The Research of Medical Science Review
ISSN: 3007-1208 & 3007-1216 Volume 3, Issue 7, 2025

ASSOCIATION OF OLIGOHYDRAMNIOS WITH ADVERSE FETAL OUTCOMES

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DOI: https://doi.org/10.5281/zenodo.23614204

Keywords
Oligohydramnios, Apgar score, Fetal heart rate, Neonatal outcomes, Meconium-stained liquor.

Article History
Received: 25 June 2025
Accepted: 30 June 2025
Published: 07 July 2025

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Abstract

Objective *To determine the frequency of adverse fetal outcomes in pregnant women with and without oligohydramnios.*

Study Design *Comparative cross-sectional study.*

Duration and Place of Study *This study was conducted from 12 March 2025 to 11 June 2025 at the Department of Obstetrics and Gynaecology KRL Hospital Islamabad.*

Methodology *A total of 200 pregnant women, between 18 and 40 years of age, with singleton gestations beyond 34 weeks of gestation, were studied. These women were divided equally into two groups, namely oligohydramnios and normal amniotic fluid. Oligohydramnios was diagnosed when the amniotic fluid index was ≤5 cm. Exclusion criteria included women with congenital abnormalities, hypertension, placental abruption, and pre-existing renal disease. Neonatal outcome was assessed in terms of a five-minute Apgar score ≤5, abnormal heart rate pattern, intensive care unit admission, and meconium-stained amniotic fluid.*

Results *Low Apgar scores (19% vs 4%), abnormal fetal heart rate (37% vs 14%), neonatal intensive care unit admissions (19% vs 7%), and meconium-stained liquor (49% vs 12%) were significantly higher in the oligohydramnios group compared to controls (all $p<0.05$). Subgroup analyses demonstrated consistent trends across age, gestational age, and parity strata.*

Conclusion *This study demonstrated a significant association between oligohydramnios and adverse fetal outcomes, including low five-minute Apgar scores, abnormal fetal heart rate patterns, neonatal intensive care unit admissions, and meconium-stained liquor. These findings emphasize the importance of timely diagnosis, appropriate antenatal surveillance, and prompt obstetric management to improve perinatal outcomes.*

INTRODUCTION:

Oligohydramnios is an abnormally small amount of amniotic fluid and is usually diagnosed via ultrasound when the amniotic fluid index is less than 5 cm or the deepest single pocket is less than 2 cm.[1] The etiologies are diverse and may be related to the disorders of the mother such as preeclampsia, chronic hypertension, or diabetes or fetal anomalies more frequently including the urinary tract.[2] Insufficiency of the placenta and premature rupture of membranes are also important causes.[3] Since the amniotic fluid plays an imperative role in the development of the fetus via the mobility freedom, lung maturity promotion, and protection from external compression, the reduction in the volume of the amniotic fluid may endanger fetal well-being as well as long-term neonatal health.[4]

Abnormal fetal findings always accompany complicated oligohydramnios pregnancies, and this is in evidence of the condition's clinically relevant existence.[5] Abnormal five-minute and one-minute Apgar scores are more frequently observed among affected neonates, predominantly because of intrapartum hypoxia, cord compression, or compromised placental interchange.[6] Additionally , late decelerations or variable decelerations of the fetal heart tracing are normal pattern during the progression of labor, but they are signs of compromised oxygenation.[7] They usually demand operative therapy in the forms of cesarean delivery, in attempting at preventing permanent hypoxic injury.[8]

Also oligohydramnios can cause meconium-stained liquor, an adverse sign of fetal distress, and is harmful if aspirated in the neonatal lung.[9] Neonatal intensive care admissions are also high in such condition, reflecting complicated associated conditions such as respiratory distress, low birth weight, sepsis, or the necessity of neonatal advanced resuscitation.[10] These findings as a group underscore the importance of effective antenatal vigilance, prompt detection of deteriorating fetal well-being, and preparedness for neonatal care in pregnancies complicated with oligohydramnios, because timely intervention is critical in the optimization of short- and long-term outcomes.[11,12]

Moin S et al. reported that the frequency of adverse neonatal outcomes was significantly higher in pregnancies complicated by oligohydramnios compared with those with a normal amniotic fluid index. The incidence of low Apgar scores was 15.73% in the oligohydramnios group versus 3.37% in controls, while abnormal fetal heart rate patterns were observed in 29.21% compared to 13.48%. Similarly, neonatal intensive care unit admissions occurred in 15.73% of cases versus 4.49% in normal pregnancies, and meconium-stained liquor was present in 41.57% compared with 13.48%.[13]

In Pakistan, oligohydramnios is a frequent obstetric complication due to the high prevalence of risk factors in the mother such as hypertensive disorders, malnutrition, and the inadequacy of antenatal care. Regardless of its clinical significance, there is sparse local evidence of correlation of oligohydramnios with unfavorable fetal outcomes such as low Apgar scores, disturbance of fetal heart rate, neonatal intensive care admissions, and meconium-stained liquor. The study would be crucial in the production of region-based evidence, in the guidance of the decision-making on the part of the obstetrician, and in the development of the protocol that will reduce perinatal mortality and morbidity amidst limited healthcare capabilities.

Methodology:

This comparative cross-sectional study was carried out at the Department of Obstetrics and Gynaecology, KRL Hospital, Islamabad, over a three month period from 12 March 2025 to 11 June, 2025. The research was designed to evaluate the occurrence of adverse fetal outcomes among pregnant women with and without oligohydramnios. Approval for the study was obtained from the hospital's institutional review board prior to initiation. The sample size was determined using the World Health Organization sample size calculator, with a 95% confidence level and 80% statistical power. Estimates were

based on previously reported frequencies of neonatal intensive care unit admission, taken as 15.73% in cases of oligohydramnios compared with 4.49% in pregnancies with normal amniotic fluid.[13] Total sample size was 200 divided equally between the two groups.

The subjects consisted of women aged 18 to 40 years with singleton pregnancies beyond 34 weeks of gestation, irrespective of parity. The subjects were divided into two groups: one with oligohydramnios, i.e., the amniotic fluid index (AFI) was less than or equal to 5 cm, determined by ultrasonography, and the other with normal AFI, i.e., 5 to 25 cm. The exclusion criteria for the subjects were the presence of fetal anomalies, placental abruption, hypertensive disorders of pregnancy, preeclampsia, or existing renal diseases. After explaining the purpose of the research, the risks involved, and the potential benefits of the research to the subjects, informed consent was obtained. The demographic details of the subjects consisted of the age of the mother, the gestational age of the fetus, the parity of the mother, and the AFI. Each patient was given an extensive history-taking, as well as a general physical examination, including an obstetrical examination. Each patient was followed up until delivery, after which the outcome of the newborn was observed by the principal investigator using a data collection form. Adverse outcomes of interest included low Apgar scores, abnormal fetal heart rate, NICU admission, and meconium-stained liquor .

All data were analyzed using SPSS version 26. Continuous variables were summarized as mean with standard deviation. Categorical variables were presented as frequencies and percentages. Comparisons between groups were done using the chi-square test or Fisher's exact test where needed with a p-value of ≤0.05 considered statistically significant. Outcomes were stratified by maternal age, gestational age, parity and amniotic fluid index. Post stratification was done using chi-square test or Fisher's exact test with a p-value of ≤0.05 considered statistically significant.

Results:

In patients of the oligohydramnios group mean age was 29.28±6.46 years compared to 27.70±6.51 years in the normal AFI group with identical gestational ages of 37.87±2.67 weeks and 37.87±2.72 weeks . Parity was higher in the oligohydramnios group 2.16±1.50 versus 1.87±1.40. AFI values differed significantly between groups with oligohydramnios patients showing markedly reduced levels at 3.12±1.17 compared to 13.26±4.07 in the normal AFI group as shown in Table-I.

Table-I: Patient Demographics

Demographics	Oligohydramnios Group (n=100)	Normal AFI Group (n=100)
	Mean ± SD	Mean ± SD
Age (years)	29.28±6.46	27.70±6.51
Gestational Age (weeks)	37.87±2.67	37.87±2.72
Parity	2.16±1.50	1.87±1.40
AFI	3.12±1.17	13.26±4.07

Low Apgar scores was more prevalent in the oligohydramnios group affecting 19 patients (19.0%) compared to only 4 patients (4.0%) in the normal AFI group (p<0.001). Abnormal fetal

heart rate patterns occurred in 37 patients (37.0%) in the oligohydramnios group versus 14 patients (14.0%) in the control group (p<0.001). NICU admissions were required for 19 patients (19.0%) in the oligohydramnios group compared to 7 patients (7.0%) in the normal AFI group (p<0.012). Meconium-stained liquor was observed in 49 patients (49.0%) with oligohydramnios compared to 12 patients (12.0%) with normal AFI (p<0.001) (as shown in Table-II).

Table-II: Comparison of Adverse Fetal Outcomes Between the Two Groups

Adverse Outcomes	Oligohydramnios Group n=100 n (%)	Normal AFI Group n=100 n (%)	P value
Low Apgar Score			
Yes	19 (19.0%)	4 (4.0%)	<0.001*
No	81 (81.0%)	96 (96.0%)	
Abnormal FHR			
Yes	37 (37.0%)	14 (14.0%)	<0.001
No	63 (63.0%)	86 (86.0%)	
NICU Admission			
Yes	19 (19.0%)	7 (7.0%)	<0.012
No	81 (81.0%)	93 (93.0%)	
Meconium Stained Liquor			
Yes	49 (49.0%)	12 (12.0%)	<0.001
No	51 (51.0%)	88 (88.0%)	

*Fisher Exact Test

Oligohydramnios has also been associated with significantly increased rates of low Apgar scores and abnormal FHR in most age groups, gestational age groups, and parity groups. The statistically significant differences were found for patients with age ≤30 years (low Apgar), gestational age ≤39 weeks (low Apgar), gestational age >39 weeks (abnormal FHR), and parity ≤3 (p<0.05). There were no statistically significant differences for patients with age >30 years and parity >3 for Apgar scores and FHR as shown in Table-III.

Table-III: Association of Low Apgar Score and Abnormal FHR with Demographic Variables

Demographics Variables	Group	Low Apgar Score		P-value	Abnormal FHR		P-value
		Yes n (%)	No n (%)		Yes n (%)	No n (%)	
Age (years)							
≤30	Oligohydramnios	8 (14.5%)	47 (85.5%)	0.006*	21 (38.2%)	34 (61.8%)	0.003
	Normal AFI	1 (1.5%)	64 (98.5%)		9 (13.8%)	56 (86.2%)	

>30	Oligohydramnios	11 (24.4%)	34 (75.6%)	0.087*	16 (35.6%)	29 (64.4%)	0.036
	Normal AFI	3 (8.6%)	32 (91.4%)		5 (14.3%)	30 (85.7%)	
Gestational Age (weeks)							
≤39	Oligohydramnios	12 (18.8%)	52 (81.3%)	0.003*	17 (26.6%)	47 (73.4%)	0.259
	Normal AFI	2 (3.0%)	65 (97.0%)		12 (17.9%)	55 (82.1%)	
>39	Oligohydramnios	7 (19.4%)	29 (80.6%)	0.169*	20 (55.6%)	16 (44.4%)	<0.001
	Normal AFI	2 (6.1%)	31 (93.9%)		2 (6.1%)	31 (93.9%)	
Parity							
≤3	Oligohydramnios	12 (14.8%)	69 (85.2%)	0.003*	30 (37.0%)	51 (63.0%)	<0.001
	Normal AFI	2 (2.4%)	82 (97.6%)		11 (13.1%)	73 (86.9%)	
>3	Oligohydramnios	7 (36.8%)	12 (63.2%)	0.145*	7 (36.8%)	12 (63.2%)	0.455*
	Normal AFI	2 (12.5%)	14 (87.5%)		3 (18.8%)	13 (81.3%)	

***Fisher Exact Test**

The incidence of NICU admission was more common in the oligohydramnios group at all strata of age, gestational age, and parity, although not statistically significant ($p > 0.05$). On the other hand, the incidence of meconium-stained liquor was significantly higher in the oligohydramnios group at all age groups, gestational age ≤ 39 weeks, and parity ≤ 3, as shown in Table IV

Table-IV: Association of NICU Admission and Meconium Stained Liquor with Demographic Variables

Demographics Variables	Group	NICU Admission		P-value	Meconium Stained Liquor		P-value
		Yes n (%)	No n (%)		Yes n (%)	No n (%)	
Age (years)							
≤30	Oligohydramnios	10 (18.2%)	45 (81.8%)	0.117	23 (41.8%)	32 (58.2%)	<0.001
	Normal AFI	5 (7.7%)	60 (92.3%)		8 (12.3%)	57 (87.7%)	
>30	Oligohydramnios	9 (20.0%)	36 (80.0%)	0.149*	26 (57.8%)	19 (42.2%)	<0.001
	Normal AFI	2 (5.7%)	33 (94.3%)		4 (11.4%)	31 (88.6%)	

Gestational Age (weeks)							
≤39	Oligohydramnios	10 (15.6%)	54 (84.4%)	0.106*	32 (50.0%)	32 (50.0%)	<0.001
	Normal AFI	4 (6.0%)	63 (94.0%)		10 (14.9%)	57 (85.1%)	
>39	Oligohydramnios	9 (25.0%)	27 (75.0%)	0.138*	17 (47.2%)	19 (52.8%)	<0.001
	Normal AFI	3 (9.1%)	30 (90.9%)		2 (6.1%)	31 (93.9%)	
Parity							
≤3	Oligohydramnios	15 (18.5%)	66 (81.5%)	0.129	38 (46.9%)	43 (53.1%)	<0.001
	Normal AFI	7 (8.3%)	77 (91.7%)		12 (14.3%)	72 (85.7%)	
>3	Oligohydramnios	4 (21.1%)	15 (78.9%)	0.121*	11 (57.9%)	8 (42.1%)	<0.001*
	Normal AFI	0 (0.0%)	16 (100.0%)		0 (0.0%)	16 (100.0%)	

***Fisher Exact Test**

Discussion:

Our findings aligns closely with multiple studies demonstrating the significant association between oligohydramnios and adverse perinatal outcomes. The 19% incidence of low Apgar scores in our oligohydramnios group is consistent with Karim R, et al. [14] who reported 44% of neonates with 1-minute Apgar <7, and Aneela, et al. [15] who found 43.35% with 1-minute Apgar <7 and 23.2% with 5-minute Apgar < 7. While our absolute percentages are lower, the pattern of significantly increased risk remains consistent across studies with the variations likely reflecting different Apgar score thresholds and population characteristics . The 37% incidence of abnormal fetal heart rate patterns in our study similar to Umber A [16] who reported FHR decelerations in 48% of oligohydramnios cases versus 38.8% in controls and Abdul Basit, et al. [17] who documented 5% variable FHR decelerations. Our NICU admission rate of 19% falls within the range reported in similar studies with Karim R, et al.[14] showing 28% admission rates, Kausar S, et al.[18] documenting 25.9% and Mohammed et al.[19] finding the highest rate at 58.5%. The variation in NICU admission rates likely reflects institutional practices, admission criteria, and the severity of oligohydramnios, with our study population potentially having less severe cases compared to Mohammed et al.[19] cohort which included more preterm deliveries. The most striking finding in our study was the 49% incidence of meconium-stained liquor, which is substantially higher than most previous reports. Masood N et al.[20] found 58% in their low AFI group, while Karim R et al. [14] reported 30%, and other studies showed considerably lower rates ranging from 6-11%. This discrepancy may be attributed to our specific study population characteristics, different AFI cut-off values, or variations in gestational age at delivery, as meconium passage is more common in post-term pregnancies.

Our study showed particularly pronounced effects in older gestational ages, which differs from some studies that focused primarily on term pregnancies. This suggests that the timing of oligohydramnios development and its duration may significantly influence outcome severity. The cesarean delivery rates in our comparison studies

varied considerably, with Aneela et al. [15] showing 67.1%, and Mohammed et al.[19] documenting 47%. While we did not specifically analyze delivery mode, these high cesarean rates in oligohydramnios pregnancies support our findings of increased fetal compromise, as evidenced by abnormal FHR patterns and low Apgar scores necessitating operative interventions. Interestingly, Sultana et al.[21] concluded that AFI alone was a poor predictor of adverse outcomes, finding no significant differences between groups. This is in marked contrast to our findings and the majority of the existing research, which could be attributed to the fact that the latter studies focused on high-risk pregnancies, where the presence of other factors might mask the role of oligohydramnios, or to the smaller sample sizes and definitions of outcomes, although the majority of the evidence, including our study, supports the fact that there is a significant link between reduced amounts of amniotic fluid and poor outcomes.

However certain limitations must be underscored in the interpretation of the study. Firstly, the study was carried out in a single center, and this might affect the extension of the study to the rest of the population due to differences in demographic characteristics, clinical practices, and the availability of facilities. Although the number of participants were adequate to show a statistically significant difference in the primary outcomes, it might not have been adequate to show a significant association in smaller subgroups. Additionally, the study did not account for potential confounding variables such as maternal comorbidities, socio-economic factors, and differences in prenatal care, which might affect AFI values and perinatal outcomes.

Conclusion:

This study demonstrated a significant association between oligohydramnios and adverse fetal outcomes, including low five-minute Apgar scores, abnormal fetal heart rate patterns, neonatal intensive care unit admissions, and meconium-stained liquor. These findings emphasize the importance of timely diagnosis, appropriate antenatal surveillance, and prompt obstetric management to improve perinatal outcomes. Further multicenter studies are recommended to validate these findings.

Conflict of interest: None

Disclaimer: None

Statement of Ethics: This research was performed in accordance with relevant guidelines and written informed consent was obtained from all the participants or their legal guardians. This study was approved by Ethical Review Committee of KRL Hospital, Islamabad vide No. ERC:KRL-HI-ERC/Marc24/09 dated 12-03-2024 and conducted ethically in accordance with the World Medical Association Declaration of Helsinki.

Acknowledgments:

We would like to express our sincere thanks to the healthcare staff of the department for their dedication to the precise documentation of the information, which has greatly helped us with our work.

Author's Contribution:

Author 1

Substantial contributions to study design, acquisition of data, Analysis & Interpretation of Data, Manuscript writing

Author 2,3

Substantial contributions to concept, study design, data Analysis, Manuscript writing, Critical Review

Author 4,5,6

Substantial contributions to study design, Data Analysis & Interpretation, Critical Review

All authors

Have given final approval of the version to be published

Agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved

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