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Original Research

Maternal and Fetal Outcomes in Idiopathic Oligohydramnios vs. Normal Amniotic Fluid Index After 34 Weeks: A Case-Control Study in Eastern India

***Indrani Dutta[1], Sweta Suman[2], Tania Pan[2]**

[1]Department of Obstetrics and Gynaecology, Manipal Tata Medical College, Jamshedpur, India, [2]Department of Community Medicine, Narayan Medical College and Hospital, Jamuhar, Bihar, India.

Abstract

Background: Oligohydramnios, traditionally associated with adverse perinatal outcomes, often prompt early delivery via caesarean section, even in otherwise uncomplicated pregnancies. However, emerging research suggests that isolated oligohydramnios may not significantly impact neonatal outcomes, warranting re-evaluation of current management strategies. This study aimed to assess maternal and fetal outcomes in patients with idiopathic oligohydramnios diagnosed between 34–40 weeks of gestation, compared to low-risk pregnancies with normal amniotic fluid volume.

Methodology: A prospective case-control study was conducted in a tertiary care hospital in Eastern India over a period of one year. The study enrolled 100 pregnant women divided into cases: women with idiopathic oligohydramnios (amniotic fluid index [AFI] ≤5 without any identifiable maternal, fetal, or placental cause) and controls: gestational age-matched women with normal AFI (5–25 cm). Maternal characteristics, labor course, mode of delivery, and neonatal outcomes were analyzed. Statistical analysis was performed using SPSS, with $p<0.05$ considered significant.

Results: The rate of labor induction was significantly higher in cases compared to controls (50% vs. 20%, $p=0.001$). Meconium-stained liquor (44%) and non-reactive cardiotocography (NRCTG) (60%) were more common in the oligohydramnios group. Caesarean section rates were markedly higher among cases (78% vs. 32%, $p<0.001$), primarily due to fetal distress (71.8%). Newborns of cases had a higher incidence of small-for-gestational-age (SGA) status (56%). APGAR scores <7 at 1 and 5 minutes were more frequent in cases, with significantly higher neonatal intensive care unit (NICU) admissions (60% vs. 16%, $p<0.001$).

Conclusion: Isolated oligohydramnios is associated with increased obstetric interventions, higher caesarean rates, and adverse neonatal outcomes, including SGA and higher NICU admissions, despite reassuring antenatal fetal surveillance. These findings suggest the need for individualized care and close fetal monitoring rather than automatic early delivery in isolated oligohydramnios cases.

Keywords: Idiopathic Oligohydramnios; Amniotic Fluid Index; Caesarean Section; Fetal Distress; Neonatal Outcomes; Perinatal Morbidity.

***Correspondence:** Indrani Dutta, Department of Obstetrics and Gynaecology, Manipal Tata Medical College, Jamshedpur, India. **Email:** indranidoc@gmail.com

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Introduction

Amniotic fluid (AF) is essential for fetal development, supporting the growth of respiratory, gastrointestinal, urinary, and musculoskeletal systems in a sterile, thermally regulated environment. [1,2] The assessment of amniotic fluid volume is a routine part of obstetric care, serving as a crucial indicator of fetal well-being. [3,4] The amniotic fluid index (AFI), established through the four-quadrant technique by Phelan et al. in 1987, remains a widely used method to estimate AF volume via ultrasonography. [5,6]

Oligohydramnios is characterized by a reduction in AF volume, defined by an AFI ≤ 5 cm or the absence of a pocket measuring at least 2×1 cm. [7] It affects approximately 1–5% of pregnancies, with the incidence rising beyond 12% in post-term pregnancies. [8] It is most common in the third trimester when AF volume depends on fetal urination, lung secretions, swallowing, and intramembranous absorption. [9] While factors like maternal hypertension, diabetes, fetal anomalies, and placental insufficiency can contribute to oligohydramnios, nearly 50% of cases remain idiopathic. [1,7,10,11]

The timing and severity of oligohydramnios influence outcomes. Early-onset cases may lead to fetal deformities, pulmonary hypoplasia, or fetal demise, while later occurrences can cause intrauterine growth restriction (IUGR), preterm birth, fetal distress, and higher caesarean rates. [1] The presence of oligohydramnios often prompts obstetric interventions, yet recent studies suggest that idiopathic oligohydramnios in otherwise low-risk pregnancies may not necessarily predict adverse perinatal outcomes. [12-15] Understanding the true impact of idiopathic oligohydramnios on pregnancy outcomes is crucial to avoid unnecessary interventions and optimize patient care.

Given the limited data from Eastern India, this study aims to assess and compare maternal and fetal outcomes in women with idiopathic oligohydramnios diagnosed between 34 to 40 weeks of gestation against low-risk pregnancies with normal AFI.

Methodology

Study design and population. This prospective hospital-based case-control study was conducted in the Department of Gynaecology and Obstetrics, Tata Main Hospital, Jamshedpur, over a period of 12 months, from May 2023 to April 2024, after obtaining approval from the Institutional Ethics Committee (IEC) of Tata Main Hospital, Jamshedpur.

Study participants. The study included pregnant women with singleton pregnancies with cephalic presentation, attending the antenatal clinic, or admitted for delivery between 34 and 40 weeks of gestation. A total of 100 pregnant women were enrolled, which comprised of 50 cases and 50 controls. Cases included women diagnosed with idiopathic oligohydramnios (amniotic fluid index [AFI] ≤5 cm) without any identifiable maternal, fetal, or placental cause. Controls were low-risk pregnant women, matched for gestational age, with normal amniotic fluid volume (AFI 5–25 cm).

Women were excluded from the study if they did not provide informed written consent or had an uncertain gestational age. Pregnancies before 34 weeks or beyond 40 weeks of gestation, multiple pregnancies, or those complicated by premature rupture of membranes or polyhydramnios (AFI > 25 cm) were also excluded. Additionally, women with pregestational or gestational medical conditions such as diabetes, chronic hypertension, new-onset hypertension, cardiac diseases, or renal disorders were not included. Elective lower segment caesarean section (LSCS) deliveries and pregnancies with fetal anomalies were also excluded to ensure a homogenous study population focused on idiopathic oligohydramnios without other confounding factors.

Study procedure. Eligible participants were screened during routine antenatal care and informed written consent was obtained. Detailed antenatal history, including risk factors, was recorded. Clinical examinations and ultrasonography (USG) were performed, with AFI measured via the four-quadrant technique described by Phelan et al. [5]. USG was conducted by a single operator to minimize inter-

observer variability. AFI was measured three times for values <8 cm and the average were taken as the final AFI. Women diagnosed with idiopathic oligohydramnios were included as cases, while low-risk women with normal AFI were enrolled as controls. Participants were followed through labor, delivery, and the postpartum period. Neonatal outcomes were assessed immediately after delivery. All data were meticulously recorded using a predesigned, pretested proforma.

Data analysis. Data were entered into Microsoft Excel 2016 and analyzed using SPSS version 23.0. Continuous variables were expressed as mean ± standard deviation (SD), and categorical variables as frequencies and percentages. Comparison of study outcomes was done for categorical variables using the Chi-square test or Fisher Exact test (as applicable) and for continuous variables using the Mann Whitney U test (since data had skewed distribution). A p-value<0.05 was considered statistically significant.

Results

The study included 50 pregnant women diagnosed with idiopathic oligohydramnios (cases) and 50 low-risk pregnant women with normal amniotic fluid volume (controls). The mean age of participants was comparable between the two groups, with cases having a mean age of 22.45 ± 3.22 years and controls 22.91 ± 2.97 years (p=0.436). Similarly, the mean BMI was 20.95 ± 0.83 kg/m² in cases and 20.56 ± 0.81 kg/m² in controls (p=0.231). The parity distribution was also similar, with the majority being nulliparous in both groups.

Table 1: Comparison of baseline characteristics between cases and controls

Characteristics	Cases (N=50)	Controls (N=50)	p-value[#]
Mean age (years)	22.45 ± 3.22	22.91 ± 2.97	0.436
Mean BMI (kg/m^2)	20.95 ± 0.83	20.56 ± 0.81	0.231
Parity			
Nulliparous	36 (72.0)	38 (76.0)	0.806
Primiparous	12 (24.0)	11 (22.0)	
Multiparous	1 (2.0)	1 (2.0)	
Mean gestational age (weeks)	37.62 ± 0.87	39.01 ± 0.81	0.092

Values are presented as n (%) or mean ± SD, # p value was calculated using Mann Whitney U test (for continuous variables) and Chi-square test (for categorical variables); *p<0.05 was considered statistically significant.

In terms of intrapartum characteristics, spontaneous labor was significantly less common in the cases group (50.0%) than in controls (80.0%) (p=0.001). A higher proportion of cases required labor induction (50.0% vs. 20.0%). The need for artificial rupture of membranes (ARM) or oxytocin augmentation was comparable between groups (p=0.169). However, meconium-stained liquor was more frequent in cases (44.0%) compared to controls (20.0%) (p=0.010). Cardiotocography (CTG) findings showed that non-reactive or non-reassuring patterns were significantly more common in the oligohydramnios group (60.0% vs. 12.0%, p<0.001). Consequently, the rate of lower segment caesarean section (LSCS) was markedly higher among cases (78.0%) than controls (32.0%) (p<0.001). Intrapartum fetal distress was the most common indication for LSCS among cases (71.8%) (Table 2).

Table 2: Comparison of intrapartum-related characteristics between cases and controls

Parameters	Cases (N=50)	Controls (N=50)	p-value[#]
Type of labour			
Spontaneous	25 (50.0)	40 (80.0)	0.001*
Induced	25 (50.0)	10 (20.0)	
Need for augmentation of labour			
Artificial rupture of membranes (ARM)	33 (66.0)	30 (60.0)	0.169
ARM and oxytocin	10 (20.0)	17 (34.0)	
None	7 (14.0)	3 (6.0)	
Colour of liquor			
Clear liquor	28 (56.0)	40 (80.0)	0.010*
Meconium-stained liquor (MSL)	22 (44.0)	10 (20.0)	
Cardiotocography finding			
Reactive/ reassuring	20 (40.0)	44 (88.0)	<0.001*
Non-reactive/ non-reassuring	30 (60.0)	6 (12.0)	
Mode of delivery			
Vaginal delivery	11 (22.0)	34 (68.0)	<0.001*
Lower segment caesarean section	39 (78.0)	16 (32.0)	
Indications of LSCS (n=54)			
Intrapartum fetal distress	28 (71.8)	6 (37.5)	0.027*
Other causes	14 (28.2)	11 (62.5)	

Values are presented as n (%) or mean ± SD; # p value was calculated using Mann Whitney U test (for continuous variables) and Chi-square test or Fisher Exact test (for categorical variables); *p<0.05 was considered statistically significant.

Neonatal outcomes were notably worse in the oligohydramnios group. The mean birth weight was significantly lower in cases (2.48 ± 0.40 kg) than in controls (2.85 ± 0.34 kg) (p<0.001). A higher proportion of neonates among cases were small for gestational age (SGA) (56.0%) compared to controls (16.0%) (p<0.001). APGAR scores were also lower in the newborns cases, with 78.0% of neonates scoring <7 at 1 minute and 26.0% scoring <7 at 5 minutes, both of which were statistically significant (p<0.001 and p=0.016, respectively). Neonatal intensive care unit (SNCU) admissions were significantly higher in the cases group (60.0% vs. 16.0%, p<0.001), though the duration of stay was comparable (p=0.918) (Table 3).

Table 3: Comparison of neonatal outcomes between cases and controls

Characteristics	Cases (N=50)	Controls (N=50)	p-value[#]
Mean birth weight (kg)	2.48 ± 0.40	2.85 ± 0.34	<0.001*
Birth weight for gestational age			
Small for gestational age (SGA)	28 (56.0)	8 (16.0)	<0.001*
Appropriate for gestational age (AGA)	22 (44.0)	42 (84.0)	
APGAR score at 1 minute			
<7	39 (78.0)	22 (44.0)	<0.001*
≥7	11 (22.0)	28 (56.0)	
APGAR score at 5 minutes			
<7	13 (26.0)	4 (8.0)	0.016*
≥7	37 (74.0)	46 (92.0)	
SNCU admission of newborns			
Yes	30 (60.0)	8 (16.0)	<0.001*
No	20 (40.0)	42 (84.0)	
Duration of SNCU stay (n=38)			
Upto 24 hours	23 (76.7)	6 (75.0)	0.918

24-48hours	6 (20.0)	2 (25.0)
>48 hours	1 (3.3)	0 (0.0)

Values are presented as n (%) or mean ± SD, # p value was calculated using Mann Whitney U test (for continuous variables) and Chi-square test or Fisher Exact test (for categorical variables); *p<0.05 was considered statistically significant.

Discussion

The present study aimed to assess maternal and fetal outcomes in pregnancies complicated by idiopathic oligohydramnios between 34–40 weeks of gestation and compare them with low-risk pregnancies with normal amniotic fluid volume. Our findings support the association of isolated oligohydramnios with increased obstetric interventions and adverse neonatal outcomes, consistent with prior research [16-19].

The mean maternal age in our study was comparable between cases and controls, aligning with previous findings by Kumari et al. [18] and Jeyamani et al. [20]. The parity distribution also showed no significant difference, with a higher proportion of nulliparous women, similar to observations by Jandial et al. [21]. This is relevant because nulliparity itself is an independent risk factor for labour dystocia in oligohydramnios, which could contribute to the higher caesarean section rates observed in cases. Additionally, a significantly higher proportion of patients with oligohydramnios presented between 37–37+6 weeks, which may reflect clinicians' tendency to expedite delivery once oligohydramnios is diagnosed, even in the absence of other maternal or fetal risk factors. This finding is consistent with Chaudhari et al. [22], who also reported an increased proportion of preterm and early-term deliveries in patients with oligohydramnios.

Labour induction was significantly more common in the oligohydramnios group (50%), compared to only 20% in the control group (p=0.001). This aligns with findings by Kumari et al. [18] and Ahmar et al. [7], who reported induction rates of 54% and 42.22%, respectively. The higher induction rate is likely a consequence of concerns regarding reduced amniotic fluid compromising placental function and increasing the risk of cord compression. While induction can be a proactive approach to prevent adverse outcomes, it may also contribute to a higher likelihood of caesarean delivery, particularly in the setting of an unfavorable cervix or fetal distress during labour.

Intrapartum complications were notably higher in the oligohydramnios group. The incidence of meconium-stained liquor (44%) and non-reactive CTG (60%) were significantly elevated, reflecting compromised fetal status. Meconium-stained liquor is a well-documented consequence of fetal hypoxia, and its association with oligohydramnios is thought to arise from chronic placental insufficiency and reduced cushioning of the umbilical cord, leading to intermittent cord compression [23]. Our findings align with studies by Patel et al. [17] and Hederlingova et al. [24], who reported similar rates of meconium-stained liquor and non-reassuring fetal heart patterns in pregnancies complicated by oligohydramnios.

The caesarean section rate was significantly higher in cases (78%) than in controls (32%) (p<0.001), with fetal distress being the most common indication (71.8%). These findings are consistent with those of Patel et al. [17] and Bachhav et al. [19], who reported caesarean section rates of 81.25% and 66%, respectively, in patients with isolated oligohydramnios. Interestingly, Saxena et al. [16] reported an even higher LSCS rate of 85.71%, although their study population included patients with additional risk factors like PIH and IUGR. This emphasizes the impact of isolated oligohydramnios itself as a potent risk factor for caesarean delivery, even in the absence of other complicating conditions. The decision to perform caesarean sections in these cases is often influenced by the combination of reduced amniotic fluid volume, which limits fetal movement and increases susceptibility to cord accidents, along with abnormal CTG findings indicating fetal distress.

Neonatal outcomes were significantly worse in the oligohydramnios group, with a higher incidence of small for gestational age (56%) infants. The mean birth weight was significantly lower in cases, consistent with findings from Saxena et al. [16] and Patel et al. [17]. Reduced amniotic fluid may be an indicator of chronic placental dysfunction, contributing to impaired fetal growth and an increased likelihood of intrauterine growth restriction (IUGR). Naviero-Fuentes et al. [25] also reported a significantly higher risk of SGA in pregnancies with isolated oligohydramnios, reinforcing the association between low amniotic fluid and compromised fetal growth.

In addition to growth restrictions, neonatal morbidity was higher in the oligohydramnios group. APGAR scores <7 at 1 and 5 minutes were more common, and 60% of newborns required admission to the SNCU, compared to only 16% in controls. Similar trends have been reported by Bachhav et al. [19] and Jeyamani et al. [20], who found increased NICU admissions and lower APGAR scores in neonates born to mothers with oligohydramnios. The higher SNCU admission rate in our study may also be influenced by institutional protocols, where SGA babies are routinely admitted for observation, even in the absence of immediate complications. Nonetheless, the increased incidence of low APGAR scores suggests that these infants are at higher risk of perinatal asphyxia and other complications related to intrauterine compromise.

Despite the increased rates of obstetric intervention and neonatal complications, there were no perinatal deaths in our study. This is an encouraging finding, as it suggests that vigilant antenatal monitoring and timely delivery can prevent severe adverse outcomes. However, Jeyamani et al. [20] reported fetal deaths in 5.4% of cases, highlighting the potential severity of complications when oligohydramnios is not adequately managed. The absence of mortality in our study may be attributed to the rigorous fetal surveillance protocols and proactive decision-making, which prioritized fetal well-being over prolonged expectant management.

While our findings align with much of the existing literature, the study has certain limitations. The relatively small sample size and single-center design may limit the generalizability of the results. Also, the healthcare staff were not blinded to the case or control groups due to ethical considerations, given that the case group comprised individuals already identified as high-risk. This lack of blinding introduced the possibility of selection, performance, and observer bias. Additionally, the lower number of preterm deliveries in the oligohydramnios group restricted our ability to conduct a stratified analysis to explore associations of outcomes with preterm deliveries. Future research with larger, multicentric cohorts and sufficient representation of preterm cases would offer a more comprehensive understanding of the implications of isolated oligohydramnios.

Conclusion

Our study reinforces that isolated oligohydramnios at term is associated with increased obstetric interventions, higher caesarean section rates, adverse neonatal outcomes, including SGA rates, and higher SNCU admissions. While timely intervention can mitigate severe perinatal mortality, the increased incidence of fetal distress and neonatal morbidity underscores the need for individualized management. Careful fetal surveillance, judicious labour induction, and a low threshold for caesarean delivery may be necessary to optimize outcomes in these high-risk pregnancies.

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