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Original Research Article

The feto-maternal outcome in oligohydramnios at a tertiary care centre

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ABSTRACT

Background: Oligohydramnios is associated with more operative deliveries and poorer perinatal outcomes, yet its optimal management remains debated. The objective is to describe feto-maternal outcomes in oligohydramnios, including mode of delivery, NICU admission, Apgar score, congenital anomalies and neonatal death.
Methods: This prospective observational study was conducted at PDU Medical College, Rajkot, from June 2023 to December 2024. Two hundred women with singleton pregnancies at 28-42 weeks, intact membranes and ultrasound-confirmed AFI ≤5 cm were recruited by purposive sampling.
Results: Most women were aged 21-25 years (50.0%), primigravida (51.0%) and urban (64.5%). Pregnancy-induced hypertension (19.5%) and intrauterine growth restriction (18.0%) were the commonest associated conditions; 47.5% had no identifiable risk factor. Caesarean section was performed in 54.0%, mainly for severe oligohydramnios (44.4%) and fetal distress (24.1%). Meconium-stained liquor occurred in 21.5%. Birth weight was below 2.5 kg in 64.5%, 65.5% were admitted to the NICU, and 39.0% had a 1-minute Apgar score of 4-6. Neonatal death occurred in 20.0%. From the mildest (AFI 4-5 cm) to the most severe (AFI 0-1 cm) group, NICU admission rose from 49.2% to 84.6% and neonatal death from 16.9% to 28.2%. Postpartum haemorrhage was the only maternal complication (3.0%); 2.5% of neonates had structural congenital anomalies.
Conclusions: Oligohydramnios was accompanied by high rates of caesarean delivery, NICU admission, low birth weight and neonatal death, all increasing as AFI decreased. Close antenatal surveillance with non-stress testing and Doppler assessment, with timely delivery planning, is important.

Keywords: Oligohydramnios, Amniotic fluid index, Feto-maternal outcome, Neonatal mortality

INTRODUCTION

Oligohydramnios is a reduction in amniotic fluid volume that is usually diagnosed on ultrasonography when the amniotic fluid index (AFI), the sum of the deepest vertical pockets in the four uterine quadrants, is 5 cm or less.[1,2] Assessment of amniotic fluid volume has become a routine element of antepartum surveillance in high-risk pregnancies.[3] In a cohort of 6423 women scanned at or beyond 34 weeks, 2.3% had an AFI of 5 cm or less, and these pregnancies had more obstetric intervention and higher perinatal morbidity and mortality, including stillbirth and neonatal death.[4]

When oligohydramnios accompanies fetal growth restriction, post-dated pregnancy or maternal disease, it may by itself justify delivery because of the risk of intrauterine death and neonatal morbidity. The position is less clear for isolated oligohydramnios in an otherwise uncomplicated term pregnancy. Routine delivery in this situation may amount to overtreatment, since it exposes women to failed induction and operative delivery without

a demonstrated fetal benefit.[5,6] A large survey of deliveries in China likewise concluded that caesarean section is not indicated for isolated oligohydramnios at term.[7] The prognostic value of oligohydramnios, the pitfalls of its sonographic assessment and its optimal management therefore continue to need systematic study. We undertook this study to describe the feto-maternal outcomes of pregnancies complicated by oligohydramnios at a tertiary care centre. The specific aims were to document the mode of delivery and the neonatal outcomes in terms of NICU admission, Apgar score, congenital anomalies and neonatal death.

METHODS

Study design and setting

This prospective observational study was conducted in the Department of Obstetrics and Gynaecology, PDU Medical College, Rajkot, over 19 months, from June 2023 to December 2024. The study was approved by the Institutional Ethics Committee of PDU Medical College, Rajkot, and written informed consent was obtained from every participant before enrolment.

Participants

Pregnant women admitted to the obstetric ward who satisfied the eligibility criteria were recruited by purposive sampling until 200 cases had been enrolled. Women with a singleton pregnancy at 28-42 weeks of gestation, intact membranes and an ultrasonographically confirmed AFI of 5 cm or less were included. Women with premature rupture of membranes, multiple gestation, a gestational age below 28 weeks or intrauterine fetal death were excluded.

Clinical and sonographic assessment

Women at or beyond 28 weeks who presented to the outpatient department or labour room underwent a detailed history and a complete general, systemic and obstetric examination. Gestational age was established from the last menstrual period and a first- or second-trimester ultrasound scan. Haemoglobin, blood group with Rh typing and urinalysis were performed in all women, and further tests were ordered according to any coexisting medical condition. All women underwent an ultrasound examination, and the AFI was calculated by the four-quadrant technique; an AFI of 5 cm or less was taken as oligohydramnios.[1,2]

Management protocol

All women with oligohydramnios were admitted and managed according to a uniform protocol. When fetal maturity had been reached (gestational age of 36 weeks or more), pregnancy was terminated. Labour was induced according to the Bishop score using an extra-amniotic Foley catheter, intracervical dinoprostone gel or an oxytocin infusion, as appropriate, and caesarean section was reserved for failed induction, severe oligohydramnios or other obstetric indications.

When fetal maturity had not been reached and the umbilical artery Doppler was normal, or showed raised resistance with or without centralisation of flow, expectant management was followed. It consisted of rest in the left lateral position, oral and intravenous hydration, correction of any identifiable cause, oral or intravenous amino acid supplementation, and fetal surveillance by a daily fetal movement count, twice-weekly non-stress testing and amniotic fluid volume assessment, and weekly umbilical artery Doppler. If the gestational age was 34–36 weeks and the umbilical artery Doppler showed absent or reversed end-diastolic flow, either at enrolment or during follow-up, pregnancy was terminated immediately. Expectant management was also stopped once fetal maturity was reached, when the non-stress test became non-reactive, when absent or reversed end-diastolic flow appeared, or when a maternal indication for delivery arose.

Outcome measures

The following were recorded for every woman: gestational age at delivery; mode of onset of labour and mode of delivery; indications for caesarean section, including emergency caesarean section for fetal distress; meconium staining of the liquor; fetal heart rate abnormalities in labour; birth asphyxia; NICU admission; and intrauterine growth restriction. A neonatologist attended every delivery, and active resuscitation was undertaken when thick meconium-stained liquor was present. Birth weight was recorded for all neonates.

Statistical analysis

Data on the 200 women, recruited from the outpatient department and as emergency admissions, were entered in Microsoft Excel and analysed by descriptive statistics, with categorical variables expressed as frequencies and percentages. For the analysis of outcome by severity, the women were grouped by AFI into severe (0–1 cm), moderate (2–3 cm) and mild (4–5 cm) oligohydramnios, and crude relative risks were calculated from the group proportions. No tests of significance or adjusted analyses were performed.

RESULTS

Two hundred women with an ultrasonographically confirmed AFI of 5 cm or less who met the inclusion criteria were studied during the 19-month period. The findings are presented in five tables: the maternal baseline profile (Table 1), the clinical and sonographic profile (Table 2), the mode of delivery and indications for caesarean section (Table 3), the neonatal and maternal outcomes (Table 4), and the outcomes by severity of oligohydramnios (Table 5).

In Table 1, half of the women (50.0%) were aged 21–25 years, 51.0% were primigravida and 53.0% were nulliparous, so oligohydramnios occurred mainly in young women in their first pregnancy. Educational attainment was low, with 85.5% illiterate or educated only to primary level; 54.0% belonged to families below the poverty line, and half (50.5%) were unbooked for antenatal care. These findings suggest limited access to, or uptake of, routine antenatal surveillance. Urban residents accounted for 64.5% of the women, 77.0% were Hindu and 89.0% had no previous abortion.

In Table 2, most cases (44.0%) were diagnosed at 37–39 weeks, and about one-third (32.5%) were diagnosed before 37 weeks. An AFI of 4 cm was the commonest single value (30.0%), and 78.0% of the women had an AFI of 2–4 cm, so oligohydramnios was predominantly of moderate rather than extreme degree. Pregnancy-induced hypertension (19.5%) and intrauterine growth restriction (18.0%) were the leading identifiable risk factors, while 47.5% of cases had no identifiable cause. The non-stress test was non-reactive in 31.0% of the women, and the umbilical artery Doppler was normal in 84.5%. Most fetuses were cephalic (94.5%).

In Table 3, caesarean section was the commonest mode of delivery (54.0%), followed by induced vaginal delivery (37.0%); only 9.0% of women delivered vaginally after spontaneous onset of labour. Of the 108 caesarean sections, severe oligohydramnios itself (44.4%) and fetal distress (24.1%) were the two most frequent indications, and a previous caesarean scar accounted for a further 15.7%.

In Table 4, low birth weight (below 2.5 kg) was present in 64.5% of the neonates, 65.5% needed NICU admission and 39.0% had a 1-minute Apgar score of 4–6. Meconium-stained liquor was seen in 21.5% of deliveries. Neonatal death occurred in 20.0% of cases. In contrast, maternal outcome was favourable: postpartum haemorrhage occurred in 3.0% of women, and there was no maternal death. A structural congenital anomaly was present in 2.5% of neonates, and these were mainly renal or craniofacial.

Table 5 shows a graded rise in adverse outcome with increasing severity of oligohydramnios. From the mild (AFI 4–5 cm) to the severe (AFI 0–1 cm) group, NICU admission increased from 49.2% to 84.6%, caesarean delivery from 41.5% to 76.9%, and neonatal death from 16.9% to 28.2%. The crude relative risks for severe compared with mild oligohydramnios were about 1.7 for NICU admission, 1.85 for caesarean delivery and 1.7 for neonatal death.

Table 1: Baseline demographic and obstetric profile of the study population (n=200).

Variables	Number of cases (N)	Percentage (%)
Age (years)		
<20	41	20.5
21–25	100	50.0
26–30	50	25.0
>30	9	4.5
Educational status		
Illiterate	72	36.0
Primary education	99	49.5
Secondary education	29	14.5
Residence		
Urban	129	64.5
Rural	71	35.5
Booking status		
Booked	99	49.5
Unbooked	101	50.5
Religion		
Hindu	154	77.0
Muslim	39	19.5
Other	7	3.5
Socioeconomic status		
Below poverty line	108	54.0
Lower middle class	91	45.5
Not answered	1	0.5
Gravida		
Primigravida	102	51.0
Second	53	26.5
Third	33	16.5

Continued.

Variables	Number of cases (N)	Percentage (%)
Fourth	7	3.5
Fifth	1	0.5
Sixth or higher	4	2.0
Parity		
0	106	53.0
1	60	30.0
2	27	13.5
3	5	2.5
4	1	0.5
5	1	0.5
History of previous live birth		
Present	86	43.0
Absent	114	57.0
History of previous abortion		
Present	22	11.0
Absent	178	89.0

Table 2: Clinical and sonographic profile of the study population (n=200)

Variables	Number of cases (N)	Percentage (%)
Gestational age at diagnosis (weeks)		
28–30	3	1.5
31–33	18	9.0
34–36	44	22.0
37–39	88	44.0
>39	47	23.5
Associated risk factor (multiple responses possible)		
Pregnancy-induced hypertension	39	19.5
Intrauterine growth restriction	36	18.0
Doppler changes	26	13.0
Pre-eclampsia	20	10.0
Post-dated pregnancy	11	5.5
Anaemia	8	4.0
Eclampsia	3	1.5
No identifiable risk factor	95	47.5
Amniotic fluid index (cm)		
0	19	9.5
1	20	10.0
2	46	23.0
3	50	25.0
4	60	30.0
5	5	2.5
Fetal presentation		
Cephalic	189	94.5
Breech	11	5.5
Non-stress test		
Reactive	138	69.0
Non-reactive	62	31.0
Placental location		
Anterior	114	57.0
Posterior	54	27.0
Fundo-anterior	15	7.5
Fundo-posterior	10	5.0
Fundo-lateral	5	2.5

Continued.

Variables	Number of cases (N)	Percentage (%)
Low-lying	2	1.0
Umbilical artery Doppler finding		
Normal	169	84.5
Reduced diastolic flow	13	6.5
Absent end-diastolic flow	8	4.0
Brain-sparing effect	7	3.5
Early diastolic notch	2	1.0

Percentages are calculated on 200 women. Risk factors were not mutually exclusive, so their percentages do not add up to 100.

Table 3: Mode of delivery and indications for caesarean section.

Variables	Number of cases (N)	Percentage (%)
Mode of delivery (n=200)		
Caesarean section (LSCS)	108	54.0
Induced vaginal delivery	74	37.0
Spontaneous vaginal delivery	18	9.0
Indication for caesarean section (n=108; multiple indications possible)		
Severe oligohydramnios	48	44.4
Fetal distress	26	24.1
Previous caesarean scar	17	15.7
Meconium-stained liquor	11	10.2
Intrauterine growth restriction	9	8.3
Doppler changes	8	7.4
Breech presentation	7	6.5
Failed induction	5	4.6
Placenta praevia	2	1.9
Eclampsia	2	1.9

Percentages for the indications are calculated on the 108 caesarean sections and do not add up to 100 because more than one indication could apply.

Table 4: Neonatal and maternal outcome (n=200).

Variables	Number of cases (N)	Percentage (%)
Colour of liquor at delivery		
Clear	157	78.5
Meconium-stained	43	21.5
Birth weight		
<1.5 kg	22	11.0
1.5–2.0 kg	41	20.5
2.1–2.5 kg	66	33.0
2.6–3.0 kg	50	25.0
>3.0 kg	21	10.5
Apgar score at 1 minute		
7–9	122	61.0
4–6	78	39.0
NICU admission		
Yes	131	65.5
No	69	34.5
Neonatal outcome		
Discharged (survived)	160	80.0
Neonatal death	40	20.0
Maternal complication		
Postpartum haemorrhage	6	3.0
None	194	97.0

Continued.

Variables	Number of cases (N)	Percentage (%)
Congenital anomaly (structural)		
Cleft lip or cleft palate	2	1.0
Multicystic kidney disease	2	1.0
Bilateral renal agenesis	1	0.5

Table 5: Delivery and neonatal outcomes according to the severity of oligohydramnios (AFI).

AFI group	N	NICU admission n (%)	Caesarean section n (%)	Neonatal death n (%)
0–1 cm (severe)	39	33 (84.6)	30 (76.9)	11 (28.2)
2–3 cm (moderate)	96	66 (68.8)	51 (53.1)	18 (18.8)
4–5 cm (mild)	65	32 (49.2)	27 (41.5)	11 (16.9)

DISCUSSION

In this prospective study of 200 women with oligohydramnios (AFI ≤5 cm) at a tertiary care centre, more than half of the women were delivered by caesarean section, two-thirds of the neonates were admitted to the NICU, and one in five neonates died. Both neonatal admission and neonatal death, as well as caesarean delivery, became more frequent as the AFI fell.

Most women were young primigravidae, with half aged 21–25 years and 51.0% in their first pregnancy. A similar profile was reported from another Indian tertiary centre, where 61.7% of 188 women with oligohydramnios at 28–42 weeks were primigravida and the mean age was 25.4 years.[8] The high proportion of women with low education, low income and no antenatal booking probably reflects the catchment of a public referral hospital. Because the study had no comparison group, it cannot show whether these factors are linked to oligohydramnios itself. Pregnancy-induced hypertension and intrauterine growth restriction were the most frequent associated conditions, in keeping with the known association between a reduced AFI and fetal growth restriction.[9] Nearly half of the women (47.5%) had no identifiable risk factor, which illustrates how often oligohydramnios occurs without a recognisable cause.

The caesarean rate of 54.0% is lower than the 69.1% reported in the Nagpur series but is still high.[8] In addition, 91.0% of our women needed either induction of labour or caesarean section, in keeping with the greater obstetric intervention described in women with oligohydramnios in the earlier Parkland cohort.[4] Induction of labour is itself linked with a higher caesarean risk in nulliparous women.[6] In our series, 44.4% of caesarean sections were performed for severe oligohydramnios alone. In contrast, a large Chinese survey concluded that caesarean section is not indicated for isolated oligohydramnios at term.[7] However, only 52.5% of our women had an associated risk factor, and 32.5% were diagnosed before 37 weeks, so our cohort was not confined to isolated, term oligohydramnios, and the figures cannot be compared directly. Even so, the proportion of caesarean sections done for severe oligohydramnios alone suggests that the threshold for operative delivery in this indication deserves review.

The gradient seen across AFI groups is consistent with published pooled estimates. A meta-analysis found that an antepartum AFI of 5 cm or less carried a pooled relative risk of 2.2 (95% CI 1.5–3.4) for caesarean delivery for fetal distress and was associated with a low 5-minute Apgar score.[10] A later systematic review of controlled studies found that, in low-risk pregnancies, oligohydramnios was associated with more NICU admissions, caesarean deliveries for fetal distress and meconium aspiration syndrome.[11] A recent meta-analysis showed that even borderline oligohydramnios (AFI 5.1–8.0 cm) was associated with higher odds of caesarean delivery overall (OR 2.20, 95% CI 1.70–2.84) and for fetal distress (OR 2.70, 95% CI 1.70–4.30), as well as with low Apgar scores, low birth weight and NICU admission.[12] An earlier cohort similarly found that a borderline AFI doubled the incidence of adverse perinatal outcome.[13] If modest reductions in fluid volume carry measurable risk, it is biologically plausible that the risk continues to increase as the AFI falls further, which is what Table 5 shows. This comparison is limited, however, because our groups were compared with each other and not with women with normal fluid, and the figures are unadjusted for coexisting growth restriction or hypertension.

Abnormal umbilical artery Doppler velocimetry has been related to adverse perinatal outcome even in pregnancies with a borderline AFI.[14] Such findings were present in a minority of our women, but we did not relate Doppler findings or the non-stress test to outcome. Low birth weight was very common in our cohort (64.5%), and higher than the 53.2% in the Nagpur series.8 In a multi-country low-resource study, infants of pregnancies with oligohydramnios were on average 162 g lighter than those of pregnancies with normal fluid.[15] In the meta-analysis of Rabie et al the excess of low birth weight was seen mainly when oligohydramnios coexisted with maternal or fetal comorbidity, which may confound the association.[11] Because we did not analyse birth weight by AFI group or

by underlying condition, we cannot say how much of the low birth weight in our cohort is due to growth restriction and how much to the reduction in fluid.

The neonatal death rate of 20.0% was high. In the Parkland cohort, neonatal death occurred in 5% of infants of women with oligohydramnios compared with 0.3% of the remainder.[4] The Nagpur series reported a perinatal mortality of 8.5%.8 Several features of our cohort may explain the higher figure. About one-third of the women were diagnosed before 37 weeks and 11.0% of the neonates weighed less than 1.5 kg, so prematurity and severe growth restriction probably contributed substantially. Preterm pregnancies with a decreased AFI have been shown to carry high risks of preterm birth, growth restriction and major malformation.[9] As a tertiary referral centre, our hospital may also receive a disproportionate number of severe cases. Deaths were counted only up to discharge, and no data on cause of death were analysed.

Structural congenital anomalies were found in 2.5% of neonates and were mostly renal or craniofacial, in line with the recognised role of fetal renal anomalies in reducing amniotic fluid. This proportion is lower than the 10% reported among infants of women with oligohydramnios in the Parkland cohort.[4] The difference may be because intrauterine deaths were excluded from our study and because the cohorts differ in gestational age. Maternal morbidity was low, with postpartum haemorrhage in 3.0% and no maternal death. A larger study in low-resource settings reported more haemorrhage in women with oligohydramnios than in those without.[15] As we lacked a control group, we cannot say whether our figure represents an excess.

Although our analysis was descriptive, the findings support closer antenatal surveillance as the AFI falls, using the non-stress test and umbilical artery Doppler, with a low threshold to plan delivery in severe oligohydramnios. They also support the individualised approach to isolated oligohydramnios at term that has been advocated, so as to avoid unnecessary induction and caesarean section in milder cases.[5]

Limitations

This was a single-centre study with purposive sampling, which limits generalisability and may have introduced selection bias. There was no control group with normal amniotic fluid, so the excess risk attributable to oligohydramnios could not be estimated directly. Only descriptive statistics were used: no significance tests were applied, and the comparison across AFI groups was not adjusted for confounders such as growth restriction, hypertension and gestational age at delivery. Outcomes were recorded only up to hospital discharge, and long-term infant outcomes were not assessed.

CONCLUSION

In this prospective study of 200 women with oligohydramnios (AFI ≤5 cm), caesarean delivery, NICU admission, low birth weight and neonatal death were frequent, and all became more common as the AFI decreased, whereas maternal morbidity was low. These findings favour AFI-graded antenatal surveillance, including non-stress testing and umbilical artery Doppler, with closer monitoring and a lower threshold for delivery as the AFI approaches 0–1 cm. A controlled study with adjusted analysis is needed to quantify the risk attributable to oligohydramnios and to define the best timing and mode of delivery.

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