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Perinatal Outcome in Term Oligohydramnios

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ABSTRACT

Background: Isolated term oligohydramnios is a clinical problem which is associated with potential adverse perinatal outcomes. In the absence of other maternal or fetal abnormalities, diagnosis and management of the condition are still focal points of clinical divergence. Characterizing the outcome profile of such cases is essential for proper intervention on schedule, most especially for resource-lacking settings. **Objective:** To determine the frequency of perinatal complications in patients with isolated oligohydramnios at term pregnancy. **Study Design:** Descriptive cross-sectional study. **Duration and Place of Study:** This study was conducted from June 2024 to November 2024 at the Department of Obstetrics and Gynaecology, Saidu Group of Teaching Hospital Swat. **Methodology:** A total of 113 term pregnant women aged 18 to 40 years with singleton cephalic pregnancies and confirmed isolated oligohydramnios were enrolled. Patients with hypertension, fetal anomalies, IUGR, PROM, and NSAID exposure were excluded. Demographic and clinical characteristics were recorded. Perinatal outcomes analyzed included mode of delivery, low APGAR score at 5 minutes, low birth weight and NICU admission. **Results:** Among 113 patients, 69.9% underwent cesarean section and 30.1% delivered vaginally. Low APGAR scores at 5 minutes were seen in 31.9% of neonates, 39.8% had low birth weight, and 38.9% required NICU admission. NICU admission was significantly associated with maternal age (p=0.007) and parity (p=0.004). Low birth weight was significantly associated with gestational age (p<0.001), while low APGAR scores had a significant association with socioeconomic status (p=0.010). **Conclusion:** Isolated oligohydramnios at term is associated with high cesarean rates and increased risk of neonatal complications including low APGAR scores, low birth weight, and NICU admissions

INTRODUCTION

Oligohydramnios refers to an abnormality where there is reduction of amniotic fluid volume.[1] It is usually diagnosed when there is an amniotic fluid index (AFI) below 5 cm or the single deepest pocket below 2 cm.[2] It occurs due to several etiology such as fetus growth restriction, placental insufficiency, membrane break, or post-date pregnancy.[3] During term pregnancies, oligohydramnios of concern occurs due to the suggestion of compromised health of the fetus.[4] The amniotic fluid plays a crucial role in the maturation of the fetus since cushioning off against injury, movement, as well as maturation of the respiratory and skeletal musculature, is facilitated.[5] Reduction of its volume is, however, an indicator of placental insufficiency and needs close surveillance.[6]

Perinatal issues involved with term oligohydramnios are significant and necessitate close obstetric monitoring. Fetal distress is one of the most frequently reported outcomes, and it could be manifested as abnormal cardiotocographic tracings.[7] Compression of the umbilical cord is more likely in an environment of restriction of fluid, leading to intermittent or persistent decelerations of the fetus's heart rate.[8] Additionally, intrauterine growth restriction (IUGR) is most commonly associated with oligohydramnios, as an expression of chronic placental insufficiency.[9] Meconium-stained liquor and meconium aspiration syndrome are also more common, and they have the capacity to induce neonatal respiratory compromise.[10] These challenges can collectively induce an increased risk of perinatal morbidity as well as mortality. The risk of caesarean section is significantly high for term oligohydramnios, partly because of an increased incidence of fetal distress and non-reassuring patterns of fetal heart rate.[11] Obstetricians are more likely to interfere surgically where there is oligohydramnios for fear of neonatal adverse outcomes.[11] Additionally, the Apgar score, also known as an assessment tool for ascertaining the newborn infant's health status immediately after birth, is usually lower for these conditions.[12] Abnormally low scores of 1 and 5-minute Apgar score are predictive of an inability to adapt to extrauterine life and could indicate intrinsic hypoxia or asphyxia, for instance, which would require

neonatal resuscitation and intensive care immediately.[13] Low birth weight (LBW), involving birth weight below 2500 grams, is frequent among neonates born of term mothers who have term oligohydramnios.[14] Chronic placental insufficiency, typically underlying, tends to restrict the growth of the fetus, producing LBW neonates that are susceptible to disturbances of metabolism, hypothermia, and infection.[15] As such, more of these neonates are admitted into the neonatal intensive care unit (NICU) for close observation and supportive care.[16] Admission into the NICU is a significant step that ensures neonatal outcomes are better, where respiratory support, thermoregulation, and close observation for neonatal problems resulting from intrauterine compromise are obtained.[16]

In a study conducted by Biradar et al, 62% of term pregnant women diagnosed with oligohydramnios underwent lower segment cesarean section, with fetal distress identified as the most frequent indication. Low birth weight, defined as less than 2.5 kg, was observed in 38.6% of neonates. Additionally, 25% of newborns had an Apgar score below 7 at one minute, and 40% required admission to the neonatal intensive care unit (NICU).[17]

A pressing necessity for this research is presented by the setting of Swat because perinatal outcomes of term oligohydramnios have not been locally generated yet. Geographic, socio-economic, as well as healthcare delivery characteristics of the region, can have the potential of influencing presentation as well as management of these high-risk pregnancies. What has otherwise been published is largely founded on urban or tertiary care institutional settings, which might not present true realities for patients as well as healthcare providers of the setting of Swat. This research can, as its contribution, bridge gaps between antenatal surveillance, bring forth the burden of adverse outcomes, and inform measures to fortify maternal as well as neonatal health care strategies of the region.

METHODOLOGY

This descriptive cross-sectional study was conducted over a six-month period, from June to November 2024, at the Department of Obstetrics and Gynaecology, Saidu Group of Teaching Hospital Swat. A total of 113 pregnant women presenting at term were enrolled. The sample size was calculated using the WHO calculator, incorporating a 95% confidence level, 6% absolute precision, and a reported prevalence of 12% for isolated oligohydramnios from previous literature.[17]

Women between 18 to 40 years of age with a confirmed singleton intrauterine pregnancy in cephalic presentation and a gestational age between 37 to 40 weeks were eligible. Gestational age was verified either through a reliable menstrual history or first-trimester ultrasound. Both primigravida and multigravida were included. Exclusion criteria were strictly observed and included women diagnosed with hypertensive disorders (defined as blood pressure exceeding 140/90 mmHg), those with prelabor rupture of membranes confirmed via clinical examination, users of NSAIDs as identified through medical records, and pregnancies complicated by either congenital anomalies or fetal growth restriction observed on ultrasonographic and Doppler evaluation.

Upon obtaining ethical clearance from the hospital review board, patients who met the inclusion criteria and consented to participate were assessed during their routine third-trimester antenatal visit. Detailed demographic data were obtained, including maternal age, gestational age at presentation, parity, income, area of residence, professional background, education level, and socioeconomic classification. A thorough physical assessment including fundal height was performed. All participants underwent obstetric ultrasonography. Those found to have an amniotic fluid index (AFI) less than 5 cm without identifiable maternal or fetal causes were classified as having isolated oligohydramnios. Conditions excluded from this diagnosis were hypertension, smoking, NSAID exposure, prelabor rupture of membranes, congenital anomalies, and intrauterine growth restriction. Eligible patients were managed according to institutional protocols under the care of a consultant obstetrician with a minimum of five years of experience. The mode of delivery was determined based on clinical judgment. Delivery-related complications were closely monitored. Perinatal outcomes of interest included operative delivery through lower segment cesarean section specifically due to reduced amniotic fluid volume, low APGAR scores at 5 minutes (defined as scores below 7 based on standard assessment criteria for appearance, pulse, grimace, activity, and respiration), birth weight under 2.5 kilograms measured on calibrated scales, and need for neonatal intensive care unit (NICU) admission within the first 24 hours of life. Neonates requiring intensive care were admitted and treated accordingly.

All collected data were entered and analyzed using SPSS version 23. Quantitative variables such as maternal age and gestational age were presented as means and standard deviations; where data deviated from normal distribution based on the Shapiro-Wilk test, median and interquartile range (IQR) were reported. Categorical variables were described using frequencies and percentages. Potential confounders were addressed through stratification, and post-stratification associations were evaluated using chi-square or Fisher's exact test where appropriate. A p-value of ≤ 0.05 was considered statistically significant.

RESULTS

The mean age was 29.73±6.66 years, with a mean parity of 2.42±1.90 and mean gestational age of 39.10±1.43 weeks. The majority of patients (65.5%, n=74) resided in urban areas, while 34.5% (n=39) were from rural areas. Regarding socioeconomic status, 38.9% (n=44) were classified as poor, 38.1% (n=43) as middle class, and 23.0% (n=26) as high socioeconomic status (as shown in Table 1).

Table 1

Patient Demographics (n=113)

Demographics		Mean ± SD
Age (years)		29.73±6.66
Parity		2.42±1.90
Gestational Age (weeks)		39.10±1.43
Residence	Urban n (%)	74 (65.5%)
	Rural n (%)	39 (34.5%)
Socioeconomic Status	Poor n (%)	44 (38.9%)
	Middle n (%)	43 (38.1%)
	High n (%)	26 (23.0%)

Perinatal outcomes revealed that 69.90% (n=79) of deliveries were via cesarean section compared to 30.10% (n=34) vaginal deliveries. Low APGAR scores at 5 minutes were observed in 31.90% (n=36) of cases, while 39.80% (n=45) had low birth weight. NICU admission was required for 38.90% (n=44) of newborns (as shown in Table 2).

Table 2

Frequency of Perinatal Outcomes in Term Oligohydramnios

Perinatal Outcomes		Frequency	% age
Mode of Delivery	Vaginal	34	30.10%
	C-section	79	69.90%
Low APGAR Score at 5 min	Yes	36	31.90%
	No	77	68.10%
Low Birth Weight	Yes	45	39.80%
	No	68	60.20%
NICU Admission	Yes	44	38.90%
	No	69	61.10%

In further analysis, for age groups, patients ≤30 years had vaginal delivery rates of 33.9% (n=20) versus 25.9% (n=14) in those >30 years (p=0.356). Low APGAR scores were nearly identical between age groups: 32.2% (n=19) in ≤30 years versus 31.5% (n=17) in >30 years (p=0.934). Low birth weight occurred in 35.6% (n=21) of patients ≤30 years compared to 44.4% (n=24) in those >30 years (p=0.337). However, NICU admission rates showed a significant difference, with 50.8% (n=30) in the ≤30 years group versus 25.9% (n=14) in the >30 years group (p=0.007). Regarding parity, patients with ≤3 pregnancies had vaginal delivery rates of 30.1% (n=25) versus 30.0% (n=9) in those with >3 pregnancies (p=0.99). Low APGAR scores were observed in 33.7% (n=28) of patients with ≤3 pregnancies versus 26.7% (n=8) in those with >3 pregnancies (p=0.476). Low birth weight rates were 36.1% (n=30) in the ≤3 parity group versus 50.0% (n=15) in the >3 parity group (p=0.184). NICU admission showed a significant association with parity, occurring in 47.0% (n=39) of patients with ≤3 pregnancies versus 16.7% (n=5) in those with >3 pregnancies (p=0.004). For gestational age, patients with ≤39 weeks had vaginal delivery rates of 31.7% (n=20) versus 28.0% (n=14) in those >39 weeks (p=0.666). Low APGAR scores were more frequent in the ≤39 weeks group at 38.1% (n=24) versus 24.0% (n=12) in the >39 weeks group (p=0.110). Low birth weight showed a highly significant association, with 55.6% (n=35) in the ≤39 weeks group versus 20.0% (n=10) in the >39 weeks group (p<0.001). NICU admission rates were 36.5% (n=23) and 42.0% (n=21) respectively (p=0.552). Urban versus rural residence showed minimal differences across all outcomes, with vaginal delivery rates of 29.7% (n=22) versus 30.8% (n=12) (p=0.909), low APGAR scores of 29.7% (n=22) versus 35.9% (n=14) (p=0.504), low birth weight of 36.5% (n=27) versus 46.2% (n=18) (p=0.318), and NICU admission rates of 33.8% (n=25) versus 48.7% (n=19) (p=0.122). Socioeconomic status revealed interesting patterns, with poor patients having the highest vaginal delivery rate at 40.9% (n=18) compared to 23.3% (n=10) in middle class and 23.1% (n=6) in high socioeconomic groups (p=0.135). Low APGAR scores showed a significant association (p=0.010), with rates of 31.8% (n=14) in poor, 18.6% (n=8) in middle class, and notably 53.8% (n=14) in high socioeconomic status patients. Low birth weight rates were similar across groups: 38.6% (n=17) in poor, 37.2% (n=16) in middle class, and 46.2% (n=12) in high socioeconomic status patients (p=0.747). NICU admission rates were 36.4% (n=16), 44.2% (n=19), and 34.6% (n=9) respectively (p=0.662) (as shown in Table 3).

Table 3

Association of Perinatal Outcomes with Demographic Factors

Demographic Factors		Mode of Delivery		p-value	Low APGAR Score at 5 min		p-value	Low Birth Weight		p-value	NICU Admission		p-value
		Vaginal n(%)	C-section n(%)		Yes n(%)	No n(%)		Yes n(%)	No n(%)		Yes n(%)	No n(%)	
Age Group	≤30	20 (33.9%)	39 (66.1%)	0.356	19 (32.2%)	40 (67.8%)	0.934	21 (35.6%)	38 (64.4%)	0.337	30 (50.8%)	29 (49.2%)	0.007
	>30	14 (25.9%)	40 (74.1%)		17 (31.5%)	37 (68.5%)		24 (44.4%)	30 (55.6%)		14 (25.9%)	40 (74.1%)	
Parity Group	≤3	25 (30.1%)	58 (69.9%)	0.99	28 (33.7%)	55 (66.3%)	0.476	30 (36.1%)	53 (63.9%)	0.184	39 (47.0%)	44 (53.0%)	0.004*
	>3	9 (30.0%)	21 (70.0%)		8 (26.7%)	22 (73.3%)		15 (50.0%)	15 (50.0%)		5 (16.7%)	25 (83.3%)	
Gestational Age Group	≤39	20 (31.7%)	43 (68.3%)	0.666	24 (38.1%)	39 (61.9%)	0.110	35 (55.6%)	28 (44.4%)	<0.001*	23 (36.5%)	40 (63.5%)	0.552
	>39	14 (28.0%)	36 (72.0%)		12 (24.0%)	38 (76.0%)		10 (20.0%)	40 (80.0%)		21 (42.0%)	29 (58.0%)	
Residence	Urban	22 (29.7%)	52 (70.3%)	0.909	22 (29.7%)	52 (70.3%)	0.5[illegible]4	27 (36.5%)	47 (63.5%)	0.3[illegible]8	25 (33.8%)	49 (66.2%)	0.122
	Rural	12 (30.8%)	27 (69.2%)		14 (35.9%)	25 (64.1%)		18 (46.2%)	21 (53.8%)		19 (48.7%)	20 (51.3%)	
Socioeconomic Status	Poor	18 (40.9%)	26 (59.1%)		14 (31.8%)	30 (68.2%)		17 (38.6%)	27 (61.4%)		16 (36.4%)	28 (63.6%)	
	Middle	10 (23.3%)	33 (76.7%)	0.135	8 (18.6%)	35 (81.4%)	0.010	16 (37.2%)	27 (62.8%)	0.747	19 (44.2%)	24 (55.8%)	0.662
	High	6 (23.1%)	20 (76.9%)		14 (53.8%)	12 (46.2%)		12 (46.2%)	14 (53.8%)		9 (34.6%)	17 (65.4%)	

*Fisher's exact test

DISCUSSION

Current research demonstrates that term oligohydramnios has been associated with high perinatal morbidity, as cesarean section percentages reach 69.9%, and high percentages of low APGAR scores (31.9%), low birth weight (39.8%), and admission to NICU (38.9%) are reached. These findings are correlated to the pathophysiology that amniotic fluid decreases the cushion protective effect so that the fetus is susceptible to umbilical compression as labor proceeds, resulting in resultant fetal hypoxia, for which an operative delivery is required to avoid further compromise. Fetal distress patterns on labor monitoring are implicated as the cause of the resultant cesarean section percentage, as lower amniotic fluid volume increases patients' risk for cord compression as uterine contractions continue, and obstetricians opt for support of surgical delivery for certainty of fetal safety.

The very strong link between young maternal age (≤30 years) and high admission to NICU rates (50.8% vs 25.9%) might represent an additive effect of being primigravida often accompanying young mothers and their presumably immatures uterofetal physiological adaptations. Similarly, the very strong link between being of lower parity (≤3 pregnancies) and higher admission to NICU rates (47.0% vs 16.7%) might signify that multiparous women have better uterine contractility patterns and uteroplacental vascular growth, potentially counterbalancing certain toxic effects of oligohydramnios. The very significant link between earlier maturity (≤39 weeks) and lower birth weight (55.6% vs 20.0%) indicates that oligohydramnios might have special risk augmentation antedating full maturity of the fetus, as the combination of smaller amniotic fluid volume and relative prematurity increases several-fold the risk of intrauterine growth restriction. Lacking an explanation, the surprising fact that patients of high socio-economic status had the highest incidence of low APGAR scores (53.8%) is worth further clarification, as that might signify various obstetric management strategies, timing of delivery determination, or pre-existing maternal conditions being disproportionately represented amongst those of high socio-economic group. Our cesarean section rate of 69.9% is notably higher than most comparable studies, including Singh S, et al. [18] who reported 48% cesarean rates in oligohydramnios cases versus 22% in controls, and Nagpal A, et al. [19] who documented 40% cesarean rates in their oligohydramnios group. However, our findings are more consistent with the elevated operative delivery rates observed in severe oligohydramnios cases, suggesting that our study population may have included more severe cases or that institutional protocols for fetal monitoring were more stringent. The lower cesarean rates in some studies may reflect differences in AFI thresholds, patient populations, or management protocols, as Gandotra N, et al. [20] reported only 29% cesarean deliveries but included a younger population with mean age of 25.6 years compared to our 29.73 years.

The significant association between younger maternal age (≤30 years) and increased NICU admission rates (50.8% vs 25.9%) may reflect the combined effect of primigravida status often associated with younger mothers and their potentially less developed maternal-fetal physiological adaptations. This finding contrasts with the general obstetric literature where advanced maternal age is typically associated with worse outcomes, but aligns with Gandotra N, et al. [20] who studied a predominantly young population (64% aged 20–25 years) and found high rates of adverse outcomes including 13% NICU admissions for 1-minute APGAR <7. Our overall NICU admission rate of 38.9% is comparable to Singh S, et al. [18] who reported 40% NICU admissions in oligohydramnios cases, and Milani F, et al. [21] who documented 30% NICU admissions in their oligohydramnios group, suggesting consistency across different populations and healthcare settings.

Similarly, the strong correlation between lower parity (≤3 pregnancies) and higher NICU admission rates (47.0% vs 16.7%) suggests that multiparous women may have more efficient uterine contractility patterns and better developed uteroplacental circulation, potentially mitigating some adverse effects of oligohydramnios. This finding is supported by Bumrah S, et al.[22] who noted that 55% of their oligohydramnios patients were primigravida, though they reported lower NICU admission rates of 26.6%, which may reflect their inclusion of earlier gestational ages (≥28 weeks) and finding that isolated oligohydramnios carried lower morbidity.

The highly significant association between earlier gestational age (≤39 weeks) and low birth weight (55.6% vs 20.0%) indicates that oligohydramnios may be particularly detrimental when occurring before full fetal maturation, as the combination of reduced amniotic fluid and relative prematurity compounds the risk of growth restriction. Our low birth weight rate of 39.8% falls within the range reported by other studies, with Gandotra N, et al. [20] documenting the highest rate at 66% of neonates weighing <2.5 kg, while Milani F, et al. [21] reported 30% low birth weight in their oligohydramnios group compared to 7.1% in normal AFI cases. Nagpal A, et al. [19] found 32.1% low birth weight in their oligohydramnios group, demonstrating the consistent association between reduced amniotic fluid and fetal growth restriction across different populations.

Our low APGAR score rate of 31.9% at 5 minutes is substantially higher than most comparative studies, with Gandotra N, et al. [20] reporting only 4% with 5-minute APGAR <7, Singh S, et al. [18] documenting 4.2% with 5-minute APGAR <7, and Manzoor S, et al. [23] finding 8.5% with 5-minute APGAR <7. This difference may reflect variations in APGAR scoring criteria, delivery room management protocols, or the severity of oligohydramnios in our study population. The unexpected finding that high socioeconomic status patients had the highest rate of low APGAR scores (53.8%) warrants further investigation, as this may reflect differences in obstetric management approaches, timing of delivery decisions, or underlying maternal conditions that are more prevalent in this demographic group.

Interestingly, our study's demographic profile differs from several comparative studies, with a higher mean maternal age of 29.73 years compared to Gandotra N, et al. [20] at 25.6 years and Bumrah S, et al. [22] at 25.3 years, which may contribute to the differences in outcomes observed. The reassuring findings from Manzoor S, et al. [23] who reported no significant perinatal mortality in isolated oligohydramnios cases, and Bumrah S, et al. [22] who found that isolated oligohydramnios carried low morbidity with only 20% SGA babies in idiopathic cases, suggest that the presence of additional risk factors may be crucial determinants of adverse outcomes. This emphasizes the need for broad risk stratification for the management of oligohydramnios, since the combination of decreased amniotic fluid volume together with other maternal or fetal risk factors is thought to have a synergistic effect on perinatal morbidity.

Several limitations exist for this study. It is one-center, and results may not generalize to other centers. It also has a relatively small sample of 113 patients, which could reduce the power of the study for identifying subtler associations between variables. Larger multicenter trials are recommended as a way to confirm and generalize these results.

CONCLUSION

Our study has confirmed that term oligohydramnios is actually strongly associated with perinatal adverse outcomes, including increased cesarean delivery rate, decreased birth weight, decreased APGAR score, and admission to the NICU. These findings reconfirm the clinical importance of the prompt diagnosis and careful management of oligohydramnios for decreasing perinatal risks.

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REFERENCES

1. Huri M, Di Tommaso M, Seravalli V. Amniotic fluid disorders: from prenatal management to neonatal outcomes. Children (Basel). 2023;10(3):561. https://doi.org/10.3390/children10030561.
2. Twesigomwe G, Migisha R, Agaba DC, Owaraganise A, Aheisibwe H, Tibaijuka L, et al. Prevalence and associated factors of oligohydramnios in pregnancies beyond 36 weeks of gestation at a tertiary hospital in southwestern Uganda. BMC Pregnancy Childbirth. 2022;22(1):610. https://doi.org/10.1186/s12884-022-04939-x.
3. Beke A, Simonyi A. Association of neonatal and fetal malformations with polyhydramnios and oligohydramnios - introduction of a new "association factor". BMC Pregnancy Childbirth. 2025;25(1):707. https://doi.org/10.1186/s12884-025-07797-5.
4. Irfan A, O'Hare E, Jelin E. Fetal interventions for congenital renal anomalies. Transl Pediatr. 2021;10(5):1506-1517. https://doi.org/10.21037/tp-2020-fs-05.
5. Shinde A, Chaudhari K, Dewani D, Shrivastava D. Effect of amino acid infusion on amniotic fluid index in pregnancies associated with oligohydramnios and fetal growth restriction. Cureus. 2023;15(5):e39027. https://doi.org/10.7759/cureus.39027.
6. Gao H, Tao H, Zou L, Luo QQ, Zhang WY. A multicenter retrospective cohort study of pregnancy outcomes in idiopathic oligohydramnios at term. Int J Womens Health. 2025;17:1665-1672. https://doi.org/10.2147/IJWH.S508609.
7. Sawant AA, Wankhede S, Thakare S, Narayan GN, Saha I, Vernekar A, et al. Maternal and perinatal outcomes in oligohydramnios: a cross-sectional analysis of pregnancies between 28 to 42 weeks of gestation. Cureus. 2025;17(2):e79232. https://doi.org/10.7759/cureus.79232.
8. Li YL, Zhen L, Lin XM, Qin JC, Li DZ. Prenatal genetic investigation in pregnancies with oligohydramnios: results from a single referral medical center. Taiwan J Obstet Gynecol. 2024;63(6):836–40. https://doi.org/10.1016/j.tjog.2024.08.002.
9. Leytes S, Kovo M, Weiner E, Ganer Herman H. Isolated oligohydramnios in previous pregnancy is a risk factor for a placental related disorder in subsequent delivery. BMC Pregnancy Childbirth. 2022;22(1):912. https://doi.org/10.1186/s12884-022-05230-9.
10. Abate E, Alamirew K, Admassu E, Derbie A. Prevalence and factors associated with meconium-stained amniotic fluid in a tertiary hospital, northwest Ethiopia: a cross-sectional study. Obstet Gynecol Int. 2021;2021:5520117. https://doi.org/10.1155/2021/5520117.
11. Dammer U, Pretscher J, Weiss C, Schneider M, Faschingbauer F, Beckmann MW, et al. Perinatal outcome in pregnant women with isolated oligohydramnios diagnosed with the single deepest pocket method. In Vivo. 2024;38(2):754-760. https://doi.org/10.21873/invivo.13498.
12. Yeshaneh A, Kassa A, Kassa ZY, Adane D, Fikadu Y, Wassie ST, et al. The determinants of 5th minute low Apgar score among newborns who delivered at public hospitals in Hawassa City, South Ethiopia. BMC Pediatr. 2021;21(1):266. https://doi.org/10.1186/s12887-021-02745-6.
13. Huang S, Yitayew M, Rozycki HJ. The contribution of low Apgar scores in identifying neonates with short-term morbidities in a large single center cohort. J Perinatol. 2024;44(6):865-872. https://doi.org/10.1038/s41372-024-01944-0.
14. Kasuga Y, Ikenoue S, Tamagawa M, Oishi M, Endo T, Sato Y, et al. What are the causes for low birthweight in Japan? a single hospital-based study. PLoS One. 2021;16(6):e0253719. https://doi.org/10.1371/journal.pone.0253719.
15. Rosa-Mangeret F, Benski AC, Golaz A, Zala PZ, Kyokan M, Wagner N, et al. 2.5 million annual deaths-are neonates in low- and middle-income countries too small to be seen? a bottom-up overview on neonatal morbi-mortality. Trop Med Infect Dis. 2022;7(5):64. https://doi.org/10.3390/tropicalmed7050064.
16. Sgayer I, Elafawi M, Braude O, Abramov S, Lowenstein L, Odeh M. Perinatal outcomes of pregnancies with borderline oligohydramnios at term. Fetal Diagn Ther. 2025;52(1):59-64. https://doi.org/10.1159/000541008.
17. Biradar KD, Shamanewadi AN. Maternal and perinatal outcome in oligohydramnios: study from a tertiary care hospital, Bangalore, Karnataka, India. Int J Reprod Contracept Obstet Gynecol. 2016;5(7):2291-4.
18. Singh S, Gautam P. Perinatal outcome in oligohydramnios (AFI<5) at term. Int J Acad Med Pharm. 2023;5(3):1280–5. https://doi.org/10.47009/jamp.2023.5.3.261.
19. Nagpal A, Girotra P, Nagpal D, Nagpal L, Nagpal SK. Perinatal outcome in term pregnancy with oligohydramnios. Int J Clin Obstet Gynaecol. 2021;5(5):39–41. https://doi.org/10.33545/gynae.2021.v5.i5a.1015.
20. Gandotra N, Mahajan N, Manhas A. Perinatal outcome associated with oligohydramnios at term. Int J Reprod Contracept Obstet Gynecol. 2020;9:3576–9. https://doi.org/10.18203/2320-1770.ijrcog20203546.
21. Milani F, Khosousi L, Sharami SH, Shakiba M, Rasoulian J, Attari SM, et al. Evaluation of perinatal outcomes in pregnant women with low amniotic fluid index. J Family Reprod Health. 2023;17(4):199–204.
22. Bumrah S, Grover S, Kaur K, Rajora P, Tapasvi I. Clinico-epidemiologic profile and perinatal outcome of patients with oligohydramnios in third trimester in a tertiary care hospital. Int J Reprod Contracept Obstet Gynecol. 2023;12(5):1222–6. https://doi.org/10.18203/2320-1770.ijrcog20231035.
23. Manzoor S, Usman F, Maqsood S, Arif A, Manzoor S, Hijazi A. Perinatal outcome in term pregnancies with isolated oligohydramnios. Pak J Med Health Sci. 2021;15(11):3168–9. https://doi.org/10.53350/pjmhs2115113168.