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Original Research Article

## A comparative study on maternal and foetal outcome between low and normal amniotic fluid index in term pregnancies

Sushila Kharakwal, Hema J. Shobhnae, Sippy Agarwal, Zainab Mehboob\*

Department of Obstetrics and Gynaecology, MLB Medical College, Jhansi, Uttar Pradesh, India

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**\*Correspondence:**

Dr. Zainab Mehboob,

E-mail: [zainabshibin@myyahoo.com](mailto:zainabshibin@myyahoo.com)

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### ABSTRACT

**Background:** Amniotic fluid index (AFI) approximates amniotic fluid volume. It measures the overall well-being of the foetus. objective of the study was to determine Maternal and Foetal outcome in oligohydramnios pregnancies and compare them with cases of normal amniotic fluid volume full term pregnancies.

**Methods:** This hospital based prospective comparative study included 300 pregnant women with full term pregnancies. Distributed equally into two groups, cases (AFI  $\leq 5$  cm) and controls (AFI: 6 to 24 cm). AFI measured using Phelan's four quadrant method. Detailed history, a clinical assessment and obstetric examination done for participants. Labour onset, amniotic fluid type, reason for LSCS, mode of delivery, birth weight, APGAR score, NICU admission, and delivery outcome were the outcome measures studied.

**Results:** Mean age for case group was  $24.36 \pm 4.23$  years and  $25.82 \pm 3.45$  years for control group. For case group 36% and 30% of control group were induced. In case group liquor in 26% was significantly meconium soiled, compared to 7.3% of control group. Case group had 38% Caesarean procedures due to foetal distress. For case group 38% births were vaginal, while 62% in control group. In case group 30% of newborns were under 2.5 kilogram, compared to 16% in control group. In case group 17.33% participants had APGAR scores  $<7$  compared to 2% in the control group. Case group lost 3.33% of infants, whereas the control group lost 1 (0.70%).

**Conclusions:** Oligohydramnios is a high-risk pregnancy and that patients with this condition require appropriate antepartum care, intensive foetal monitoring, and intrapartum care.

**Keywords:** Amniotic fluid index, APGAR score, Meconium, Oligohydramnios

### INTRODUCTION

The amniotic fluid cushions the developing foetus and functions as a protective layer against biological and mechanical injuries. It provides space for physical movement, permits foetal ingestion and respiration, and has antibacterial properties.<sup>1</sup> Amniotic fluid index (AFI) is an approximation of amniotic fluid volume. It measures the overall well-being of the fetus.<sup>2</sup> The amniotic fluid index is measured by transabdominal ultrasonography using a four-quadrant technique, as described by Phelan et al. in 1997. The comparison of the measurement to the index is essential for determining foetal and maternal well-being.<sup>3</sup> Oligohydramnios is interpreted as an AFI of less than 5 cm. It is the sum of the deepest vertical dimensions

in each quadrant of the uterus as measured by USG.<sup>4</sup> Oligohydramnios occurs in approximately 1-5% of pregnancies.<sup>5</sup> Oligohydramnios is a condition that can cause complications in around 12% of pregnancies that continue beyond 41 weeks of gestation.<sup>6</sup>

Oligohydramnios has been associated with utero-placental insufficiency, hypertension, preeclampsia, diabetes, chronic hypoxia, rupture of amniotic membranes, dehydration, and post-term pregnancy.<sup>7</sup>

Low amniotic fluid has been associated with increased risk of maternal morbidity in terms of increased rate of induction of labour and operative interventions, and intrauterine growth retardation, meconium aspiration

syndrome, birth asphyxia, low APGAR scores, and congenital anomalies.<sup>3,8</sup>

The foetal complications that are commonly seen associated with decreased amniotic fluid volume include stillbirths, foetal anomalies, aberrant FHR tracings during labour, an increase in caesarean sections for foetal distress, and potentially foetal acidosis.<sup>9</sup>

With this background, we performed a study with the objective of determining Foetal and Maternal outcome in oligohydramnios pregnancies and comparing them with cases of normal amniotic fluid volume full term pregnancies.

## METHODS

After receiving approval from the institution's ethical review committee, this hospital-based observational comparative study was initiated and conducted in Department of Obstetrics and Gynaecology, of our institute from August 2021 - August 2022. The investigation adhered to the principles of the Helsinki Declaration. In all, 300 pregnant women who visited our tertiary care institution throughout the duration of the investigation were recruited for the study. The study subjects were allocated into case and control groups by 1:1 ratio.

The inclusion criterias for our study were patients with sonographically proven cases of oligohydramnios (AFI  $\leq$  5 cm), gestational age equal to or more than 37 weeks, singleton pregnancy and intact membranes.

Exclusion criteria for the study were patients with multiple gestation, patients with foetus having congenital anomalies like renal agenesis, polycystic kidney disease and polyhydramnios cases.

Depending on the value of AFI, women were divided into 2 different groups:

Case group (n=150): Pregnant female with AFI  $\leq$  5 cm.

Control group (n=150): Pregnant female with AFI 6-24 cm.

On admission, a thorough history was obtained, a clinical assessment was conducted, and the gestational age was determined. In patients with regular menstrual cycles, the gestational period was determined by the LMP or by first trimester USG. A speculum and per vaginal examination was performed to rule out per vaginal drainage and confirm the intactness of the membranes. Patients were consecutively enrolled in the investigation until the required sample size was reached. Informed written consent was obtained from every participant included in the study. Demographic information and detailed history were recorded on a structured proforma developed specifically for the study.

During the obstetric examination, special attention was given to the uterine height, symphysio-fundal height, abdominal circumference, foetal presentation and position, engagement of the presenting part, and foetal heart.

All patients underwent an obstetric ultrasound examination in order to determine the amniotic fluid index using Phelan's four quadrant method. In each quadrant, the greatest vertical compartment devoid of foetal tissue and umbilical cord loops was measured, and the sum of these measurements determined the AFI in centimetres.<sup>3</sup>

The monitoring of maternal and foetal wellbeing was conducted during labour and managed in accordance with the standard treatment protocol established by the institute.

Maternal outcome was assessed by onset of labour, type of amniotic fluid, indication for lower segment caesarean section (LSCS), the mode of delivery as to whether it is vaginal delivery, instrumental or operative delivery, and postnatal complications if any.

Foetal outcome was noted in the form of perinatal morbidity, which was assessed by using birth weight, APGAR score, admission to NICU or immediate perinatal period and outcome of the delivery.

The data was initially processed and coded on MS Excel office version 2021. Statistical analysis was performed using the Statistical Package for Social Sciences (SPSS) version 23 IBM (USA). Normality of data was checked using Kolmogorov-Smirnov and Shapiro-Wilk tests. For categorical variables, frequency and proportions was used in the descriptive analysis, while mean and SD was used for continuous variables. A p-value  $<$  0.05 was considered to be statistically significant at 95% confidence interval. Categorical outcomes were compared between groups using Chi-square test and Fisher's exact test wherever applicable. A p-value less than 0.05 was considered to be statistically significant at 95% confidence interval.

## RESULTS

The AFI index was used to categorize the participants in the study. There were 150 cases of oligohydramnios and 150 pregnant women with normal AFI who were used as controls. The difference between the mean ages of the women in the case group (24.36 $\pm$ 4.23) and the control group (25.82 $\pm$ 3.45) was not statistically significant (P=0.780) (Table 1). In this study, the majority of patients were primiparous (55.3% in the case group and 56.7% in the control group). This variation was found to be statistically insignificant (P = 0.81) (Table 1). The majority (36%) of pregnancies in the case group were delivered by 37 weeks. The majority (41.3%) of pregnancies in the control group were delivered after 38 completed weeks (Table 1). Significantly more pregnancies were carried to term in the control group. In the case group, the frequency of postdated pregnancies was higher (18%).

**Table 1: Baseline characteristics of the study participants (n=300).**

| Variables  | Study group | Control group |
|--|-------------|---------------|
|  | (N=150)     | (N=150)       |
|  | N (%)       | N (%)         |
| <b>Age group (years)</b>                             |             |               |
| <20  | 12 (8)      | 7 (4.7)       |
| 20-30  | 132 (88)    | 138 (92)      |
| >30  | 6 (4)       | 5 (3.3)       |
| Mean age   | 24.36±4.23  | 25.82±3.45    |
| <b>Parity</b>  |             |               |
| Primi  | 83 (55.3)   | 85 (56.7)     |
| Multi  | 67 (44.7)   | 65 (43.3)     |
| <b>Gestational age (in weeks)</b>                    |             |               |
| ≥37  | 54 (36.0)   | 18 (12.0)     |
| 38   | 30 (20.0)   | 62 (41.3)     |
| 39   | 13 (8.6)    | 43 (28.7)     |
| 40   | 26 (17.3)   | 14 (9.3)      |
| >40  | 27 (18.0)   | 13 (8.6)      |
| Data presented as Number and percentages and mean±SD |             |               |

**Table 2: Maternal outcome of study participants (N=300)**

| Maternal outcome              | Case group (N=150) | Control group (N=150) | P value |
|-------------------------------|--------------------|-----------------------|---------|
| <b>Onset of labour</b>        |                    |                       |         |
| Induced                       | 54 (36)            | 45 (30)               | 0.001   |
| Spontaneous                   | 96 (64)            | 105 (70)              |         |
| <b>Indication for LSCS</b>    |                    |                       |         |
| Breech                        | 10 (6.67)          | 3 (2)                 | 0.001   |
| CPD                           | 15 (10)            | 19 (12.7)             |         |
| FD                            | 57 (38)            | 17 (11.3)             |         |
| IUGR                          | 10 (6.67)          | 5 (3.3)               |         |
| Others                        | 1 (0.06)           | 2 (1.3)               |         |
| <b>Type of amniotic fluid</b> |                    |                       |         |
| Clear                         | 81 (54)            | 110 (73.3)            | 0.001   |
| Thick                         | 39 (26)            | 11 (7.3)              |         |
| Thin                          | 30 (20)            | 29 (19.4)             |         |
| <b>Mode of delivery</b>       |                    |                       |         |
| Normal vaginal                | 57 (38)            | 93 (62)               | 0.001   |
| LSCS                          | 93 (62)            | 57 (38)               |         |

Data presented as Number and percentages. P<0.05 was considered statistically significant.

Labour occurred spontaneously in 64% of participants of case group and 70% of control group. Induction of labour was performed on 36% of the participant of case group and 30% of the control group. This difference was found to have statistical significance (p = 0.001). A total of 73.3% of patients in the control group had clear liquor, compared to 54 % in the case group. In the case group, 20% and 19.3% of the control group exhibited scant meconium,

respectively. Liquor was heavily soiled with meconium in 26% of the case group but only in 7.3% of the control group. This distinction was determined to be statistically significant, with a p value of 0.001 for the difference (Table 2). Foetal distress was the main reason for Caesarean-sections (38%) in patients falling under the case group. The results revealed that the majority of deliveries, specifically 62%, were conducted through lower segment caesarean section (LSCS) and conversely, normal vaginal labour accounted for only 38% of the deliveries in the case group. The results of the control group indicate that 62% of participants underwent normal vaginal labour, while only 38.0% underwent a lower segment caesarean section (LSCS). The present study has identified this difference as a statistically significant difference (P= 0.001) (Table 2).

**Table 3: Foetal outcome of study participants (N=300).**

| Foetal outcome              | Case group (N=150) | Control group (N=150) | P value  |
|-----------------------------|--------------------|-----------------------|----------|
| <b>Birth weight (in Kg)</b> |                    |                       |          |
| <2.5                        | 45 (30)            | 24 (16)               | 0.001    |
| ≥2.5                        | 105 (70)           | 126 (84)              |          |
| <b>APGAR score</b>          |                    |                       |          |
| <7                          | 26 (17.33)         | 3 (2)                 | <0.00001 |
| ≥7                          | 124 (82.67)        | 147 (98)              |          |
| <b>NICU admission</b>       |                    |                       |          |
| Yes                         | 78 (52)            | 27 (18)               | <0.00001 |
| No                          | 72 (48)            | 123 (82)              |          |
| <b>Outcome</b>              |                    |                       |          |
| Normal                      | 145(96.67)         | 149(99.3)             | 0.001    |
| Death                       | 5(3.33)            | 1(0.7)                |          |

Data presented as Number and percentages. P<0.05 was considered statistically significant.

In the case group, 30% of infants weighed less than 2.5 kilograms, while in the control group, only 16% of infants weighed less than 2.5 kilograms. This difference was deemed statistically significant as the p value was 0.001. Among the participants in case group, 26 (17.33%) babies were with APGAR score <7, and 124 (82.67%) babies were with APGAR score ≥7. Among the participants in control group, 3 (2%) babies were with APGAR score <7, and 147 (98%) babies were with APGAR score ≥7. The difference in the proportion of APGAR score between case group was statistically significant (p-value <0.0001). In the case group, 78 (52%) babies admitted in NICU, whereas in control group, 27 (18%) babies admitted to NICU. The difference in the proportion of NICU admission between study group was statistically significant (p-value <0.0001). In the case group, perinatal deaths was seen in 5 (3.33%) in comparison with 1 (0.70%) in the control group. The difference in the proportion of perinatal death between study group was statistically significant (p-value=0.001) (Table 3).

## DISCUSSION

In the present study, mean age of individuals in the case group was determined to be 24.36±4.23 years, while the mean age of those in the control group was 25.82±3.45 years. Statistical analysis revealed that this difference was not statistically significant (p-value = 0.780). The present study is comparable to the investigations conducted by Patil SV et al. and Swati et al., in which a statistically significant difference in the mean age of the participants was not observed between the experimental and control participants.<sup>10,11</sup> In a study conducted by Hindumati et al., the mean age of the participants was reported to be 22.5 years. Similarly, Sangeeta et al. reported a mean age of 23.1 years in cases and 22.6 years in controls.<sup>12,13</sup>

Our findings indicate that 55.30% of cases in the oligohydramnios group were primigravida with no statistical significance. Similar to ours, previous studies have reported no significant association between age and parity in cases of oligohydramnios.<sup>14,15</sup>

In the present study, 54 (36%) participants from the case group were induced. In a study by Casey et al, the rate of induction was 42%, and in a study by Rainford et al, it was as high as 98%. There is increased incidence of caesarean delivery in Oligohydramnios. This increased incidence is due to increased induction of labour leading to foetal distress.<sup>16,17</sup>

Similar to Madhavi K and Rao CP et al., and Sreelakshmi U et al., the incidence of Meconium-Stained Liquor (MSL) between cases and controls in our study was statistically significant (p-value = 0.001).<sup>18,19</sup>

Caesarean section for foetal distress was also higher in patients with oligohydramnios as compared to the group with normal AFI (38 vs. 11.3%) (p = 0.001). Similar to ours Rutherford et al. found an inverse relationship between amniotic fluid index and caesarean section for foetal distress.<sup>20</sup>

In this study, 65% of cases and 10% of controls underwent LSCS, while 90% of controls were delivered vaginally. Cases exhibited a higher incidence of LSCS compared to controls. Hindumati et al. found that 47% of women underwent LSCS, while Umber et al. reported a 32% incidence. Casey et al., Rainford et al., and Golan et al. reported 32%, 35.2%, and 33.3% of LSCS in oligohydramnios groups, respectively.<sup>12,16,17,21,22</sup>

In the current study, birth weight less than 2.5 kg was found in 30% of the patients in case group compared to 16% in control group, and the difference was statistically significant (p = 0.001). Morris et al. found that 60% of babies were of LBW in the group with AFI<5, indicating that oligohydramnios had an association with growth restriction.<sup>23</sup>

APGAR score <7 was seen in 17.33% the case group participant compared to 2% in the control group (p<.00001). Our study results were consistent with Rainfor et al., Elizabeth G et al., and Kreiser D et al.<sup>17,24,25</sup>

In the case group, 78 (52%) infants were admitted to the NICU, while in the control group, only 27 (18%) infants were admitted (p = <0.00001). This observation is in line with the findings observed in the studies by Bhagat and Chawla et al., Soumini and Ramna et al, and Puri and Sharma et al.<sup>26-28</sup>

In the present study, 3.33% of the babies in case group died whereas only 1 baby (0.70%) died in the control group. The difference was statistically significant (p-value=0.001). This is similar to a study done by Casey BM et al., and Sarma N et al.<sup>16,29</sup>

## CONCLUSION

Oligohydramnios is being detected more often these days due to routinely performed obstetric USG. From the study we can conclude that there was no correlation between oligohydramnios and mean maternal age and parity. However, we discovered a significant association between oligohydramnios and induction of labour, delayed delivery, and an increase in the frequency of operative deliveries. Oligohydramnios was also found to be significantly associated with unfavourable perinatal outcomes such as intrapartum Meconium-Stained Liquor (MSL), low birth weight (LBW), NICU admission, low APGAR, and perinatal mortality. This study concludes that oligohydramnios is a high-risk pregnancy and that patients with this condition require appropriate antepartum care, intensive foetal monitoring, and intrapartum care. Every case of oligohydramnios requires a thorough antenatal evaluation, parental counselling, individualization, and time and mode of delivery decisions.

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