

## Low Amniotic Fluid Index as a Predictor of Adverse Perinatal Outcome – An Indian Perspective

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### Abstract

**Background:** Oligohydramnios has increased incidence of meconium stained liquor, abnormal FHR tracing, low Apgar score, low birth weight, admission to NICU, birth asphyxia and cesarean section for fetal distress.

**Objective:** To compare the perinatal outcome in women with singleton term pregnancies having amniotic fluid index (AFI) < 5cm to those having AFI between 6 to 20 cm.

**Material and methods:** It is a prospective comparative study which included a total of 100 women with singleton term pregnancy with cephalic presentation, divided into two groups of 50 each. Women in Group 1 had amniotic fluid index <5 cm and in Group 2, had AFI from 6-20 cm. Primary outcome measures were fetal distress, meconium stained amniotic fluid, Apgar score less than seven at five minutes and low birth weight. Secondary outcome measures were caesarean section, neonatal complications and admission in NICU.

**Results:** An AFI <5 cm was associated with significant high rate of induction of labor ( $p < 0.001$ ), caesarean section ( $p = 0.04$ ) and fetal distress ( $p < 0.05$ ). Meconium-stained liquor ( $p = 0.76$ ), Apgar score less than seven at 5 minutes ( $p = 0.307$ ), low birth weight ( $p = 0.130$ ) or NICU admission ( $p = 1$ ) were comparable in the two groups.

**Conclusion:** Low AFI (<5cm) at term is associated with significantly high rate of intrapartum fetal distress and caesarean section, though the neonatal outcome is not affected by the AFI levels.

**Keywords:** Amniotic fluid; Amniotic fluid index (AFI); Oligohydramnios; Perinatal outcome

### Introduction

Amniotic fluid (AF) is clear fluid which surrounds fetus in amniotic cavity in the mother's womb. An amniotic fluid volume more than two standard deviation below the mean for specific gestational age or volume reduced below the 5th percentile for particular gestational age would define oligohydramnios [1]. Other definitions for oligohydramnios are volume less than 500 ml at 32-36 weeks [2] or amniotic fluid index (AFI) <5 cm at term [3]. The prevalence of oligohydramnios depends largely upon the definition and criteria used and the population studied and it complicates between 0.5-5% of all pregnancies [4]. Late onset oligohydramnios has increased incidence of meconium stained liquor, abnormal FHR tracing, low Apgar score, low birth weight, admission to NICU, birth asphyxia and cesarean section for fetal distress [5]. The present study was carried out to compare the perinatal outcome in women with singleton term pregnancies (37-41 weeks) having amniotic fluid index (AFI)  $\leq 5$  cm to those having normal AFI (6-20 cm).

### Materials and Methods

The present study was conducted in the Department of Obstetrics and Gynecology at a tertiary care centre in India on 100 women with

singleton term pregnancy (37-41 weeks) attending the department and were divided into two groups:

1. Group 1 (study group)-50 pregnant women with AFI  $\leq 5$  cm
2. Group 2 (control group)-50 pregnant women with normal AFI between 6 to 20 cm.

| Parameter                        | Group 1 (study group) | Group 2 (Control group) | Test of significance (student t test) | P value |
|----------------------------------|-----------------------|-------------------------|---------------------------------------|---------|
| Age (years) (mean+SD)            | 23.66 $\pm$ 2.79      | 24.04 $\pm$ 3.03        | t=0.650                               | p>0.05  |
| Parity (mean+SD)                 | 0.78 $\pm$ 0.84       | 0.68 $\pm$ 0.76         | t=0.621                               | p>0.05  |
| Gestational age in wks (mean+SD) | 38.64 $\pm$ 1.09      | 38.96 $\pm$ 1           | t=1.45                                | p>0.05  |
| AFI (cm) (mean+SD)               | 3.09 $\pm$ 1.02       | 13.06 $\pm$ 3.51        | -                                     | -       |

**Table 1:** Characteristics of women as per age, parity, gestational age and AFI.

Women with singleton term pregnancy (37-41wks) with cephalic presentation, with intact membranes, sure about dates and/or a

sonogram in first trimester of pregnancy and having AFI measurement within one week of delivery were included in the study. Pregnancy associated with previous history of unknown perinatal loss, any congenital malformation in fetus, antepartum hemorrhage, medical disorder like diabetics, cardiac disease was excluded from the study. Every woman coming next to the woman of the study group and fulfilling inclusion and exclusion criteria was taken in the study as control group. Ethical approval was taken from the institutional ethics committee.

At entry into the study, detailed history and written informed consent was taken from all the subjects. Phelan method was used for

ultrasonographic measurement of AFI. Measurements of the deepest pool in each quadrant were summated and AFI was recorded in centimeters. If the woman did not deliver within 7 days of ultrasound, a repeat ultrasound for measuring AFI was done. The mode of delivery and perinatal outcomes were noted. Primary outcome measures were intrapartum fetal distress, meconium stained amniotic fluid, A 5' minute Apgar score <7 and low birth weight. Secondary outcome measures were caesarean section, neonatal complications like neonatal hypoglycemia, neonatal seizure and neonatal admission and length of stay in NICU. Chi square and student t test were used to analyze the data.

| Parameters                  |                   | Group 1 (study group) | Group 2 (Control group) | Test of significance (Chi-sq test) $\chi^2$ | P value |
|-----------------------------|-------------------|-----------------------|-------------------------|---|---------|
| Fetal distress              |                   | 16                    | 7                       | 4.57  | < 0.05  |
| Meconium staining of liquor |                   | 6                     | 7                       | 0.08  | 0.766   |
| Mode of delivery            | Caesarean section | 18                    | 9                       | 4.10  | 0.04    |
|                             | Vaginal           | 31                    | 39                      | 3.04  | 0.08    |
|                             | Operative vaginal | 1                     | 2                       | 0.344                                       | 0.557   |

**Table 2:** Comparison among the groups as per mode of delivery, fetal distress and meconium staining of liquor.

## Results

Results of the study are shown in tables 1-3.

As far as residence was concerned 56% and 54% of women came from rural area in the study group and control group respectively. Most of the patients 66% women in group 1 and 72% in group 2 were unbooked. Only 12% of the women were illiterate in both the groups. Most of the patients (72%) were induced in study group while only 12% were induced in the control group and the difference was highly

significant ( $p < 0.001$ ). Twenty five percent of the women with induced labor had fetal distress in study group and 16.7% of women with induced labor had fetal distress in control group and this difference was not statistically significant ( $p = 0.657$ ). There were 18 caesarean section in study group and 13 were due to fetal distress and five of remaining were due to either failed induction or prolonged labor. Among the control group there were total of nine caesarean sections, five were for fetal distress and four for other indications.

| Parameters                            | Group I (study group) | Group II (Control group) | Test of significance           | P value |
|---------------------------------------|-----------------------|--------------------------|--------------------------------|---------|
| Birth weight (kgs)<br>(Mean $\pm$ SD) | 2.66 $\pm$ 0.508      | 2.76 $\pm$ 0.366         | (student t test) $t = 1.15$    | >0.05   |
| Birth weight $\leq$ 2.5kg             | 19                    | 12                       | (Chi-sq test) $\chi^2 = 2.29$  | 0.130   |
| Apgar score of <7 at 5 min            | 3                     | 1                        | (Chi-sq test) $\chi^2 = 1.04$  | 0.307   |
| Admission to NICU                     | 3                     | 3                        | (Chi-sq test) $\chi^2 = 0.000$ | 1       |
| Neonatal complications                | 2                     | 2                        | (Chi-sq test) $\chi^2 = 0.000$ | 1       |

**Table 3:** Perinatal outcome in the two groups.

## Discussion

Late onset oligohydramnios has been associated with incidence of meconium stained liquor, fetal distress, low Apgar score, low birth weight, admission to NICU, birth asphyxia and cesarean section for fetal distress. In the present study the two groups were comparable in terms of age, parity and gestation age ( $p > 0.05$ ) (Table 1).

Significantly higher induction of labor was seen among women with low AFI (72%) as compared to control group (12%) ( $p < 0.001$ ). This is similar to that reported by Casey et al. who also found high rate of induction of labor in the group with low AFI (42%) as compared to group with normal AFI (22% ;  $p < 0.001$ ) (6). Similarly in a study by Ahmad et al. induction of labor was found to be significantly high, 63% in women with oligohydroamnios as compared to 14% in the control group ( $p < 0.001$ ) [6,7].

The rate of caesarean delivery was 36% in the study group which is double as compare to the control group (18%) and was significantly high ( $p=0.04$ ; Table 2). Ahmad et al also found more than two fold higher caesarean section rate in group with low AFI as compared to control group, presumably as described by author due to higher rate of labor induction in cases of low AFI(7). In another study by Bangal et al who studied perinatal outcome in women with low AFI (<5cm) but did not compare it with normal AFI found very high rate (44%) of caesarean section in women with low AFI [8].

In the present study, 72.2% of the total caesarean section were due to fetal distress in study group and 55.6% in the control group and it was not statistically significant ( $p=0.149$ ). Similarly Casey et al observed caesarean deliveries for non-reassuring fetal heart rate were not significantly increased when oligohydroamnios had been diagnosed ( $p=0.18$ ) (6). In the study by Locatelli et al the rates of caesarean delivery for non-reassuring fetal testing were significantly higher ( $p<0.001$ ) in AFI <5 cm group (8.2%) compared with AFI >5cm (3.9%) which is contrary to our study [9].

Meconium staining of the liquor was seen only in six cases of study group and there was no significant difference between the two groups ( $p=0.766$ ; Table 2). In the study by Magann et al. meconium stained amniotic fluid was not different between the groups [10]. In study by Nargis et al meconium stained liquor was seen in 44% of the women with low AFI (<5 cm) as compared to present study where 12% had meconium stained liquor [11].

The rate of fetal distress were significantly higher (32%) in the study group as compared to the control group (14%) and difference was statistically significant ( $p<0.05$ ; Table 2) which may be due to the earlier detection of abnormal fetal heart rate patterns. William found an increased risk of non-reassuring fetal heart rate patterns during labor for oligohydroamnios patient (OR 16.6 [2.7-98.1]) [12]. In the present study 25% and 16.7% of the women with induced labor had fetal distress in study group and control group respectively and difference was not statistically significant ( $p=0.657$ ). Thus showing induction of labor was not responsible factor for increase fetal distress and we can consider oligohydroamnios as an independent cause for the fetal distress.

We did not found any difference in the perinatal morbidity, low birth weight and low Apgar score at 5 min in between the two groups in present study (Table 3). Ahmad et al. [7] and Locatelli et al. [10] also found no difference in the low Apgar score at 5 minutes in the two groups. Ahmad et al observed that oligohydroamnios group when compared with control group had significantly lower birth weight babies and they were delivered at a significant earlier gestation due to iatrogenic preterm delivery via induction of labor or caesarean sections as compared to control group [7]. While in present study, only term pregnancy was considered and that may be reason for less number of low birth weight neonates. Locatelli et al concluded that the number of neonates with birth weight <10<sup>th</sup> percentile was significantly higher in

study group (13.2%) compared with the control group (5.5%), ( $p<0.0010$ ) [10]. In the present study only three neonates (6%) had NICU admission in both the groups and there was no neonatal death in any group. The results of this study are consistent with the study by William concluded that there was no strong relationship between AFI and neonatal complications or length of stay in the neonatal intensive care unit [12]. Neonatal complications were not increased in the present study which may be due to very early detection of the fetal distress and early intervention by operative delivery.

It is concluded from the present study that low AFI ( $\leq 5$  cm) at term is associated with significantly high rate of intrapartum fetal distress and caesarean section as compared with the normal AFI. However, the Apgar score <7 at 5' min and neonatal complications is not affected by amniotic fluid index at term which may be due to earlier detection of fetal distress thus leading to the prompt operative delivery of the fetus. So the intense monitoring of the fetal heart rate during the intrapartum period can prevent the adverse neonatal outcomes.

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