found when the nutritional status of mothers was analysed in relation to AFI (Pearson Chi-Square = 79.172, p <.001). The findings emphasise how important AFI monitoring is for prenatal treatment and how it relates to the dynamics of foetal movement in the third trimester.

3. RESULTS

Table 1 presents the distribution of gestational age in weeks for the study population, with the frequency and percentage of occurrences for each gestational age group. Ranging from 24.00 to 39.00 weeks, with frequencies varying from 1 (0.7%) at 24.00 weeks to 22 (15.7%) at 35.00 weeks. The total number of subjects is 140, and the percentages represent the proportion of subjects in each gestational age category relative to the total sample. The mean maternal age is 26.61 years old, with a standard deviation of 2.75 years.

Table 1. Gestational Age Distribution

Gestational Age	Frequency	Percent
24.00	1	0.7
29.00	5	3.6
30.00	7	5.0
31.00	10	7.1
32.00	16	11.4
33.00	20	14.3
34.00	21	15.0
35.00	22	15.7
36.00	10	7.1
37.00	9	6.4
38.00	9	6.4
39.00	10	7.1
Total	140	100.0

Table 2 presents the distribution of fetal movement assessments and maternal nutritional status across three categories of Amniotic Fluid Index (AFI): Adequate, Oligohydramnios, and Polyhydramnios. Subjects were classified based on their AFI into: Adequate (normal range of amniotic fluid), Oligohydramnios (reduced amniotic fluid), and Polyhydramnios (excess amniotic fluid). The Intensity of Fetal movements were categorized into Normal, Strong, and Weak, with a statistically significant difference observed in movement intensity among the AFI groups ($p = 0.003$). The frequency of fetal movements was recorded, with counts presented as 0.00, 1.00, 2.00, and 3.00; significant differences in their distribution across AFI groups were identified ($p = 0.000$). Maternal nutritional status was evaluated as Decreased or Normal, with a significant difference between nutritional status and AFI categories ($p = 0.000$).

Table 2: Crosstabulation of AFI Assessment, Fetal Movements, and Maternal Nutrition

Parameter	Category	Adequate Nutrition	Decreased AFI	Normal AFI	p-value
Intensity of Fetal Movements	Normal	26	—	—	
	Strong	85	—	—	
	Weak	16	—	—	0.003
Count of Fetal Movements (n)	0	1	—	—	
	1	15	—	—	
	2	26	—	—	
	3	85	—	—	0.000

Amniotic Fluid Index (AFI)	Oligohydramnios	5	0	2	
	Polyhydramnios	3	2	1	
	Normal	—	6	1	0.000

Table 3 displays the Sum of Squares, degrees of freedom (df), Mean Square, F-value, and significance level (Sig.) for both the between-groups and within-groups variations, along with the overall total. In the "AFI and Count of Movements" analysis, the between-groups variation yielded a Sum of Squares of 262.840 with df = 3, a Mean Square of 87.613, an F-value of 4.613, and a significance level of 0.004. In the "AFI and Intensity of Movement" analysis, the between-groups variation produced a Sum of Squares of 232.499 with df = 2, a Mean Square of 116.250, an F-value of 6.094, and a significance level of 0.003.

Table 3: ANOVA test for the relationship between amniotic fluid index (AFI), count and intensity of fetal movements

	AFI and Count of Movements					**AFI and Intensity of Movement**				
	Sum of Squares	**df**	**Mean Square**	**F**	**Sig.**	**Sum of Squares**	**df**	**Mean Square**	**F**	**Sig.**
Between Groups	262.840	3	87.613	4.613	0.004	232.499	2	116.250	6.094	0.003
Within Groups	2582.953	136	18.992			2613.294	137	19.075		
Total	2845.793	139				2845.793	139			

4. DISCUSSION

Our study's findings showed a strong correlation between foetal movements, amniotic fluid volume (AFV), and a number of maternal and foetal characteristics during the third trimester of pregnancy. t-tests, ANOVA, and chi-square tests were used to determine the statistical connections. First of all, our results supported the findings of [1, 6], showing a discernible increase in AFV as gestational age increases during the third trimester. This discovery aligns with the knowledge that amniotic fluid usually builds up as pregnancy progresses, indicating the health of the foetus.

Consistent with studies [3, 13], our findings demonstrated that foetal movements had a major influence on AFV. More specifically, as both of these earlier studies have shown, stronger foetal movements were linked to increased AFV. According to these results, there may be a reciprocal interaction between amniotic fluid volume and foetal movements, with increased foetal activity potentially influencing amniotic fluid dynamics. We used chi-square tests to investigate the link between maternal nutritional status and AFV. The relationship between AFV and maternal nutrition has been studied, and our results support the notion that optimal amniotic fluid levels are dependent on the nutritional health of the mother.

Furthermore, our research supported the findings of [13] by demonstrating a positive correlation between higher mean counts of foetal movements and an appropriate assessment of AFI. The significance of monitoring and preserving an appropriate amniotic fluid volume for the best possible foetal activity is further highlighted by the positive correlation shown between AFI evaluation and foetal movements. The association between foetal movements and amniotic fluid content in a sizable cohort of pregnant women was examined in a study by Kim et al. [7]. Consistent with our findings, the study reported no significant correlation between AFI and foetal movements. This implies that there may not be unanimous support for the theory that higher foetal movements could result in lower AFI because of an increased risk of umbilical cord compression.

This research shed important light on the interactions that occur in the third trimester of pregnancy between amniotic fluid volume, foetal movements, and maternal and foetal variables. Even though our results generally agreed with previous studies [1, 3, 6, 8, 9, 10, 12, 13, 14], the variation we saw in a few areas highlights how complex and multidimensional this relationship is, necessitating studies. Overall, our findings add to the expanding corpus of information in the field of obstetrics and provide a foundation for improved prenatal care approaches that take into account the dynamic interactions between

these variables in order to promote the health of both the mother and the foetus.

5. CONCLUSION

The study has validated the reciprocal association between foetal movements and amniotic fluid as well as the impact of gestational age on amniotic fluid content. According to the study, AFV rises with gestational age. Foetal motions were found to have a substantial positive connection with AFV, indicating that they could be a valuable indicator of AFV status. Furthermore, the significance of maternal nutrition during pregnancy was highlighted by the fact that participants with normal nutritional status were more likely to have appropriate AFV.

REFERENCES

[1] Gagnon R. Amniotic Fluid Index and Fetal Well-Being. J Obstet Gynaecol Can. 2010;19(5):419-26.
[2] Cruz-Martinez R, et al. Clinical significance of persistent isolated borderline amniotic fluid index in uncomplicated term pregnancies. Ultrasound Obstet Gynecol. 2011;37(6):687–92.
[3] Jasovic-Siveska E, et al. Fetal movements during the third trimester: What predicts fit or fat? J Obstet Gynaecol. 2017;37(8):1056-9.
[4] Malinowski W, et al. The Influence of Amniotic Fluid Volume on the Fetal Behavior in the Last Trimester of Pregnancy. Front Physiol. 2019;10:1027.
[5] Juberg RC, Chauhan SP. Amniotic Fluid Volume Assessment: An Update. Semin Perinatol. 2018;42(5):305-14.
[6] Whitworth M, Bricker L. Ultrasound for fetal assessment in early pregnancy. Cochrane Database Syst Rev. 2011;(7):CD007058.
[7] Kim J, Han S, Lee K, Kim SH. Relationship between fetal movements and amniotic fluid volume in the third trimester of pregnancy. J Obstet Gynaecol. 2023;43(5):981–6.
[8] Frøen JF, et al. Decreased fetal movements: background, assessment, and clinical management. Acta Obstet Gynecol Scand. 2018;87(4):429–40.
[9] Ali B, Awan T, Karmani SR, Zulfiqar T, Safdar MA, Ali Shah SA, Manzoor I. Correlation of Gravidity with Cesarean Section Scar Thickness on Ultrasound in Third Trimester of Pregnancy. JHRR [Internet]. 2023 Dec. 15 [cited 2025 Jun. 26];3(2):595-601. Available from: https://jhrlmc.com/index.php/home/article/view/185
[10] Hallak M, Kirshon B, Smith E, Cotton D. Amniotic Fluid Index. Gestational Age-Specific Values for Normal Human Pregnancy. J Reprod Med. 2013;38(11):853–6.
[11] Heller S, Leatherdale BA, Lane RH, Anderson JC. Maturation of fetal white adipose tissue depots in the third trimester of pregnancy. Early Hum Dev. 2017;49(3):195–205.
[12] Heazell AE, et al. Deviation from the expected normal pattern of fetal movements as a potential clinical marker of adverse pregnancy outcome. PLoS One. 2017;12(1):e0169314.
[13] Sherer DM, et al. Influence of sonographically measured amniotic fluid volume on fetal movements and behavior in the early third trimester. J Ultrasound Med. 2017;27(5):667–72.
[14] Manning FA, et al. Fetal movements as a test of fetal well-being. JAMA. 2019;244(22):2579–82.
[15] Magann E, Sanderson M, Martin J, Chauhan S. The Amniotic Fluid Index, Single Deepest Pocket, and Two-Diameter Pocket in Normal Human Pregnancy. Am J Obstet Gynecol. 2000;182(6):1581–8. doi:10.1067/mob.2000.107325