Original Article

Adverse Perinatal Outcomes in Isolated Borderline Amniotic Fluid Index at Term Pregnancies

Sandleen Javad[1], Saleha Hassan[2], Rukhsana Nazir[3], Dureshahwar [4], Seema Gul[5], Sharmeen Kousar[6]

[1]Senior Registrar, Department of Gyane & Obs, Watim Medical & Dental College and General Hospital Rawalpindi
[2]Assistant Professor, Department of Gyane & Obs, Watim Medical and Dental College and Hospital, Rawalpindi
[3]Senior Medical Officer, Department of Gyane & Obs, KRL Hospital, Islamabad
[4]Associate Professor, Department of Gyane & Obs, Watim Medical and Dental College and Hospital, Rawalpindi
[5]Professor, Department of Gyane & Obs, Watim Medical and Dental College and Hospital, Rawalpindi
[6]Assistant Professor, Department of Gyane & Obs Unit 2, Fauji Foundation Hospital, Rawalpindi

***Correspondence**: Dr. Sandleen Javad*
Senior Registrar, Department of Gyane & Obs,
Watim Medical & Dental College and General Hospital Rawalpindi
sandleenjavad@yahoo.com

Abstract

Objective: To determine the frequency of adverse perinatal outcomes, specifically low Apgar scores and NICU admissions, in term pregnancies with isolated borderline AFI, and to assess the influence of maternal age and parity on these outcomes.

Methodology: This prospective observational study was conducted in the Department of Obstetrics and Gynecology of Watim Hospital, Rawalpindi from August 2024 to November 2024. A total of 163 gravid women aged 20 to 35 years with singleton pregnancy (37- 40 weeks) and isolated borderline AFI: 5–8 cm, were included in the study. Written informed consent was taken. AFI was measured by ultrasound. Data was analyzed using SPSS version 22.0.

Results: The majority aged 20-30 years (27.4±3.68). Most deliveries occurred between 37-38 weeks' gestation, with a mean gestational age of 38.23 ± 0.97 weeks. Neonatal outcomes showed that 36.8% of newborns had an APGAR score <7 at 1 minute, which improved significantly to 18.4% at 5 minutes. NICU admission was required in 67.5% of cases. Stratification analysis showed that neonates of mothers aged 20-30 years have higher rates of low APGAR scores at both 1 minute and 5 minutes compared to those aged 31-35 years. Primiparous women had more neonates with APGAR scores <7 at 1 minute and 5 minutes than multiparous women.

Conclusion: There is significant perinatal morbidity due to isolated borderline AFI resulting in low Apgar scores and consequently higher NICU admissions in term pregnancies. The patient's age and parity influenced the outcomes.

Keywords: Amniotic fluid index, Apgar scores, NICU admissions, perinatal outcome, Isolated oligohydramnios, borderline AFI.

Cite this article as: Javad S, Hassan S, Nazir R, Dureshahwar, Gul S, Kousar S. Adverse Perinatal Outcomes in Isolated Borderline Amniotic Fluid Index at Term Pregnancies. J Soc Obstet Gynaecol Pak. 2025;15(3): 203-207. DOI. 10.71104/jsogp.v15i3.857

Introduction

Amniotic fluid, the protective liquid surrounding the fetus in the uterus, plays a crucial role in fetal development and well-being, facilitating musculoskeletal development and fetal movement.[1] Its volume fluctuates with gestational age, expanding to approximately 400 ml by 20 weeks and nearly 1 liter between 36-38 weeks, followed by a reduction to 600-800 ml at term and a continued decline post-term, highlighting its gestational age-dependent nature.[2] The measurement of amniotic fluid volume is essential for assessing fetal health, and the Amniotic Fluid Index is a widely used method for this evaluation.[2] Deviations from the normal amniotic fluid volume, specifically oligohydramnios, and polyhydramnios, are associated with adverse pregnancy outcomes.[3]

Oligohydramnios, characterized by reduced amniotic fluid, has significant implications for fetal well-being, correlating with diminished Apgar scores, increased Neonatal Intensive Care Unit admissions, and fetal growth restriction.[4] Borderline Amniotic Fluid Index, defined as an AFI between 5 and 8 cm, or alternatively between 5.1 and 10 cm, presents a unique clinical

Authorship Contribution: [1,2]Substantial contributions to the conception or design of the work or the acquisition, [3]Drafting the work or revising it critically for important intellectual content. [4,5]Final approval of the study to be published.[6]Active participation in active methodology

Funding Source: none
Conflict of Interest: none

Received: Dec 19, 2024
Revised: May 14, 2025
Accepted: July 07, 2025

challenge.[5] The incidence of oligohydramnios with AFI (5-8cm) in term pregnancies is about 12%.[6] When there is insufficient amniotic fluid surrounding the fetus without any accompanying abnormalities in the mother or the fetus, it is referred to as isolated oligohydramnios. It is identified when the deepest vertical pocket < 2cm or AFI is <5 cm.[4]

Some studies suggest a twofold increase in adverse perinatal outcomes in term pregnancies complicated by borderline AFI, as demonstrated by research indicating a significant rise in NICU admissions for women delivering at term with isolated borderline AFI.[7] Conversely, other investigations have not found a correlation between borderline AFI and adverse perinatal outcomes in term pregnancies, with some studies reporting minimal impact on Apgar scores and NICU admission rates.[8]

Further complicating the clinical picture is the consideration of intermediate- and high-risk pregnancies, where remote self-monitoring of maternal and fetal health has been implemented to track various parameters, including C-reactive protein, non-stress test results via cardiotocography, temperature, blood pressure, heart rate, and maternal-fetal well-being through questionnaires, potentially influencing the identification and management of borderline AFI cases.[9] In a study conducted by Ansari SN et al in Nepal in 2021 showed only 3.1% neonates born to mothers with borderline AFI with Apgar scores <7 and found no requirement for NICU admissions and no neonatal mortality was observed in any of the babies.[10] Therefore, it is essential to identify biomarkers of placental insufficiency relevant to term gestation.[11]

Many practitioners believe that low fluid levels result in aggressive and needless interventions, even in healthy pregnancies at term. Stricter fetal monitoring will be implemented if a positive link between isolated borderline AFI and unfavorable outcomes is found. Although previous studies in Pakistan have investigated borderline AFI, this study is unique in focusing exclusively on isolated borderline AFI in term pregnancies and to assess the influence of maternal age and parity on these outcomes. By analyzing a well-defined low-risk population, this study isolates the impact of borderline AFI itself on neonatal outcomes.

Methodology

This prospective observational study was conducted in the Department of Obstetrics and Gynecology, Watim General Hospital, Rawalpindi, following approval from the hospital's ethical committee in August 2024. A total of 163 gravid women were enrolled based on predefined inclusion and exclusion criteria. The sample size was calculated using the WHO sample size calculator, considering a power of test at 80%, confidence level of 95%, level of significance at 5%, anticipated population of 12%, and a precision of 8%. A non-probability consecutive sampling technique was employed.[12]

Participants included women aged 20 to 35 years with singleton cephalic term pregnancies (gestational age between 37 to 40 weeks) and a borderline amniotic fluid index (AFI) of 5–8 cm. Women with contraindications to vaginal delivery, fetal congenital anomalies, malpresentations, multiple gestations, or any associated maternal medical disorders were excluded.

Upon admission, each participant underwent a thorough evaluation that included a detailed obstetric history, general physical examination (GPE), systemic examination, as well as per abdominal and per vaginal assessments to determine labor status. Routine laboratory investigations were performed, including complete blood count (CBC), blood sugar random (BSR), urine routine examination, blood group typing, hepatitis profile, and cardiotocography (CTG). An ultrasound examination was carried out to confirm the amniotic fluid index.

Labor progress was closely monitored and documented using a standardized partogram. Uterine contractions, maternal vital signs, and fetal heart rate (FHR) were assessed at regular half-hourly intervals. Any interventions or complications during labor were noted.

Neonatal outcomes were evaluated immediately after birth, focusing on APGAR scores at 1 and 5 minutes. Any newborn with an APGAR score ≤7 at either time point was further assessed for the need for NICU admission. Follow-up of both mother and neonate was maintained for 24 hours postpartum to observe for any complications.

All data was recorded systematically using a pre-designed proforma. Confounding variables were minimized by strictly adhering to the exclusion criteria.

Data was entered and analyzed in SPSS version 22.0. Quantitative/ Continuous data like age, gravidity, parity, NICU admissions, Apgar scores were presented as Mean and Standard deviation. Independent sample t-test were used to compare perinatal outcome in terms of NICU admissions and Apgar scores between two

groups. Effect modifiers like age and parity were controlled by the stratification. Post stratification X^2 test was applied. P value less than 0.05 was considered as significant.

Results

In this study of 163 term pregnant women with isolated borderline AFI, the majority 113(69.9%) were aged 20–30 years, with a mean age of 27.46 ± 3.69 years. Most deliveries occurred between 37–38 weeks' gestation 102(62.6%), with a mean gestational age of 38.23 ± 0.97 weeks. Nulliparous women accounted for 97(59.5%) of the cohort (Figure 1).

Neonatal outcomes showed that 36.8% (n=60) of newborns had an APGAR score <7 at 1 minute, which improved significantly to 30(18.4%) at 5 minutes (p = 0.002) (Table I). NICU admission was required in 110(67.5%) of cases. Stratification analysis demonstrated significant associations between maternal age and APGAR scores, with neonates of mothers aged 20–30 years having higher rates of low APGAR scores at both 1 minute (p = 0.024) and 5 minutes (p = 0.0001) compared to those aged 31–35 years (Table II). Similarly, nulliparous women had more neonates with APGAR scores <7 at 1 minute (p = 0.002) and 5 minutes (p = 0.004) than multiparous women (Table II).

Table No II: Stratification for Frequency of NICU Admission with Respect to Age & Parity.

Age (in years)	Apgar Score ≤7 At 1 Minute			Apgar Score ≤7 At 5 Minute		
	Yes	No	P value	Yes	No	P Value
20-30	40	74	0.024	23	91	0.0001
31-35	20	29		10	39	
Parity						
Nullipara	36	58	0.002	22	72	0.004
Multipara	24	45		11	58	

Discussion

Amniotic fluid, which surrounds the fetus in utero, is a determinant of fetal health. Given its association to possible complications, borderline AFI, defined as an AFI between 5 and 8 cm, presents a clinical challenge. Pregnancy outcomes are negatively associated with oligohydramnios and polyhydramnios, which are deviations from normal amniotic fluid levels. Decreased amniotic fluid volume, or oligohydramnios, can have a major impact on fetal health by causing fetal growth restriction, and lower Apgar scores. This study is unique because it examines the effects of isolated borderline AFI on neonatal outcomes in term pregnancies while taking maternal age and parity into consideration. The study assessed the consequences of birth for 163 term pregnant women with only borderline amniotic fluid index (AFI). A high proportion (69.9%) of participants were 20 to 30 years of age, and their mean age was 27.46 ± 3.69 years. The majority of deliveries happened between 37–38+6 weeks. Lower APGAR scores at birth were found to be related to both young maternal age (20 to 30) and to women who had not given birth before. Even though neonatal health after delivery improves significantly, the chances of a favourable outcome are largely affected by the mother's age and number of children. Rising NICU

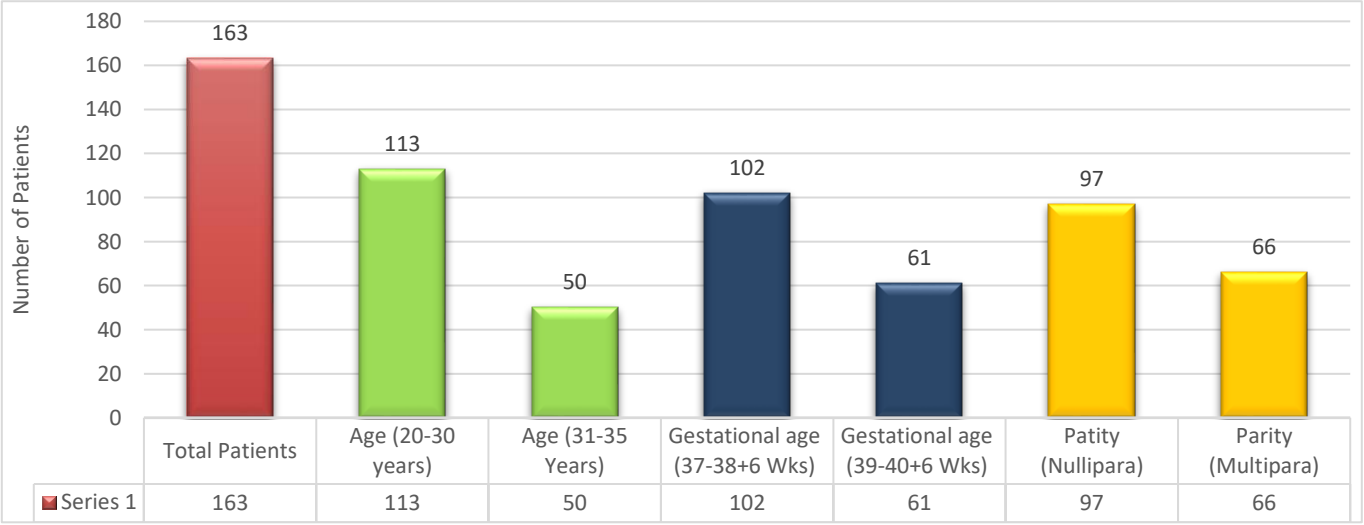

Figure 1. Distribution of Study Participants by Parity.

Table No I: APGAR Score of the Patients ≤ 7 (n=163)

Apgar score ≤7	At 1 Min		At 5 Mins		P Value
	No. of patients	%	No. of patients	%	
Yes	60	36.81	30	18.4	0.002
No	103	63.19	133	81.6	
Total	163	100	163	100	

intake emphasizes the need for close observation during birth when the AFI is at the borderline. Such findings go along with existing research pointing out that borderline AFI can have a detailed influence on newborns, questioning the previous label of these pregnancies as “low risk.”

The researchers Moin et al.[13] carried out a prospective observational study comparing outcomes for term pregnancies between borderline AFI and normal AFI. Researchers found that the borderline AFI group experienced poorer results, like low birth weight babies, more NICU hospitalization and more need for caesarean section surgery. Like the other study, the current research notes that women with a borderline AFI have a high rate of NICU admissions (67.5%). Despite the lack of mention of caesarean deliveries, the poor condition of the babies at birth (as shown in their APGAR scores) confirms the argument made by Moin et al. that borderline AFI pregnancies should be seen as high risk. Also, the fact that APGAR scores can differ as a result of a mother’s age and the number of children she has born highlights the several factors that can play a role in the outcomes of such pregnancies. Moin et al. also recommended regular follow-up in cases of borderline AFI, which aligns with this study's view that these pregnancies must be managed with extra care. Because the results agree, current clinical protocols for isolated borderline AFI should be re-examined, and action should be taken early to avoid bad outcomes.

According to S and Gayathri (2023)[14], when they studied previous cases, there was an increased risk of low birth weight, more caesarean sections and complications for the babies in the borderline AFI group compared to the normal group. This study’s research finding add to this by revealing that a significant number of neonates had low APGAR scores, and there were many NICU admissions as well. The study outcomes also emphasize that low APGAR scores are linked to maternal age and a mother’s first childbirth, and these could contribute to why outcomes vary among babies. S and Gayathri. suggested that risk-based decisions for women and their fetuses would improve outcomes, which was shown by the results of this current study. Analyzing the results by age and parity in this study, clinicians can choose better strategies to help women with borderline AFI. So, the fact that the current study findings align with those of S and Gayathri. strengthens the view that borderline AFI is no longer safe to manage the same way as other cases.

A study by Ali et al. (2024)[15] showed that while oligohydramnios is an isolated condition, mothers are more likely to have induced labour, APGAR scores lower than what is typical, and their babies spend more time in the NICU. Furthermore, about a third (36.8%) of these newborns presented with an APGAR score less than 7 at the 1-minute mark, but only a small share (18.4%) continued to have it at the 5-minute mark. Ali et al. pointed out that foetal distress is more common in these cases, which supports our findings that younger and nulliparous women were more likely to suffer neonatal problems. Many of these high-risk expectant mothers end up in the NICU, showing just how much of a big problem mildly low birth weight is when combined with other risk factors for mothers. Even though the study omitted topics on mode of delivery and induction, its results are in agreement with Ali et al.’s point that any woman with borderline AFI needs more careful monitoring. Revising how management is carried out in these cases is well supported by what this study found. Thus, it seems that quickly figuring out maternal age and number of children and treating pregnancies accordingly may lessen the chances of negative perinatal outcomes.

Jamal et al. (2016)[16] studied adverse pregnancy outcomes in term pregnancies with borderline versus normal AFI and found that those with borderline AFI experienced greater problems with foetal and newborn health, and the methods used for childbirth were different. The current study found a helpful but incomplete increase in APGAR scores during the first 5 minutes and that newborns were still often admitted to the NICU. Jamal et al.’s main point is strengthened by these findings, which confirm that even normal gestational age can still lead to complications with borderline AFI. Today’s stratification analysis provides new findings since it shows that newborn outcomes are associated with a mother’s young age and being a first-time mom, two variables not well represented in the research of Jamal et al. It points out that AFI needs to be analyzed together with other patient details to provide better risk stratification. Because of this, this study proposes that medical decisions should consider various risk factors, and the findings support early and customized strategies for delivery as suggested by Jamal et al.[16]

According to Talpur et al.[17], pregnancies with borderline AFI experiences more foetal distress, decreased APGAR scores and required admittance to the NICU, so they recommended careful monitoring of the foetus. Current research agrees with the above concerns

because 36% of neonates start with low APGAR scores, and 68% still need to be admitted to the NICU, which is unusual for low-risk mothers. The current research reveals that a pregnant woman's age and how many pregnancies she has had greatly affect neonatal condition, so this should be considered in women showing borderline AFI. Women who had never given birth (nulliparous) made up the greatest proportion (59.5%). 36.8% of newborns had APGAR scores below 7 after 1 minute, but this changed to only 18.4% after 5 minutes, and the difference was statistically significant ($p = 0.002$). While authors such as Talpur et al. pointed out poor outcomes around births in general. The change from a low APGAR score to a high one after 5 minutes suggests the baby may recover, yet a lot of newborns end up in the NICU. So, this research backs up Talpur et al.'s advice to improve antenatal and intrapartum care. For this reason, the current study contributes to the evidence that borderline AFI should be given utmost attention because of its clinical implications in young, nulliparous women. This study has some limitations. It is a single center study with a small sample size and there is no control group (normal AFI). Therefore, to improve perinatal outcomes, further large comparative studies will be more beneficial in guiding gynecologists regarding stricter fetal surveillance of term pregnancies with isolated borderline AFI.

Conclusion

Isolated borderline AFI at term is associated with a higher risk of poor perinatal outcomes, in terms of significantly lower Apgar scores and more postnatal NICU admissions. Therefore, frequent fetal screening, intrapartum monitoring, and timely treatments are necessary to closely manage pregnancies with isolated low AFI. More investigations will be required to validate our findings.

References

1. Sánchez-Fernández M, Corral ME, Aceituno L, Mazheika M, Mendoza N, Mozas-Moreno J. Observer influence with other variables on the accuracy of ultrasound estimation of fetal weight at term. Medicina. 2021 Feb 27;57(3):216. https://doi.org/10.3390/medicina57030216
2. Krettli WSDC, Leite HV, Carlos A, Cabral V, Reis ZSN, Reis N, et al. Longitudinal study of the association between antenatal nephrourinary ultrasonographic findings with unfavorable clinical outcomes during postnatal period, childhood and adolescence, in patients with congenital anomalies of the kidney and urinary tract (CAKUT). J Community Med Public Health. 2023 Jun 15;7(3). https://doi.org/10.29011/2577-2228.100334
3. Desai D, Mishra N, Savani G. Perinatal outcome of term pregnancies with borderline amniotic fluid index: a prospective case-control study. Int J Reprod Contracept Obstet Gynecol. 2020 Apr 28;9(5):2047-51. https://doi.org/10.18203/2320-1770.ijrcog20201803
4. Molla M, Mengistu Z, Tsehaye W, Sisay G. Magnitude and associated factors of adverse perinatal outcomes among women with oligohydramnios at 3rd trimester at University of Gondar comprehensive specialized hospital, North West Ethiopia. Front Glob Womens Health. 2023 Jan 30;3:958617. Available from: https://doi.org/10.3389/fgwh.2022.958617
5. Maul H, Kunze M, Berger RE. Aktuelles Vorgehen bei frühem vorzeitigem Blasensprung: neue Definitionen? Ist die CRP-Bestimmung sinnvoll? Sind Alternativen in Sicht? Der Gynäkologe. 2021 Feb 16;54(3):186-93. Available from: https://doi.org/10.1007/s00129-021-04750-3
6. Augestine T, Palakkan S, Umadevi N. Obstetric outcome in pregnancies with borderline versus normal amniotic fluid index. Int J Reprod Contracept Obstet Gynecol. 2019 Jul 26;8(8):3240-5. https://doi.org/10.18203/2320-1770.ijrcog20193542
7. Fradkin EC, Lafferty M, Greenspan JS, Aghai ZH. Neonatal intensive care unit admissions before and after the adoption of the baby friendly hospital initiative. J Matern Fetal Neonatal Med. 2020 Feb 23;35(4):657-62. Available from: https://doi.org/10.1080/14767058.2020.1730796
8. Bouzaglou A, Aubenas I, Abbou H, Rouanet S, Carbonnel M, Pirtea P, et al. Pregnancy at 40 years old and above: obstetrical, fetal, and neonatal outcomes. Is age an independent risk factor for those complications? Front Med. 2020 May 27;7:208. https://doi.org/10.3389/fmed.2020.00208
9. Zizzo AR, Hvidman L, Salvig JD, Holst L, Kyng M, Petersen OB. Home management by remote self-monitoring in intermediate- and high-risk pregnancies: a retrospective study of 400 consecutive women. Acta Obstet Gynecol Scand. 2021 Dec 7;101(1):135-42. https://doi.org/10.1111/aogs.14294
10. Ansari SN, Baral J, Gurung G, Jha A. Comparison of outcome of borderline and normal amniotic fluid index in term pregnancy. Kathmandu Univ Med J (KUMJ). 2021 Jan-Mar;19(73):17-21. PMID: 34812152. https://doi.org/10.3126/kumj.v19i1.49529
11. Kaitu'u-Lino TJ, MacDonald TM, Cannon P, Nguyen TV, Hiscock R, Haan N, et al. Circulating SPINT1 is a biomarker of pregnancies with poor placental function and fetal growth restriction. Nat Commun. 2020 May 15;11(1):2411. https://doi.org/10.1038/s41467-020-16346-x
12. Rathod S, Samal SK. Evaluation of maternal and perinatal outcomes of induction in borderline oligohydramnios at term. J Clin Diagn Res. 2017 Sep;11(9):QC05-7. https://doi.org/10.7860/JCDR/2017/26313.10612
13. Moin S, Mushtaq R, Iftikhar B, Khan M, Akram NA, Fatima S. Low amniotic fluid index (AFI) as a predictor of adverse fetal outcomes in the third trimester of pregnancy. Pak Armed Forces Med J. 2020 Jan 27;70:117-21.
14. S R, Gayathri N. Maternal and perinatal outcomes, and associated factors in isolated borderline oligohydramnios: a cross-sectional analytical study. Int J Reprod Contracept Obstet Gynecol. 2023 Nov 28;12(12):3626-32. Available from: https://doi.org/10.18203/2320-1770.ijrcog20233646
15. Ali NT, Khattak NKH, Safoora N, Mumtaz NA. Low amniotic fluid index at term as a predictor of adverse perinatal outcome. Prof Med J. 2024 May 4;31(5):821-5. https://doi.org/10.29309/TPMJ/2024.31.05.8141
16. Jamal A, Kazemi M, Marsoosi V, Eslamian L. Adverse perinatal outcomes in borderline amniotic fluid index. Int J Reprod BioMed. 2016 Nov 1;14(11):705-8. https://doi.org/10.29252/ijrm.14.11.705
17. Talpur S, Kahn S, Abbasi A, Awan S, Avesis K, Kousar T. To analyse the significance of reduced amniotic fluid index in pregnancy and its correlation with perinatal outcome. J Soc Obstet Gynaecol Pak. 2021;11(3):217-19.