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Original Research Article

Evaluation of Low Amniotic Fluid Index (AFI) in Term Pregnancy on Neonatal Outcome: An Observational Study

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Abstract

Background: The normal volume of amniotic fluid is a reliable indicator of appropriate placental function and is crucial to the fetus's healthy growth and development. One of the most crucial objectives of perinatal care is early diagnosis and intervention. The aim of this study is to evaluate perinatal outcome in low AFI patients as oligohydramnios canreflect fetal jeopardy. It can also guide an obstetrician whether further evaluation needed or not as well astiming of delivery.

Methods: This study was conducted in the Sadar Hospital, Motihari, Bihar for over a period of one year i.e., from January 2025 to December 2025.In this period total 200 pregnant patients admitted in our hospital meeting the inclusion and exclusion criteria included inthis study. Among them 100 patients belong to group- A had low AFI (≤5) and group B comprises 100patients with normal AFI (>5). Assessment of perinatal outcome done by APGAR score at 1 and 5 minutes, birth weight, admission into SNCU, still birth & early neonatal death and mode of delivery.

Results: This study found a significant difference between the two groups in terms of low birth weight, mode of delivery, and APGAR score at one minute. At one minute, 21% of Group-B neonates and 36% of Group-A neonates had low APGAR scores (<7), which improved after five minutes. According to an analysis of the birth weight data, 14% of newborns from Group B and 35% of newborns from Group A had low birth weights. Group A had a greater rate of Caesarean sections (84%) and Group B had a higher rate of vaginal deliveries (64%). There was no discernible difference between the two groups in terms of perinatal mortality, SNCU hospitalization, or APGAR score at five minutes.

Conclusion: There is a statistically significant correlation between low amniotic fluid index (AFI≤5) and low birth weight, mode of delivery, and APGAR score at one minute.

Keywords: Oligohydramnios, Meconium, SNCU, APGAR Score, Low birth weight.

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Introduction

Amniotic fluid (AF), also known as liquor amnii, is the albuminous fluid found in the amniotic sac. It is a component of the baby's life support system and offers cushioning and temperature stability. It is a vital, dynamic, and complicated environment that shifts in quantity and type as pregnancy goes on. This fluid is created around 12 days after conception, just after the amniotic sac forms. Before keratinization, it is composed of either fetal plasma through highly permeable fetal skin or maternal plasma transudate through the chorio-amnion.

Around the twentieth week, fetal urine takes over as the main ingredient.[1] Fetal fluid production in the lung and urine, along with fluid resorption through fetal swallowing, balance the level of amniotic fluid during the second trimester of pregnancy. Fetal swallowing, which is necessary for GIT development, is made possible by amniotic fluid. It prevents compression of the umbilical cord and shields the developing fetus from biochemical and mechanical harm. During intrauterine growth, it covers and lubricates the fetus. The development of the fetal respiratory and musculoskeletal systems is made possible by the availability of normal amniotic fluid during gestation. As the greatest portion of the fetal extracellular space, amniotic fluid offers a more accessible method of examining the fetus than fetal blood. Therefore, the ideal

amount of amniotic fluid is necessary for the health of the fetus. Additionally, this is a crucial component of the prenatal assessment of fetuses that are susceptible to any unfavorable pregnancy result, particularly during the third trimester.[2] Throughout pregnancy, the amount of liquor consumed varies; it increases linearly until the early third trimester and then stays constant until term.

Normal amniotic fluid volume (AFV) varies with gestational age, starting at 30 ml at 10 weeks and progressively increasing to 1 liter at 36–37 weeks. After 40 weeks, the volume begins to decline, with a mean AFV of 800 ml. The patient may be at risk for low amniotic fluid levels if the pregnancy is two weeks or more past due since fluid levels nearly halve around 42 weeks of gestation. Fetal intolerance of labor, caesarean delivery due to fetal intolerance, admission to the Special newborn care unit (SNCU), intrauterine growth restriction (IUGR), a 5-minute APGAR score of less than 7, and fetal or neonatal death are among the negative perinatal outcomes linked to oligohydramnios.[3,4] Due to the possibility of fetal suffocation, growth restriction, non-reassuring fetal heart rate (FHR) tracing, and/or stillbirth, low AFI is regarded as one of the grounds for delivery.[5] Because late onset oligohydramnios differs from early onset oligohydramnios in terms of its genesis, treatment, and prognosis. Term pregnancies are preferred because the cause of oligohydramnios is primarily idiopathic. High-risk pregnancies have been the subject of the majority of oligohydramnios research.[6] Adverse perinatal outcomes, including fetal distress during labor, induction of labor, cesarean delivery due to fetal distress, meconium passage, poor Apgar score, and neonatal resuscitation or admission to the neonatal intensive care unit, are more likely to occur in such pregnancies. The link between oligohydramnios and poor perinatal outcomes has not been verified by other researches.[7]Thus, it has been questioned whether an entity such as the low-risk phrase oligohydramnios exists. The purpose of this study is to assess whether isolated oligohydramnios at term is linked to worse perinatal outcomes. Given that the prevalence is believed to be as high as 3–8% of pregnancies, it is rather prevalent in the population.[8]

Material and Methods

This hospital based prospective study was conducted at Sadar Hospital, Motihari, Bihar from January 2025 to December 2025. This study includes both women with term pregnancies who were admitted to this hospital with and without labor pain. These individuals have been assessed using sonography, a thorough clinical examination, a detailed history, and other tests. These patients who took part in the trial gave their verbal and written consent.

This study included patients with singleton pregnancies, term pregnancies, and AFI < 5 cm and AFI >5-24 cm. This study excluded patients with multiple pregnancies, fetal congenital abnormalities, pregnancies with medical conditions like diabetes mellitus, hypertension, thyroid disease, heart disease, SLE, jaundice, etc., pregnancies with obstetrical problems including CPD, APH, obstructed labor, etc., and PROM.

The condition of the mother and fetus has been assessed through appropriate history, examination, and investigation reports. If there was insufficient information, related investigations, such as ultrasonography, were repeated. Patients were divided into two groups based on the sonographic report.

Among them, 100 women with normal AFI (>5) were categorized as Group-B, and 100 women with low AFI (≤5) were categorized as Group-A. A partograph and close fetal monitoring were used to track the mother's and the fetus's conditions during labor. Following birth, specific information on the pregnancy's outcome was gathered via direct observation, the delivery note, and the neonatal chart, and it was entered into a data sheet. Following their hospital stay, patients were monitored.

Tabular and matrix formats have been used to store all of the data collected. For rigorous statistical analysis, all of the variables could be quantified or assigned a numerical value. The statistical software for social science (SPSS-20) will be used for all statistical analysis. Categorical parameters are expressed as frequency and percentage, while continuous quantities are expressed as mean ± SD. When appropriate, the chi-square test has been utilized for statistical analysis. A "P" value of less than 0.05 is regarded as significant. Relational data and key findings have been displayed in an appropriate table. To fully comprehend each table, description has been provided.

Results

The average age of the study's sample, which ranges from 18 to 42, is 25.24±5.51 years. The age range of 18 to 25 has the greatest number of cases. 62% of patients in the normal AFI group and 55% of patients in the low AFI group were between the ages of 18 and 25. The normal AFI group has a mean age of 24.9 and a standard deviation of 4.84. and the low AFI group's mean age is 25.57 with a standard deviation of 6.13. The mean age of patients with the AFI value does not significantly differ, according to the results of the t-test (t score=0.195). Table 1 demonstrates that there was

no statistically significant link between the age group and the AFI value.

Table 1: Age distribution of study population (N=200)

Age in yrs.	No. of cases	Group-A Low (AFI≤5)		Group-B Normal (AFI>5)		P Value
		No. of cases (100)	Percentage	No. of cases(100)	Percentage	
18-25	117	55	55%	62	62%	0.195
26-30	49	24	24%	25	25%	
>30	34	21	21%	13	13%	

Primigravida represents 43% of all patients in this study. Primigravida make up 41% of the low AFI (≤5) group and 45% of the normal AFI (>5) group. Multigravida make up 57% of the sample. Because the P value is higher than 0.05, it may be concluded that there is no statistically significant link between gravida and AFI. Of the 200 cases, 51% are multipara and 49% are primipara. Table 2 compares the parity of two groups.

Table 2 : Gravidity and parity vs group cross-tabulation (N=200)

		Group A AFI(≤5)	Group B AFI (>5)	Total	P Value
Gravida	Primigravida	45	41	86 (43%)	0.33
	Multigravida	55	59	114 (57%)	
	Total	100	100	200 (100%)	
Parity	Primipara	52	46	98 (49%)	0.45
	Multipara	48	54	102 (51%)	
	Total	100	100	200	

APGAR scores in this study are classified as low (<7) and normal (≥7). Out of 200 newborns, 36% from Group A and 21% from Group B had low APGAR scores after one minute. After five minutes, 8% of Group B and 9% of Group A had poor APGAR scores. There was a statistically significant correlation between the APGAR score and the AFI value at one minute, but not at five.

Table 3 : APGAR score at 1 and 5 minutes vs group cross-tabulation (N=200)

		Group		Total	P value
		Group-A (AFI≤5)	Group-B (AFI>5)		
APGAR Score 1 min	<7	36	21	57	0.019
	≥7	64	79	143	
APGAR Score 5 min	<7	9	8	17	0.80
	≥7	91	92	183	

P value has been obtained by Chi-square Test.

Table 4 demonstrates that 14% of newborns in Group B and 35% of newborns in Group A had low birth weights. Conversely, 86% of Group-B babies and 65% of Group-A babies had normal birth weights. The outcome shows that there is a statistically significant birth weight difference between the two depending on AFI.

Table 4 : Birth weight vs group cross-tabulation (N=200)

Birth Weight	Group		Total	P Value
	Group-A (AFI≤5)	Group-B (AFI>5)		
Low Birth Weight	35	14	49	0.001
Normal Birth Weight	65	86	151	
Total	100	100	200	

P value has been obtained by Chi-square Test.

13% of the 100 newborns in Group A were admitted to the SNCU, compared to 6% of the newborns in Group B. AFI and SNCU admission were found to have a statistically negligible association (p>0.05).

Table 5 : Admission in SNCU vs group cross-tabulation (N=200)

Admission in SNCU	Group		Total	P Value
	Group A (AFI≤5)	Group B (AFI>5)		
No	87	94	181	0.091
Yes	13	6	19	
Total	100	100	200	

P value has been obtained by Chi-square Test.

In this study, 3% of Group-A (AFI≤5) and 2% from Group-B (AFI>5) baby were detected as early neonatal death. 01 (one) out of 100 patients from Group-A (AFI≤5) was stillbirth resulting 04% total death from Group-A. Statistical association from chi- square test between AFI and Neonatal Death is statistically insignificant for this study.

Table 6 : Still birth and early neonatal death vs group cross-tabulation (N=200)

	Group		Total	P Value
	Group A (AFI≤5)	Group B (AFI>5)		
Alive Baby	96	98	194	0.543
Still Birth	1	0	1	
Early neonatal death	3	2	5	
	100	100	200	

P value has been obtained by Chi-square Test.

While 84% of Group-A and 36% of Group-B patients underwent LSCS procedures, 15% of Group-A and 64% of Group-B patients had normal vaginal delivery (NVD). Group A had just 1% of aided vaginal births. The two groups' delivery modes differ statistically significantly (P=0.02).

Table 7 : Mode of delivery vs group cross-tabulation (N=200)

Mode of Delivery	Group		Total	P Value
	Group A (AFI≤5)	Group B (AFI>5)		
NVD	15	64	79	0.02
Assisted	1	0	1	
LSCS	84	36	120	
Total	100	100	200	

P value has been obtained by Chi-square Test.

Discussion

The women in this study have an average age of 25.24 years, with a standard deviation of 5.51 years. The majority of the women in this study (58.5%) were between the ages of 18 and 25. This is similar to the study by Shrestha et al. [9], where the mean age was 24.36±3.98 years and the participants ranged in age from 21 to 25.

With a mean gestational age of 38.28 ± 1.009, the current study was carried out on women between the ages of 37 and 40 completed weeks. Shah et al. [10] maintained similar criteria, with a mean gestational age of 39.24 and an age distribution ranging from 37 to 42. In this study, the majority of patients (57%) are multigravida, whereas 43% are primigravida..

There is a statistically significant correlation (P value 0.001) between the two groups. Chauhan et al. [11] found a similar result, with a statistically significant p-value of 8.33% low birth weight in the low AFI group and 1.8% in the normal AFI group. In this study, 21% of the normal AFI group and 36% of the low AFI group had an after-birth 1-minute APGAR score of less than 7. Five minutes after receiving emergency resuscitation, some of them showed improvement. Both groups' APGAR at one minute was determined to be statistically significant (P value=0.019). In their analysis of distressed fetal cases, Ülker & Özdemir [12] found that 60% of neonates in the low AFI group had 1-minute Apgar scores below 7.The APGAR score at one minute showed a statistically significant difference (p=0.003) between the two groups (normal AFI group 50% vs. low AFI group 24%) according to Bachhav & Waikar [13]. This outcome is consistent with the current investigation. In this study, 9% of the low AFI group and 8% of the normal AFI group had an APGAR score of less than seven at five minutes. Therefore, there is no statistically significant correlation (P value > 0.05) between low AFI and the APGAR score at five minutes. found that low amniotic fluid index and APGAR score at birth do not significantly differ statistically.

Nine (6%) of the low AFI group and two (0.56%) of the normal AFI group had an APGAR score of less than seven at five minutes. The current study is supported by Rainford et al.'s study [14], which reported no difference in the two groups' five-minute APGAR scores. Nevertheless, a different study by Chauhan et al. [11] revealed that neonates born to women in the normal AFI group (8.33%) and low AFI group (33.33%) had APGAR scores less than 7 at 5 minutes. With a P-value of less than 0.05, the outcome was statistically significant. In a research by Zhanga et al. [15], APGAR scores <7 at 1 minute were 19% in the low AFI group and 11.5% in the normal AFI group. 3.1% of the normal AFI group and 7.75% of the low AFI group had an APGAR score of less than seven at five minutes. For their study, neither the one-minute nor the five-minute outcomes were statistically significant. According to the current study, 13% of newborns from the low AFI group were admitted to the SNCU, compared to 6% of newborns from the

normal AFI group. For this study, the relationship between amniotic fluid volume and SNCU admission is statistically not significant (P=0.091).Shrestha et al. [9], however, discovered a significant statistical difference (P=0.003) between the SNCU admission rates for the low AFI group (38.88%) and the normal AFI group (16.66%). In this study, early neonatal death was seen in 3% of Group-A (AFI≤5) and 2% of Group-B (AFI>5) babies. One stillbirth out of every 100 patients in Group-A (AFI≤5) led to a 4% overall death rate from the low AFI group, which is not statistically significant. According to Shrestha et al. [9], there were 8.33% perinatal deaths in patients with low AFI and 1.38% deaths in patients with normal AFI, with a non-significant P value of 0.053.

It was discovered that there was no statistically significant difference in short-term perinatal morbidities (p=0.59) between the two groups, which is consistent with the results of this investigation [16]. But according to Casey et al. [17], there was a statistically significant difference between the normal and low AFI groups in both stillbirths (1.4% vs. 0.3%) and newborn fatalities (5% vs. 0.3%). In this study, the low AFI group had a greater rate of cesarean sections (84%), while the normal AFI group had a higher proportion of vaginal deliveries (64%). Fetal discomfort, fetal development restriction, cord prolapse, prolonged labor, etc., were the main causes of cesarean sections. Vidya A. Thobbi [18] came to the conclusion that 74.0% of the 200 oligohydramnios in their study were cesarean deliveries, with the other 26.0% being normal deliveries. They found that the most common reason for a cesarean section was fetal distress (62%). According to a study by Hou et al. [19], pregnancies with oligohydramnios had a considerably higher caesarean delivery (CD) rate (84.4 versus 54.7%; p<0.001) than those without. Both studies corroborate the findings of his investigation. Caesarean section rates were found to be 22% in the normal AFI group and 48% in the low AFI group. Additionally, they found that fetal distress was the primary cause of 44% of cesarean deliveries [20].

Conclusion

According to the current study, oligohydramnios is linked to low birth weight, caesarean delivery, and a higher number of distressed babies with low APGAR scores (<7) at one minute. Therefore, it is determined that oligohydramnios is statistically significantly associated with low birth weight neonates, poor APGAR scores at one minute, and delivery method.

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