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To determine the association of oligohydramnios and intrauterine growth restriction and the fetomaternal outcome in primigravida in third trimester of pregnancy

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Abstract

Background: Oligohydramnios, characterized by low amniotic fluid volume, poses significant risks to maternal and fetal health, often leading to complications like intrauterine growth restriction (IUGR).

Aim & objectives: This study aims to evaluate the prevalence of IUGR in primigravida women with oligohydramnios in the third trimester and assess the associated feto-maternal outcomes.

Methods: A prospective observational study was conducted in the Department of Obstetrics and Gynaecology at SMS Medical College, Jaipur, from November 2022 to November 2023. The study included 84 primigravida women diagnosed with oligohydramnios (AFI < 5 cm) in the third trimester. Participants were followed until delivery, and maternal and neonatal outcomes were recorded. Statistical analysis was performed using unpaired t-tests for continuous variables and chi-square or Fisher's exact tests for categorical variables.

Results: Among the participants, 51.20% had intrauterine growth restriction (IUGR). The mean age of participants was 26.93 ± 2.76 years. The study found that the majority of deliveries were vaginal (59.53%), with 40.47% requiring caesarean sections, predominantly due to fetal distress. IUGR was significantly associated with lower fetal weights (1.92 ± 0.274 kg vs 2.77 ± 0.331 kg), increased NICU admissions (39.02% vs 4.65%), and

higher rates of respiratory distress syndrome (24.39% vs 6.98%) compared to oligohydramnios-only cases. Perinatal mortality was also higher in the IUGR group (4.88%). Labor induction was more common in the oligohydramnios-only group (74.42%) compared to the IUGR group (24.39%).

Conclusion: Oligohydramnios, especially when combined with IUGR, leads to significantly worse maternal and fetal outcomes, including higher rates of caesarean section, NICU admissions, and perinatal mortality. Early diagnosis and appropriate management are critical for improving outcomes in these high-risk pregnancies. Further research is needed to develop standardized protocols for the management of oligohydramnios and IUGR pregnancies.

Keywords: Oligohydramnios, Intrauterine Growth Restriction (IUGR).

Introduction

Oligohydramnios, characterized by a deficiency in amniotic fluid, poses significant challenges in obstetrics due to its association with various maternal and fetal complications. Amniotic fluid volume plays a crucial role in pregnancy, serving as a protective cushion for the fetus, preventing umbilical cord compression, and aiding fetal lung development. Although amniotic fluid volume typically fluctuates with gestational age, abnormal decreases in volume have been linked to adverse pregnancy outcomes.[1]

Diagnosed via ultrasound, oligohydramnios is defined by an amniotic fluid index (AFI) of less than 5 cm or below the 5th percentile. The condition is particularly critical in the third trimester, with reported prevalence ranging between 0.5% and 8% in pregnant women undergoing routine ultrasound, and rates as high as 37% when fetal anomalies or other complications are present.[2] Risk factors include maternal conditions like utero-placental insufficiency, hypertension, preeclampsia, diabetes, dehydration, and post-term gestation. Fetal factors, such as renal anomalies and decreased renal perfusion, also contribute. Nevertheless, many cases are idiopathic.[3]

Oligohydramnios can significantly impact fetal health, leading to complications such as pulmonary hypoplasia, meconium aspiration syndrome, fetal compression, and infection. Affected infants are at higher risk of low birth weight, with increased rates of caesarean delivery and neonatal intensive care unit (NICU) admissions. Timely diagnosis and intervention—ranging from amnioinfusion and labor induction to caesarean delivery—are associated with improved outcomes.[4]

Intrauterine growth restriction (IUGR), another critical condition, is defined by a fetus's failure to reach its genetic growth potential, often due to placental insufficiency. IUGR is associated with elevated risks of preterm birth, low birth weight, and long-term developmental issues, underscoring the importance of its early detection and management.[5]

First-time pregnancies (primigravida) may have increased risks of complications like oligohydramnios and IUGR.[6] The interaction between oligohydramnios and IUGR is complex; while each condition independently elevates the risk of adverse outcomes, their combined presence may amplify these risks. A deeper understanding of this association is essential for developing timely intervention strategies. This observational study aims to explore the prevalence of IUGR among primigravida women diagnosed with oligohydramnios in the third trimester and assess the related fetomaternal outcomes.

Materials and Methods

This hospital-based prospective observational study was conducted in the Department of Obstetrics and Gynaecology at SMS Medical College and affiliated

hospitals in Jaipur. Approval was obtained from the Institutional Ethics Committee and Review Board, and informed consent was collected from participants. The study included all pregnant women in their third trimester who met the selection criteria and attended the antenatal clinic. Data collection began in November 2022 and continued until the sample size was reached, with an additional two months allocated for data analysis.

Inclusion and Exclusion Criteria

Primigravida women in their third trimester with a singleton, live fetus in cephalic presentation and an amniotic fluid index (AFI) < 5 cm, who provided informed consent and were not enrolled in other studies, were included. Exclusions comprised cases with congenitally malformed foetuses and ruptured membranes.

Sample Size and Sampling

With a 95% confidence level, 80% study power, and a presumed IUGR prevalence of 70% among oligohydramnios pregnancies based on the study by Mandal et al., the sample size was calculated as 84 cases with oligohydramnios, allowing a 10% absolute error. Consecutive sampling was used.

Methodology

This observational study, conducted over one year in the Department of Obstetrics and Gynaecology, aimed to assess the association between oligohydramnios (AFI ≤ 5 cm) and intrauterine growth restriction (IUGR) and related fetomaternal outcomes. Eligible participants' demographic, medical, and surgical histories were documented, followed by a clinical examination and ultrasound to assess AFI, fetal biometry, fetal weight, and gestational age. Participants were followed until delivery, and outcomes were recorded, including delivery type, meconium staining, APGAR scores at 1 and 5 minutes, birth weight, IUFD, and NICU admissions.

Statistical Analysis

Continuous variables were analyzed as means with an unpaired t-test, while categorical variables were analyzed with chi-square or Fisher's exact test. A p-value <0.05 was considered statistically significant.

Observations and Results

The study included 84 pregnant women, primarily aged 25-29 years (64.29%), with a mean age of 26.93 ± 2.76 years. Most participants were Hindu (75%), with Muslims (21.43%) and others (3.57%) comprising the remainder. Urban residents made up 54.76%, and rural residents 45.24%. Socioeconomically, 28.57% were upper-lower class, followed by lower (26.19%), lower middle (23.81%), upper middle (15.48%), and upper (5.95%) classes. Literacy was evenly split, with 51.19% literate. The majority (73.81%) were booked cases, receiving antenatal care. Gestation ranged mostly between 35-38 weeks (72.62%), with 23.81% at 30-34 weeks and 3.57% beyond 38 weeks. Hemoglobin improved post-intervention from a mean of 8.90 ± 0.74 mg/dl to 10.09 ± 1.29 mg/dl; Hb < 10 mg/dl cases dropped from 91.67% pre-intervention to 41.67% post-intervention.

Table 1: Distribution of cases according to amniotic fluid Index (AFI)

AFI (Amniotic Fluid Index)	Number of Cases	Percentage
0 – 1	4	4.76%
1 – 2	17	20.24%
2 – 3	32	38.10%
3 – 4	22	26.19%
4 – 5	9	10.71%
Total	84	100.00%

The amniotic fluid index (AFI) distribution showed that most cases (38.10%) had an AFI of 2-3 cm. This was followed by 26.19% with an AFI of 3-4 cm and 20.24%

with an AFI of 1-2 cm. Only 4.76% had an AFI of 0-1 cm, while 10.71% had an AFI of 4-5 cm, highlighting a notable proportion with significantly low amniotic fluid levels.

Table 2: Distribution of cases according to Doppler Change

Doppler Change	Number of Cases	Percentage
Normal	59	70.23%
Abnormal	25	29.77%
Total	84	100%

Doppler ultrasound results indicated that 70.23% of cases were normal, while 29.77% showed abnormal changes. Cardiotocography (CTG) revealed reactive readings in 69.04% of cases, with 30.96% showing non-reactive readings, suggesting potential fetal distress. Labor induction was necessary in 54.76% of cases, highlighting that over half of the pregnancies required intervention to initiate labor.

Table 3: Distribution of cases according to Mode of Delivery

Mode of Delivery	Number of Cases	Percentage
Lower Segment Caesarean Section	34	40.47%
Vaginal Delivery	50	59.53%
Total	84	100.00%

The majority of deliveries were vaginal (59.53%), while 40.47% required caesarean sections, indicating a substantial need for surgical intervention. Fetal weights varied, with 36.90% between 2.51-3.00 kg, 16.67% between 2.01-2.50 kg, 33.33% between 1.51-2.00 kg, and 4.76% at or below 1.50 kg.

Table 4: Distribution of cases according to IUGR, meconium aspiration, NICU admission and RDS.

Parameter	Number of cases	Percentage
IUGR	41	51.2
Meconium aspiration	24	28.57
NICU admission requires	18	21.43
RDS	10	11.9

Intrauterine growth restriction (IUGR) was observed in 51.20% of cases. Respiratory distress syndrome (RDS) affected 11.90%, while meconium aspiration occurred in 28.57% of newborns. NICU admission was needed for 21.43% of cases, with 78.57% of newborns not requiring NICU care.

Table 5: Different parameters of Fetal outcomes.

	Oligoamnios (43)	Oligoamnios + IUGR (41)	P value
Gestational Age			
Mean	35.8 ± 1.63	35.3 ± 1.99	0.396
Doppler Changes			
Normal	41	18	
Abnormal	2	23	0.024
Cardiotocography			
Reactive	40	18	
Non-reactive	3	23	0.032
Fetal weight			
Mean	2.77 ± 0.331	1.92 ± 0.274	0.0665
APGAR Score			
1 min (Mean)	7.98 ± 0.740	6.63 ± 0.799	0.1679
5 min (Mean)	9.23 ± 0.611	8.10 ± 0.944	0.1726
RDS			
Yes	0	10	
No	43	31	<0.001
Meconium Aspiration			
Yes	3	21	
No	40	20	0.015

NICU Admission			
Yes	2	16	
No	41	25	<0.001
Perinatal Mortality			
Yes	0	2	
No	43	39	<0.001

Fetal outcomes differed significantly between cases of oligohydramnios alone and those with both oligohydramnios and IUGR. In the oligohydramnios-only group, mean gestational age was 35.8 ± 1.63 weeks, with 95.35% showing normal Doppler results and 93.02% having reactive CTG. In contrast, the oligohydramnios with IUGR group had a lower mean gestational age of 35.3 ± 1.99 weeks, with abnormal Doppler changes and non-reactive CTG in 56.10%, indicating higher fetal distress. Mean fetal weight was 1.92 ± 0.274 kg in the IUGR group, significantly lower than 2.77 ± 0.331 kg in the oligohydramnios-only group. The IUGR group also had higher rates of respiratory distress syndrome (24.39%), meconium aspiration (51.22%), and NICU admissions (39.02%), compared to no RDS, 6.98% meconium aspiration, and 4.65% NICU admissions in the oligohydramnios-only group. Perinatal mortality was observed in 4.88% of the IUGR group, with no deaths in the oligohydramnios-only group.

Table 6: Different parameters of Maternal Outcomes

	Oligoamnios (43)	Oligoamnios + IUGR (41)	P value
Induction			
Yes	32	10	
No	11	31	0.827
Mode			
LSCS	07	26	0.127
VD	36	15	
Indication of LSCS			
Fetal Distress	00	14	<0.001
Failed Induction	01	03	
Abnormal Presentation	01	07	
CPD	03	02	
Elective	02	01	

Maternal outcomes differed between the oligohydramnios-only and oligohydramnios with IUGR groups. Labor induction was more common in the oligohydramnios-only group (74.42%) than in the IUGR group (24.39%). Caesarean sections (LSCS) were more frequent in the IUGR group (63.41%) compared to the oligohydramnios-only group (15.91%), indicating higher risk in IUGR pregnancies. Vaginal delivery was more common in the oligohydramnios-only group (83.72%) versus 36.59% in the IUGR group. In the IUGR group, LSCS was mainly due to fetal distress (33.33%), followed by abnormal presentation (16.67%) and CPD (4.88%). In the oligohydramnios-only group, LSCS was less frequent, with indications including malpresentation (2.33%) and failed induction (2.33%).

Discussion

This study aimed to assess the demographic, clinical, and perinatal outcomes of pregnancies complicated by oligohydramnios. The majority of the study participants were young, primigravida women from varied socioeconomic and educational backgrounds. By evaluating factors such as gestational age, booking status, hemoglobin levels, and fetal monitoring results, we explored the effects of oligohydramnios on maternal and fetal health. Our findings were compared with previous studies to provide a broader context for understanding the implications of oligohydramnios in pregnancy.

In our study, the most common AFI range was 2-3 cm (38.10%). This is consistent with the findings of **Dalal and Malhotra**,[7] who reported a similar distribution. Conversely, **Chudal, Bista, and Pradhan**[8] found a higher prevalence of AFI <2 cm.

Our results showed that 70.23% of cases had normal Doppler readings, while 29.77% exhibited abnormal changes. These findings are similar to those of **Lin et al.**[9], who reported a comparable percentage of normal Doppler results. However, **Gupta et al.**[10] found a higher incidence of abnormal Doppler changes.

Our study showed that 40.47% of cases underwent cesarean sections (LSCS), while 59.53% had vaginal deliveries. The similarities with **Teka et al.**[11] can be attributed to similar clinical indications for LSCS, while the differences with **Singh and Rajoriya**[12] might be due to the severity of cases included in their study.

In our study, IUGR was present in 51.20% of the cases. This is consistent with the findings of **Dalal and Malhotra**,[7] who reported a similar prevalence of IUGR among oligohydramnios cases. Respiratory distress syndrome (RDS) was present in 11.90% of the cases in our study. This is consistent with the findings of **Moses and Thakre**, [13]who reported a similar incidence of RDS. Conversely, **Bumrah et al.**[14] observed a higher prevalence of RDS. Meconium aspiration was observed in 28.57% of the newborns in our study. This is similar to the findings of **Sharma et al.**,[15] who reported a comparable incidence of meconium aspiration. However, **Teka et al.**[11] found a lower prevalence. NICU admission was required for 21.43% of the cases in our study. This is consistent with the findings of **Chauhan et al.**[16], who also reported a high rate of NICU admissions among oligohydramnios cases.

Fetal outcomes showed significant differences between the oligohydramnios-only group and the group with both oligohydramnios and intrauterine growth restriction (IUGR). The oligohydramnios-only group had a mean gestational age of 35.8 ± 1.63 weeks, with 95.35% showing normal Doppler results and 93.02% reactive cardiotocography (CTG). In contrast, the oligohydramnios with IUGR group had a mean gestational age of 35.3 ± 1.99 weeks, with 56.10% showing abnormal Doppler and non-reactive CTG. These findings align with **Molla et al.,**[17] who highlighted the impact of IUGR on perinatal outcomes, but **Bumrah et al.**[14] found less marked differences between the two groups.

Maternal outcomes showed that induction was more common in the oligohydramnios-only group (74.42%) compared to the IUGR group (24.39%). Cesarean sections were more frequent in the IUGR group (63.41%) than in the non-IUGR group (15.91%), consistent with **Singh and Rajoriya's**[12] findings of higher LSCS rates in IUGR cases. However, **Teka et al.**[11] reported a generally higher rate of cesarean deliveries due to perceived complications.

Conclusion

The study shows that oligohydramnios leads to significant complications, such as higher rates of labour induction and caesarean sections due to fetal distress. IUGR worsens these outcomes, resulting in lower birth weights, more NICU admissions, and increased perinatal mortality. Early detection and targeted management are essential to improve outcomes, and further research is needed to create standardized protocols for these pregnancies.

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