

## Amniotic Fluid Index: An Important Indicator of Perinatal Outcome

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### ABSTRACT

**Aim:** To determine whether an antepartum low amniotic fluid index (AFI) is a predictor of adverse perinatal outcome in normal pregnancy and to determine a threshold level of AFI which could predict an adverse outcome.

**Methods:** This was a prospective study conducted among 180 pregnant women at 37-40 weeks of gestation with no known obstetric or medical complications with an AFI  $\leq$  5<sup>th</sup> percentile. The results were statistically analyzed and compared.

**Results:** In the control group, the mean AFI was 10.14cm and in study group, it was 4.14 cm. 65% patients in the study group and 24% in the control group had a non-reactive stress test. In the control group, 53% of the patients were induced for reasons other than oligohydromnios, while in the study group 86% of the patients were induced for oligohydromnios. Among the control group, 33% had a LSCS, while 67% delivered vaginally and in the study group, 66% had a LSCS and 34% delivered vaginally. In this study a 5 min. APGAR <7 was seen in 34% in the study group and 11% in the control group. 33% neonates in the control group and 64% in the study group had birth weights <2.5kg.

**Conclusion:** In the presence of oligohydromnios, perinatal morbidity and mortality are high. Determination of AFI is a variable screening test for predicting fetal distress.

**Keywords:** Amniotic fluid index (AFI), Oligohydromnios, Perinatal, Fetal distress.

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### Article History:

Received: 15-06-2016, Revised: 17-06-2016, Accepted: 22-06-2016

### Access this article online

Website: <a href="http://www.ijmrp.com">www.ijmrp.com</a>	Quick Response code 
DOI: 10.21276/ijmrp.2016.2.4.013	

### INTRODUCTION

Phelan defined oligohydromnios as amniotic fluid index (AFI)  $\leq$  5 cm and borderline oligohydromnios as AFI ranging from 5-8 cm between 36-42 weeks of gestation.<sup>1</sup> Oligohydromnios occur in about 1-5% of pregnancies at term.<sup>2</sup> In pregnancies of more than 40 weeks of gestation, the incidence may be more than 12% as amniotic fluid volume declines progressively after 41 weeks of gestation.<sup>3</sup> Women with oligohydromnios are more likely to have abnormal or non-reactive FHR tracings, increased incidence of fetal distress and thus an increased incidence of cesarean sections.<sup>4</sup> Oligohydromnios is also the leading indication for labour induction. Labour induction increases cesarean delivery, particularly for primiparous women with an unripe cervix. Oligohydromnios is associated with a high rate of pregnancy complications and increased perinatal mortality.<sup>5</sup> Thus, AFI assessed antepartum or intrapartum, would help to identify the woman who need increased antepartum surveillance for pregnancy related complications.<sup>6</sup> However, some studies show that AFI is a poor predictor of adverse perinatal outcome and isolated oligohydromnios should not be the only parameter for predicting prenatal outcome.<sup>7</sup> Keeping in mind the above knowledge, the present study was carried out to find whether oligohydromnios can be used as a predictor of adverse perinatal outcome in non-complicated pregnancies at term.

### MATERIALS AND METHODS

This was a prospective study conducted among 180 eligible women recruited from the OPD and Labour ward. The inclusion criteria for the study were pregnancy at 37-42 weeks of gestation with no known obstetric or medical complications. The exclusion criteria were the presence of obstetric or medical complications and an unwillingness to participate in the study. The women were divided into control and study groups based on AFI. AFI was measured with the four quadrant technique and those with AFI < 5<sup>th</sup> percentile i.e. AFI of < 5cm at term as described by Phelan as oligohydromnios or an amniotic fluid volume of < 500ml at > 37 weeks of gestation, were included in the study group.

Follow up of the patients identified with oligohydromnios was done till they were presented in our labour room in active Labour (cervical dilatation  $\geq$  3cm and with good uterine contractions at the rate of 3-4 lasting for 45 seconds) or till admitted to labour room through the OPD for other indications.

On admission NST was done for all the included patients. Those with non-reactive NST and not in active labour also had BPP done. Documentation of obstetric interventions in the form of induction or augmentation of Labour with prostaglandins or pitocin and mode of delivery was done. Documentation of neonatal outcomes in the form of birth weights and APGAR score was also

done. Admission to the neonatal unit for perinatal morbidities like APGAR ≤ 7, seizures, hypoglycemia, hypothermia, hyperbilirubinemia, hypocalcemia, meconium aspiration, respiratory distress was documented. The results were recorded and tabulated. They were statistically analyzed using chi-square test. In addition, epidemiological parameters like sensitivity, specificity, positive predictive value were used as required observations.

**RESULTS**

Out of 180 women included in the study, 54% in the control group and 60% in the study group were primiparas. So, both the groups were comparable. While only 19% women in the control group were at the gestational age > 40 weeks, the study group consisted of 41% of such women. The mean AFI for the control group was 41.4 cm and the control group was 10.14 cm. The non-stress test was non-reactive in 65% of the patients having AFI ≤ 5, while only 24% of patients having AFI >5 had a non-reactive NST (x<sup>2</sup> =27.497, p<0.001). [Table-1]

Only 33% of the patients in the control group delivered by LSCS, while 66% of patients in study group delivered by LSCS (x<sup>2</sup> =21.36, p≤ 0001) [Table-2]

86% patients in the study group were induced, while only 53% patients in the control group were induced(x<sup>2</sup>=19.53, p≤ 0.001);

among the inductions in the control group, 7 (18%) underwent a LSCS, while in study group, 38 (61%) underwent a LSCS (x<sup>2</sup> =17.539, p≤0.001). In the control group 7 (24%) patients underwent LSCS for fetal distress, while in study group, 32 (53%) underwent LSCS for fetal distress. [Table-3]

The determination of AFI ≤ 5cm as a screening test, in predicting fetal distress during labour requiring LSCS, has a sensitivity of 82%, specificity of 63.3%, positive predictive value of 51% and a negative predictive value of 90%. A better sensitivity (82%) and a negative predictive value (90%) make it a good screening test. The 5 minute APGAR ≤ 7 was seen in 34% in one study group and 10% in the control group (x<sup>2</sup>=12.857, p= 0.0003). [Table-4]

33% patients in the control group and 47% patients in the study group had babies weighing between 2-2.4 kg, while 17% of the women in the study group had babies weighing ≤ 2kg and none in the control group had low birth weight babies (x<sup>2</sup> =16.218, p≤ 0.001). 14% of the babies in the study group had respiratory distress as compared to 6% in the control group.

94% of the neonates in the AFI 2-3 group were admitted to NICU, while 26% of those with AFI 5.1-8 group and 6% in the 8.1-14 group required NICU admission. [Table-5]

The above results show that maximum perinatal morbidity in the form of fetal distress and low APGAR scores was seen in the study group with an AFI of 2-3.

**Table 1: Distribution of NST pattern**

Sr no.	NST	Control group (n=90)	Study group (n=90)
1.	Reactive	67 (76%)	32 (35%)
2.	Non -reactive	23 (24%)	58 (65%)

Using chi square test x<sup>2</sup> =27.497, p <0.0001

**Table 2: Mode of delivery**

Sr no.	Type of delivery	Control group (n=90)	Study group (n=90)
1.	Vaginal	60 (66%)	30 (34%)
2.	LSCS	29 (33%)	60 (66%)
3.	Forceps	1 (1%)	00

Using chi square test x<sup>2</sup> =21.36, p <0.0001

**Table 3: Distribution of indications for LSCS**

Sr no.	Indication	Control group (n=29)	Study group (n=60)
1.	Fetal distress	7 (24%)	32 (53%)
2.	IUGR with oligohydromnios	4 (11%)	18 (30%)
3.	PROM with non-progress of labour	4 (14%)	03 (5%)
4.	Incoordinate uterine action	2 (7%)	-
5.	CPD	3 (10%)	-
6.	Failure of induction	4 (14%)	3 (5%)
7.	Elective LSCS	5 (20%)	4 (7%)

Using chi square test x<sup>2</sup> =6.769, p <0.05

**Table 4: Distribution of APGAR ≤ 7**

Sr no.	APGAR ≤ 7	Control group (n=90)	Study group (n=90)
1	1 min.	22	45
2	5 min	09	30

Using chi square test x<sup>2</sup> =12.857, p <0.0003

## DISCUSSION

In this study, 41% of the patients in the study group who presented with isolated oligohydromnias were admitted at > 40 weeks. In a study by Gumus et al, gestational age at delivery was 37.7 weeks for the study group and 38.3 weeks for the control group ( $p= 0.004$ ).<sup>8</sup> This result, while being statically significant, correlates with the present study. 65% patients in the study group and 24% in the control group had a non-reactive NST ( $\chi^2=27.497$ ,  $p<0.0001$ ) and this result is statically significant. In the study by Kumar et al, 40% of the patients had non-reactive NSTs<sup>9</sup>, while in a study by Sriya et al it was 41.55%.<sup>10</sup> In an another study, oligohydromnias at term (AFI<5) exhibited more perinatal mortality.<sup>11</sup> These studies show that more than half of the patients with AFI < 5 have non-reactive NSTs. While comparing the incidence of delivery by LSCS in the study and control groups (66% vs 33%), in the study by Jandial et al, 56% patients underwent LSCS, while 44% patients delivered vaginally in the study group.<sup>6</sup> Although Gumus et al had a  $p= 0.096$  (non-significant) for the same.<sup>8</sup> While inductions were significantly higher in the study group ( $p<0.001$ ), Rainford et al<sup>12</sup>, Jandial et al<sup>6</sup> and Gumus et al<sup>8</sup> had a similar finding. These studies shows that oligohydromnias is an independent indication for induction of labour in most Institutes. Comparing the incidence of LSCS for induction in the control and the study groups ( $p < 0.001$ ), the study by Jandial et al<sup>6</sup> correlates our study and the study by Achalabi et al<sup>13</sup> based on induction of labour in oligohydromnias and perinatal outcome, has similar outcomes.

The 5 min. APGAR score 7 was seen in 34% in the study group and 10% in the control group ( $\chi^2=12.857$ ,  $p= 0.0003$ ). In the study by Jandial et al<sup>6</sup>, 25% of the patients with AFI 2-3, 11.11% of patients with AFI > 3-4 and 9.09% of the patients with AFI> 4-5 had APGAR score <7 at 5 min. which is similar to our study. While in the studies by Rainford et al<sup>12</sup> and Conway et al<sup>14</sup>, the results though comparable were non-significant.

The terms of neonatal morbidity in the form of low birth weight <2kg (17%) and NICU admissions for various indications (30% vs. 9%), our findings correlate with those of Voxman et al<sup>4</sup>, Rainford et al<sup>12</sup>, Gumus et al<sup>8</sup> and Jandial et al.<sup>6</sup>

## CONCLUSION

An AFI of  $\leq 5$ cm detected after 37 completed weeks of gestation is an indicator of poor perinatal outcome. In the presence of oligohydromnias, the occurrence of non-reactive NST, abnormal FHR tracings during labour and 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. Determination of AFI can be used as an adjunct to other fetal surveillance methods. It helps to identify those infants at risk of poor perinatal outcome.

Determination of AFI is a valuable screening test for predicting fetal distress in labour requiring cesarean section. It has a sensitivity of 71%, negative predictive value of 82%, specificity of 58% and positive predictive value of 43%.

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**Source of Support:** Nil.

**Conflict of Interest:** None Declared.

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**Cite this article as:** Jyoti Malik, Pinki Rai, Ashima, Sibadatta Das. Amniotic Fluid Index: An Important Indicator of Perinatal Outcome. *Int J Med Res Prof.* 2016; 2(4):54-56.