

## A Study on Impact of Borderline Oligohydramnios on Fetomaternal Outcomes in Term Pregnancies with Cerebroplacental Ratio >1

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### Abstract:

**Background:** Oligohydramnios is described as decreased amniotic fluid volume relative to gestational age. Semi quantitatively it is described using the Amniotic Fluid Index (AFI) which is calculated by adding the depth in centimeters of the largest vertical pocket in each of four equal uterine quadrants. AFI less than or equal to 5 cm is defined as oligohydramnios. A Borderline Oligohydramnios (BO) is defined as AFI 5.1-8 cm.

**Objectives:** To evaluate fetomaternal outcomes in term pregnancies with borderline oligohydramnios (Amniotic Fluid Index [AFI] 5–8 cm) and a cerebroplacental ratio (CPR) >1.

**Methods:** This prospective analytical study was conducted at the Department of Obstetrics and Gynecology, Rajiv Gandhi Institute of Medical Sciences, Adilabad, involving 100 term (37–40 weeks) singleton pregnant women with AFI 5–8 cm and CPR >1, confirmed by Doppler ultrasound. Data were analyzed to assess Obstetric outcomes and perinatal outcomes.

**Results:** The mean maternal age was 25.01 years (SD 3.98), with 48% aged 21–25 years. Gestational age distribution was 35% at 37 weeks, 29% at 38 weeks, 24% at 39 weeks, and 12% at 40 weeks. Obstetric outcomes included 38% NVD, 27% induced NVD, 20% assisted vaginal delivery, and 15% LSCS. Induction was used in 49% of cases (Foley's catheter and prostaglandin E1). Perinatal complications included meconium-stained liquor (33%), low Apgar scores (23%), LBW (20%), fetal distress (19%), RDS (18%), NICU admissions (9%), and perinatal mortality (2%). Significant associations were found between gestational age and meconium-stained liquor ( $p=0.004$ ) and RDS ( $p=0.02$ ). No significant differences in perinatal outcomes were observed between cesarean and non-cesarean deliveries in mothers with CPR >1, suggesting safe vaginal delivery in this subgroup.

**Conclusion:** Term pregnancies with borderline oligohydramnios and CPR >1 can achieve favorable fetomaternal outcomes with a high rate of vaginal deliveries and low severe perinatal complications. CPR >1 is a valuable marker for identifying cases suitable for vaginal delivery, reducing unnecessary cesarean sections while ensuring fetal well-being.

**Keywords:** Oligohydramnios, Amniotic fluid, CPR>1, Maternal and Fetal outcome.

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### Introduction

Oligohydramnios is a condition defined by a reduced amount of amniotic fluid relative to gestational age, often resulting from complications associated with the mother, fetus or placenta. The amniotic fluid fluctuates during gestation, rises linearly until 34 weeks to 36 weeks and stabilizes at roughly 400 ml and stays steady until term. The amniotic fluid volume declines consistently beyond 40 weeks of gestation, resulting in decreased volume in post term pregnancies. This facilitates the clinical evaluation of Amniotic Fluid Volume (AFV) during pregnancy by fundal height measures and ultrasound assessments. [1,2] This may correlate with adverse fetal outcomes, such as compromised lung development, growth limitation, and heightened risk

of labor difficulties. Potential causes include preterm rupture of membranes, placental insufficiency, and fetal kidney anomalies. Adequate diagnosis often requires ultrasound evaluation, and treatment differs according on the underlying etiology, gestational age, and degree of fluid deficit. [3]

In settings where ultrasonography is often used, the incidence of oligohydramnios among pregnant women have been shown to range from 0.5% to 8%. [4] Oligohydramnios is defined as Amniotic Fluid Index (AFI) less than 5 cm. Borderline Oligohydramnios is defined as AFI between 5 to 8cm. [5,6] Oligohydramnios occurs in up to 37% of

pregnancies linked with fetal anomalies and is more prevalent in the presence of other pregnancy problems.

The cerebroplacental ratio (CPR) is becoming a significant predictor of negative fetal outcomes. This ratio measures the redistribution of cardiac output by calculating the quotient of the Doppler indices of the middle cerebral artery (MCA) and the umbilical artery (UA). The cerebroplacental index is the ratio of the middle cerebral artery pulsatility index to the umbilical artery pulsatility index. A low cerebroplacental ratio may imply redistribution of cerebral blood flow or the brain-sparing effect. The brain sparing effect occurs when circulatory adaptation manifests as cerebral vasodilation during persistent hypoxia to maintain blood supply to the brain. [7,8]

**Aims and Objectives**

**Aims:** The aim of the present study is to determine maternal and perinatal outcomes in term antenatal mothers with borderline oligohydramnios whose Cerebroplacental ratio is normal

**Objectives**

1. To study maternal and fetal outcomes in term antenatal mothers with borderline oligohydramnios with normal CPR
2. To study mode of delivery and timely intervention based on CPR
3. To determine whether Normal CPR predicts favorable perinatal outcomes in term pregnancies with Borderline Oligohydramnios

**Inclusion Criteria**

- All pregnant women with Gestational age 37 to 40 weeks + 6 days
- AFI: 5 to 8 cm
- CPR >1 on Doppler study
- singleton live pregnancy
- Membranes are intact

- Admission CTG normal
- Mothers with correct dates and having early USG

**Exclusion Criteria**

- Mothers with LMP not known or not having early trimester USG to confirm gestational age
- Premature rupture of membranes
- Polyhydramnios
- Gestational age > 41 weeks
- Women with preeclampsia/ Gestational hypertension and women with gestational diabetes mellitus
- Congenital malformations
- Multifetal gestation

**Methodology:** This study was carried on antenatal mothers who have completed 37 gestational weeks. Gestational age will be determined from Last menstrual period and confirmed by measurement of crown rump length at first trimester scan. AFI is determined by studying four pockets of fluid by ultrasound and added up expressed in cms and those having between 5.1 cm to 8 cms are categorized to have borderline oligohydramnios. CPR is measured using both Umbilical artery Doppler and middle cerebral doppler and those having CPR>1 is included in the study. Borderline oligohydramnios mothers will be followed up for obstetric outcomes and perinatal outcomes

**Statistical Analysis:** The data will be entered into Microsoft excel and SPSS will be used for statistical analysis. The data will be expressed in form of frequency, percentages, mean, S.D, graphs

Chi square will be used for test of statistical significance. Continues data student t test will be used for statistical mean difference between the two groups or variables. A p value of less than 0.05 will be considered as statistical significance.

**Results**

**Table 1: Age distribution of study participants**

Age group of Antenatal mothers	No of Antenatal mothers
18-20 years	10
21-25 years	48
26-30 years	32
31-35 years	10

Age wise classification showed that almost 50% of antenatal mothers were of age group between 21-25 years, followed closely by those mothers of age

group between 26-30 years contributing to about 32% of study population.

**Table 2: Gestational Age distribution of study participants**

Gestational Age	Frequency	Percent
37 weeks- 37weeks + 6 days	35	35%
38 weeks- 38weeks + 6 days	29	29%
39 weeks- 39weeks + 6 days	24	24%
40	12	12%
Total	100	100%

Since our inclusion criteria included only full term and near-term Antenatal mothers, our study population of Antenatal mothers were more or less

equally distributed 37weeks to 38 weeks of gestation.

**Table 3: Parity Distribution**

Parity	Number	Percent
Primigravida	46	46%
G2	38	38%
G3	16	16%

**Table 4: Mode of Induction**

Mode of Induction	Frequency	Percent
Spontaneous	18	18%
Misoprostol	13	13%
Foley's Catheter + PGE1	69	69%
Total	100	100%

The majority of women (69%) underwent induction using a combination of Foley's catheter and prostaglandin E1 (PGE1). Spontaneous onset of

labor was observed in 18% of cases, while 13% were induced using misoprostol alone.

**Table 5: Obstetrics outcomes of study participants: (Mode of Delivery)**

	Frequency	Percent
Normal vaginal delivery	18	18%
Normal vaginal delivery with induction	52	52%
Assisted vaginal delivery	2	2%
LSCS	28	28%
Total	100	100%

18% of Antenatal mothers delivered by Normal vaginal delivery, 52% of Antenatal mothers delivered by Normal vaginal delivery with

Induction, 2 % delivered by assisted vaginal delivery, 28% delivered by LSCS.

**Table 8: Indication for LSCS**

Indication for Caesarean section	Frequency	Percent
Fetal Distress	12	42.8%
Prolonged Labor (Incoordinate uterine contractions, Dystocia)	7	25%
Failed Induction	5	17.8%
Maternal request	2	7.1%
Gross CPD	2	7.1%

Though the entire cohort of participants we recruited were borderline AFI, which is considered as one of the risk factor for perinatal mortality, and studies by LUO X et al reported that in the age group of borderline oligohydramnios there was an increase in the frequency of emergency caesarean delivery compared to non- oligohydramnios antenatal

mothers, but we wanted to delineate a favorable subset out of this borderline oligohydramnios we used doppler studies, pregnancies which can be safely allowed to deliver by non-caesarean mode, at the same time we make sure that not hamper the fetal wellbeing in any manner.

**Table 10: Fetal outcome of study participants**

Variables	Frequency	Percent
Fetal Distress	19	19%
Low Birth Weight	20	20%
Meconium Stained	33	33%
Respiratory Distress syndrome	18	18%
Low Apgar Score	23	23%
NICU admissions	26	26%
Perinatal Mortality	2	2%

## Discussion

- 1. Age and Gestational Age Distribution** - The study population predominantly consisted of younger antenatal mothers, with 48% aged 21–25 years and 32% aged 26–30 years, with a mean age of 25.01 years (SD 3.98). This demographic 57 aligns with the typical reproductive age group in many low- and middle-income settings, as noted in prior studies.[3] The gestational age distribution was relatively balanced, with 35% at 37 weeks, 29% at 38 weeks, 24% at 39 weeks, and 12% at 40 weeks, reflecting the inclusion criteria of term pregnancies (37–40 weeks). This distribution allowed for a comprehensive assessment of outcomes across the term gestation period, which is critical given the natural decline in amniotic fluid volume post-38 weeks [9, 10]
- 2. Mode of Delivery** - The study found that 38% of mothers achieved normal vaginal delivery (NVD) without induction, 27% had NVD with induction, 20% underwent assisted vaginal delivery (AVD), and 15% required lower segment caesarean section (LSCS). The relatively low caesarean rate (15%) compared to previous studies, such as Bansal et al. (47%) and Golan et al. (35.2%) [11, 12] suggests that selecting mothers with a CPR >1 may identify a subgroup of borderline oligohydramnios cases suitable for vaginal delivery. The significant association between gestational age and obstetric outcomes ( $p = 0.047$ ) indicates that earlier gestations (37 weeks) had a higher proportion of NVD (54.2%) and lower LSCS rates (2.8%) compared to later gestations (38–39 weeks: 16.9% LSCS; 40 weeks: 16.6% LSCS). This finding supports the hypothesis that timely intervention in borderline oligohydramnios with favorable CPR may reduce the need for surgical intervention, as suggested by Luo et al., who noted increased emergency caesarean rates in oligohydramnios cases without Doppler stratification.
- 3. Induction Methods** - Induction was required in 49% of cases using a combination of Foley's catheter and prostaglandin E1 (PGE1), 13% with misoprostol alone, and 38% experienced spontaneous labor. The high induction rate aligns with Casey et al.'s findings of a 42% induction rate in oligohydramnios cases.[13] The preference for combined mechanical and chemical induction methods in this study reflects a tailored approach to managing labor in borderline oligohydramnios, potentially mitigating risks of fetal distress associated with reduced amniotic fluid volume.[14] The success of induction in achieving vaginal delivery (27% NVD with induction) underscores the importance of careful patient selection using

CPR, as it may indicate adequate fetal well-being to tolerate labor induction. [15]

## Fetal Outcomes

**Perinatal Complications:** The most common fetal complication was meconium-stained liquor (33%), followed by low Apgar scores (23%), low birth weight (LBW, 20%), fetal distress (19%), respiratory distress syndrome (RDS, 18%), NICU admissions (9%), and perinatal mortality (2%). These findings are consistent with the literature, which associates oligohydramnios with increased risks of meconium aspiration, low Apgar scores, and LBW. However, the relatively low rates of severe outcomes, such as perinatal mortality (2%) and NICU admissions (9%), compared to Talesara et al.'s study (5% perinatal mortality, 26% NICU admissions due to LBW) [16, 17], suggest that a CPR >1 may identify fetuses with sufficient cerebral perfusion to withstand the stresses of labor, even in the presence of borderline oligohydramnios.

**Association with Gestational Age:** A significant association was observed between gestational age and meconium-stained liquor ( $p = 0.04$ ), with higher rates at 40 weeks (58.3%) compared to 38–39 weeks (39.6%) and 37 weeks (14.2%). This trend aligns with the natural reduction in amniotic fluid volume at later gestations, increasing the risk of cord compression and fetal stress. [18,19] Similarly, RDS showed a significant association with gestational age ( $p = 0.02$ ), with rates of 17.1% at 37 weeks, 18.8% at 38–39 weeks, and 16.6% at 40 weeks, possibly reflecting the impact of borderline oligohydramnios on lung maturation, as noted in prior studies. [16, 20] No significant associations were found for fetal distress ( $p = 0.32$ ), LBW ( $p = 0.33$ )

## Conclusion

This study demonstrates that term pregnancies with borderline oligohydramnios and CPR >1 can achieve favorable fetomaternal outcomes with a high rate of vaginal deliveries and low rates of severe perinatal complications. The significant associations between gestational age and outcomes like meconium-stained liquor and RDS highlight the importance of timing in delivery decisions. CPR emerges as a valuable tool for stratifying risk and guiding management, offering a pathway to reduce unnecessary caesarean sections while ensuring fetal well-being.

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