

Pregnancy Outcome in Amniotic Fluid Index Less than 5 in Term Low-Risk Pregnancy

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Abstract

Background: To know the adverse pregnancy outcome in term low-risk pregnancy with oligohydramnios (amniotic fluid index [AFI] <5).

Materials and Methods: A case-control study on pregnancy outcome in 50 women with the ultrasound diagnosis of oligohydramnios after 37 completed weeks of gestation compared with 50 controls with no oligohydramnios matched with age and parity.

Results: Increased chances of fetal heart rate decelerations, thick meconium, low Apgar score at 5 min, birth weight <2.5 kg, admission to neonatal intensive care unit seen in study group but not statistically significant. However increased the incidence of labor induction and increase in the cesarean section for fetal distress seen in the study group and was statistically significant ($P = 0.01$).

Conclusion: Determination of AFI is valuable for predicting fetal distress in labor requiring cesarean section used as an adjunct to other fetal surveillance methods. An AFI of <5 detected after 37 weeks of gestation is an indicator for poor pregnancy outcome.

Key words: Amniotic fluid index, Apgar score, Oligohydramnios

INTRODUCTION

Amniotic fluid plays a major role in the fetal growth and development. It provides the fetus with a protective low resistance environment suitable for growth and development. It provides a cushion against the constricting confines of the gravid uterus, allowing the fetus room for the movement and growth and protecting it from external trauma. It helps to maintain the fetal body temperature and plays a part in the homeostasis of fluid and by permitting extension of the limbs it prevents joint contractures. It prevents compression of the umbilical cord and thus protects the fetus from vascular and nutritional compromise. The abnormalities of the fluid volume can

thus interfere directly with the fetal development or may be an indirect sign of underlying disorder such as fetal hypoxia, neural tube defect or gastrointestinal obstruction. Amniotic fluid index (AFI) of ≤ 5 cm defines oligohydramnios as, originally described by Phelan *et al.*¹

Many studies²⁻⁵ show that oligohydramnios is associated with a variety of ominous pregnancy outcomes, such as fetal distress, low birth weight, perinatal morbidity, perinatal mortality and increased incidence of cesarean section.

However, some studies⁶⁻⁸ show that AFI is a poor predictor of adverse outcome, and even the existence of an entity like isolated term oligohydramnios has been questioned by some authors. Thus, this study is conducted to determine whether an antepartum AFI of 5 cm or less as a predictor of adverse pregnancy outcome.

Objective of the Study

To determine whether an antepartum AFI of 5 cm or less as a predictor of adverse pregnancy outcome.

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MATERIALS AND METHODS

This study consists of an analysis of pregnancy outcome in 50 cases with diagnosis of oligohydramnios (AFI <5) by ultrasound after 37 completed weeks of gestation compared with 50 controls with no oligohydramnios (AFI more than 8) and matched for other variables such as age, parity, gestational age and any pregnancy complication.

The study and control group consist of women admitted to Vijayanagar Institute of Medical Sciences Hospital, Bellary. This is a prospective case-control study done over a period of 22 months (November 2010 to September 2012). All the cases that were available up to the study period have been taken for the purpose of the study. Consent from the patient was taken and ethical clearance taken from the Ethical Committee.

Women who had 4 or more visits at our hospital were considered as booked cases. Women with 3 or less visits and referred cases were considered as unbooked cases.

For all the selected cases, thorough history was taken, and complete examination was done. Clinical evidence of oligohydramnios was looked for. The previous obstetric records and ultrasound reports were reviewed. The good dates and excellent dates women with 37 completed weeks of gestation were studied. For all the women, ultrasound examination was done, and AFI was calculated by four quadrant amniotic fluid volume measurement technique.

For all women baseline investigations like hemoglobin%, blood group and Rh typing, urine examination was done. Non-stress test (NST) was done for all patients.

Oligohydramnios is defined as AFI \leq 5 cm. The amniotic fluid volume is considered normal if AFI is between 5.1 cm and 20 cm. For each case a control was taken with similar gravidity, parity, gestational age but the AFI of more than 8 cm and <20 cm.

Inclusion criteria:

1. AFI \leq 5
2. Single live intrauterine gestation with cephalic presentation
3. 37 completed weeks of gestation
4. Intact membrane.

Exclusion criteria:

1. AFI more than 5
2. Gestational age <37 completed weeks
3. Post-term
4. Associated fetal malformations
5. Ruptured membranes

6. Malpresentation and multiple gestation
7. High-risk pregnancy
 - a. Placental insufficiency
 - Hypertension
 - Preeclampsia
 - Diabetes
 - Chronic renal disease
 - Connective tissue disorders
 - b. Abruptio
 - c. Prostaglandin synthetase inhibitors therapy
 - d. Angiotensinogen converting enzyme inhibitors therapy
8. Uterine scar due to previous lower segment caesarean section (LSCS), myomectomy, hysterotomy.

The cases in which amnioinfusion was done were also excluded from the study to avoid confounding the outcome.

The management protocol was similar in both study group and control group.

- If patient is in labor (i.e., <3 cm in primigravida and <4 cm in multigravida are included in study), oxytocin drip started.
- For post-dated pregnancy (<41 weeks), If not in labor Bishops scoring done. Start oxytocin if the cervix is favorable. Induce with dinoprostone gel in the case of unfavorable cervix. Reassess the Bishops score after 12 h of instillation. If in labor, start oxytocin drip. If not in labor watch for another 12 h. Case will be taken for emergency LSCS if no progress.
- All cases will be monitored by continuous electronic fetal monitoring in labor. Any signs of fetal distress emergency LSCS done.
- After 3 cm dilatation of the cervical os in primigravida and 4 cm dilatation in multigravida artificial rupture of membranes done and will be classified as clear and meconium stained liquor.
- Cases with meconium stained liquor will be taken for emergency LSCS.
- All newborns will be attended by pediatrician.
- Various outcome measures recorded are induced versus spontaneous labor, nature of amniotic fluid, fetal heart rate (FHR) tracings, mode of delivery, indication for caesarean section or instrumental delivery, Apgar score at 1 min and 5 min, birth weight, admission to neonatal ward, perinatal morbidity and mortality.

OBSERVATIONS AND RESULTS

This study is performed in 50 pregnant women with AFI of \leq 5 cm and has completed 37 weeks of gestation and is compared with 50 pregnant women with AFI between 8 cm and 20 cm. These groups were similar with regard

to antepartum variables, i.e., maternal age, gravidity, parity and gestational age.

The maximum number of study and control group belongs to the age group of <20 years. The mean age for the study group was 23.1 years, and that of the control group was 22.6 years. There was no difference in the age distribution between two groups statistically.

The mean gravidity was 1.83 and 1.75 and mean parity was 0.6 and 0.6 respectively for cases and controls. Maximum numbers of patients were primigravidas in both study and control groups, and there exist a statistical significant difference in both the groups.

The mean gestational age was 39.4 weeks for the study group and 39.5 weeks for the control group which was similar.

The AFI was measured by four quadrant amniotic fluid volume assessment technique. The mean AFI for the study group was 3.55 cm and for the control group was 9.25 cm.

The outcome parameters analyzed include NST, FHR decelerations on Cardiotocography, nature of amniotic fluid, induction rate, mode of delivery, occurrence of LSCS for fetal distress, Apgar score at 1 min and 5 min, birth weight, admission to neonatal ward and perinatal mortality, induction delivery interval.

The NST was non-reactive in 5 (10%) women with AFI <5 cm compared to only 1 (2%) in the control group. There was no significant difference between two groups in the occurrence of non-reactive and reactive NST pattern ($P = 0.09$).

Most common FHR abnormality included variable decelerations found in 2 (4%) woman in the study group. Late deceleration in 1 (2%) of women of the study group. In the control group, no FHR decelerations were found. However, these ominous FHR were seen in those women of the control group who had an AFI in the lower range. There was no significant difference in two groups in the occurrence of FHR decelerations statistically ($P = 0.24$).

The amniotic fluid was meconium-stained in 9 (18%) and clear in 41 (82%) women in the study group. In the control group, only 4 (8%) women had meconium stained amniotic fluid and 46 (92%) had clear amniotic fluid. The difference in the occurrence of meconium-stained amniotic fluid between two groups was not statistically significant.

The labor was induced in 28 (56%) women with AFI ≤ 5 cm and 18 (36%) women with AFI > 8 cm. The decision for

induction or allowing for spontaneous labor was made depending upon AFI, gestational age, NST, and favorability of the cervix. The difference between two groups in this category was statistically significant ($P < 0.01$).

Induction delivery interval was < 6 h in 14 (50%) in the study group and 8 (44.4%) in the control group. It was not statistically significant ($P = 0.59$).

Number of women delivered by LSCS was 11 (22%) among study group compared to 2 (4%) in the control group. There was a statistical significant difference among two groups in this category ($P = 0.001$). Indication for LSCS in both groups was fetal distress in both groups.

Maximum number of LSCS occurred in a study group with AFI < 1 that is 5 (55.6%). This observation is statistically significant ($P = 0.01$).

Non-reactive NST cases were taken up for LSCS in both study and control groups. Five women in the study group and one woman in the control group underwent LSCS.

Among 45 women in the study group who were initially had reactive NST, 6 (13.3%) were taken up for LSCS since they had meconium stained liquor as labor progressed. This observation is statistically significant ($P = 0.04$).

The mean Apgar score was not statistically significant and the difference in the occurrence of Apgar score < 7 was statistically not significant ($P = 0.90$). The mean birth weight between the two groups was not statistically significant as shown in Table 1.

Two neonates of the study group were admitted to the neonatal ward for morbidities like birth asphyxia and meconium aspiration. No control group were admitted to the neonatal ward. The difference in the two groups was not statistically significant ($P < 0.24$).

No neonatal deaths occurred in both study and control groups. The relationship between low AFI and abnormal FHR, meconium stained liquor, caesarean section, neonatal intensive care unit (NICU) admission and perinatal mortality are shown in Table 2.

Table 1: Comparison of birth weight and Apgar score

Parameters	Study group (mean \pm SD)	Controls (mean \pm SD)	P value*
Birth weight (kg)	2.64 \pm 0.24	2.74 \pm 0.28	0.51
Apgar score 1 min	6.8 \pm 0.6	6.7 \pm 0.6	0.62
Apgar score 5 min	8.8 \pm 0.6	8.7 \pm 0.5	0.06

*Student's t-test, SD: Standard deviation

DISCUSSION

The various outcome results are comparable to results of similar studies done both in India and abroad.

The non-reactive NST rates are high in women with AFI <5 cm. The rate of non-reactive NST is 10% in present study and is less compared to that in similar study by Chandra *et al.*,⁹ Sriya and Singhai¹⁰ and Kumar *et al.*¹¹ with 69.23%, 41.55% and 40% respectively.

The FHR decelerations, during intra-partum period suggestive of fetal distress, are common in pregnant women with AFI ≤5 cm. Most common are variable decelerations due to cord compression. The ominous FHR pattern noted in 8% in the present study is less compared to 48% and 36.11% in studies by Casey *et al.*¹² and Sriya and Singhai¹⁰ respectively.

The occurrence of meconium-stained amniotic fluid is high in women with AFI ≤5 cm. The thick meconium stained liquor was noted in 18% in the study group in the present study, which is less compared to other studies. Rutherford *et al.*¹³ had 54% in his study and Sriya and Singhai¹⁰ had 38.88% and Chandra *et al.*⁹ had 23.7% in his study. In a study by Grubb and Paul 99% of women with AFI ≤ cm and prolonged deceleration had meconium stained liquor.

Various studies show different rates of LSCS for fetal distress in pregnant women with AFI of ≤5 cm. The LSCS for fetal distress was 76.92%, 51% and 43.05% in studies done by Chandra *et al.*,⁹ Casey *et al.*¹² and Sriya and Singhai¹⁰ respectively. It was 22% in our study.

The efficacy of oligohydramnios (AFI ≤5 cm) in predicting fetal distress and requirement of LSCS had a sensitivity of 84.6% and negative predictive value of 94.0%. However, the specificity and positive predictive value were poor. So, this can be considered as a screening test for the occurrence of fetal distress in the intra-partum period requiring a cesarean delivery.

The rate of LSCS was more in those with oligohydramnios and non-reactive NST (100%). Even with reactive NST

13.3% develop fetal distress and LSCS was done and it is comparable to Kumar *et al.*¹¹ study. In the control group (AFI 8-20 cm) 2% had non-reactive NST. 8% had thick meconium stained liquor and 4% cesarean section rates.

The 5 min Apgar score <7 is seen in 4% of oligohydramnios group which required NICU admission. 4% of newborns were admitted in the neonatal ward for various morbidities like birth asphyxia, meconium aspiration, etc. This is consistent with studies by Magann *et al.*¹⁴ (1995) and Casey *et al.*¹² (1999). A study by Sriya and Singhai¹⁰ (2001) showed a higher incidence of (88.88%) admission to NICU as shown in Table 3.

Among cases and controls, there was no neonatal death. In Chandra *et al.*⁹ study, neonatal death occurred in one case. In a study by Casey *et al.*¹² there was no mortality probably because of good NICU facilities.

The limitation of study includes the following:

1. Only 50 cases were available during the study period which exactly satisfied inclusion and exclusion criteria
2. The diagnosis of fetal distress was made depending on FHR tracings. However, the fetal acidosis was not proved by fetal scalp blood sampling or other methods because of non-availability
3. The use of backup surveillance methods like scalp blood sampling and acoustic stimulation and amnioinfusion would have altered the outcome
4. Neonatal follow-up after 7 days was lacking.

CONCLUSION

An AFI of <5 cm detected after 37 completed weeks of gestation in a low risk pregnancy is an indicator of poor pregnancy outcome.

- In presence of oligohydramnios, the occurrence of non-reactive NST, abnormal FHR tracings during labor, thick meconium stained liquor, development of fetal distress, the rate of LSCS, low 5 min Apgar score, low birth weight and perinatal mortality are high. In

Table 2: Relationship between AFI and various parameters

Parameters	Study (%)	Control (%)	P value
Abnormal FHR	4 (8)	0	0.24
Meconium stained liquor	9 (18)	4 (8)	0.23
Caesarean section	11 (22)	2 (4)	0.001
NICU admission	34 (68)	25 (50)	0.18
Perinatal mortality	0	0	0.24

AFI: Amniotic fluid index, FHR: Fetal heart rate, NICU: Neonatal intensive care unit

Table 3: Comparison of neonates in different studies according to low Apgar score, birth weight <2.5 kg and NICU admission in percentage

Studies	Apgar score <7 (%)		Birth weight <2.5 kg (%)	NICU admission (%)
	1 min	5 min		
Chandra <i>et al.</i>	-	23.07	61.53	46.15
Sriya and Singhai	38.88	9.72	58.38	88.88
Casey <i>et al.</i>	-	-	35.0	7.0
Present study	10	4.0	68	4.0

NICU: Neonatal intensive care unit

our study the rate of LSCS, meconium stained liquor, non-reactive NST, abnormal FHR tracing during labor, development fetal distress, NICU admission are more. However, except increased LSCS rates, in rest all parameters no statistical significant difference exist between study and control groups

- Determination of AFI can be used as an adjunct to other fetal surveillance methods
- Determination of AFI is a valuable screening test for predicting fetal distress in labor requiring cesarean section. It has a sensitivity of 84.6% and negative predictive value of 94% specificity of 54% and positive predictive value of 22%.

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