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Research Article

The Effects of Isolated Oligohydramnios in Term Pregnancies on Labor, Delivery Mode, and Neonatal Outcomes

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Abstract

Objectives: The purpose of this study is to evaluate the effects of isolated oligohydramnios on labor, delivery mode, and its neonatal outcomes.

Methods: In this prospective case-control study; we analysed 159 pregnancies with isolated oligohydramnios and 165 post-term pregnancies with normal amniotic fluid index. The same method of induction was applied during labor to both groups: dinoproston and oxytocin. The delivery mode, rate and the indications of cesarean deliveries and neonatal outcomes were compared.

Results: Cesarean section and vaginal delivery rates were similar in both groups. Also duration of first and second stage of vaginal delivery between two groups were similar. However, the rate of cesarean section performed due to fetal distress was found to be significantly higher in the study group when compared with the control group. Meconium stained amniotic fluid was statistically significant ($p<0.001$) in oligohydramnios group. Mean fetal birth weight in oligohydramnios and post-term groups was 3169 gr and 3335 gr, respectively.

Conclusion: Although pregnancies with isolated oligohydramnios are not at high risk for cesarean delivery, the rate of cesarean section performed due to fetal distress is higher than when compared with post-term pregnancies.

Keywords: Cesarean delivery, fetal distress, induction, oligohydramnios

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Oligohydramnios is defined as an amniotic fluid index (AFI) of 5 centimeter (cm.) or lower measured by ultrasound[1] and can be related with pathologies such as premature rupture of membranes, placental dysfunction and chromosomal or structural anomalies. However, in many cases, it is an isolated finding. In order to prevent antepartum still birth; the American College of Obstetricians and Gynecologists (ACOG) recommends the induction of labor between 36 0/7 and 37 6/7 weeks in pregnancies complicated with oligohydramnios.[2] Although induction of labor increases cesarean operation and operative delivery rates; when the profit loss account is made, these disadvantages have been shown to benefit the parents and their babies. [3] There is still a debate regarding the relation between oligohydramnios and cesarean section rates. The aim of this study was to evaluate mode of delivery and neonatal outcomes in women with isolated oligohydramnios undergoing induction of labor.

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Methods

This study was designed as a prospective case-control study and was conducted between January 2013-June 2014 in the Obstetrics and Gynecology department of Sisli Etfal Teaching and Research Hospital. It was approved by the appropriate Ethics Committee (Ethical approval number: 304) and was therefore performed in accordance with the ethical standards described in an appropriate version of the 1964 Declaration of Helsinki, as revised in 2013. Informed consent was taken from each patient before being included in the study.

The inclusion criteria were as follows; Primigravida and multigravida pregnant women between 18-44 years of age with bishop score less than 4, isolated oligohydramnios with vertex presentation to be induced for labor and normal post-term amniotic fluid. Body mass index (BMI) of the participants was under 35 and they did not have any concomitant systematic diseases (pregestational diabetes, chronic hypertension, chronic renal disease) or pregnancy-induced diseases. Subjects were excluded due to the presence of conditions such as: term pregnant women with normal amnion fluid, post-term pregnant women diagnosed with oligohydramnios, presence of any concomitant systematic disease and maternal or fetal condition complicating the pregnancy such as fetal abnormalities, premature rupture of membranes, preeclampsia, eclampsia, placental abruption, placenta previa, abnormal placental implantation, multi fetal gestation, non-cephalic presentation, pregnant women who have had previous uterine surgery and pregnant women to whom C-section was applied directly due to cefalo-pelvic incompatibility. Patients included in the study were divided into two groups: group 1 (study group): term pregnant women diagnosed with isolated oligohydramnios, group 2 (control group): post term pregnancies with normal amniotic fluid index. We needed patients with induction indication but without obstetric distress as a control group in order to apply the same induction form as the study group. There is no indication of induction with dinoprostone for term pregnancies, it is expected that the labor will start spontaneously. If it needs to be induced, there is the presence of one of our exclusion criteria. Therefore, we received post-term pregnancies with normal amniotic fluid as control group due to the presence of an induction indication.

Oligohydramnios was defined as an amniotic fluid index <5 cm and the ultrasound measurements were performed by a single experienced sonographer to standardize the evaluation. Isolated oligohydramnios was defined as an isolated finding without any medical and obstetric conditions. Following ACOG's recommendation; isolated oligohydramnios, in the study group, were induced after ≥ 37 weeks of gestation but not in post-term (37-40 weeks). Post-term was defined as pregnant women with normal amniotic fluid over 41 weeks according to the last menstrual period and the first trimester ultrasound. In both groups, sustained release vaginal ovule of dinoprostone was inserted into the posterior fornix with bishop score of ≤ 6. The exact time of application was recorded. The duration of administration for dinoprostone ovule was 12 hours. After the bishop score was 6-8, oxytocin infusion was started. It was prepared as 5 units in 500 mL salin and was started with an initial dose of 4 mU/min which was increased 2 mU/min every 20 minutes. In cases, in which contractions per 10 minutes were monitorized, no increase in dose of oxytocin was needed. Maximum dose was defined as 20 mU/min. All patients had continuous fetal heart monitoring once uterine contractions were established. Fetal distress was diagnosed according to International Federation of Gynecology and Obstetrics (FIGO).[4] Failure to progress in labor was diagnosed as active-phase arrest in the first stage of labor with ≥6 cm of dilation and ruptured membranes who fail to progress despite 4 h of adequate uterine activity, or at least 6 h of oxytocin administration within adequate uterine activity and no cervical change and arrest of labor in the second stage, at least 2 h of pushing in multiparous women and at least 3 h of pushing in nulliparous. Failure to vacuum birth was used for patients who failed 3 times despite the application of vacuum during labor (KiwiOmni Cup). These patients were taken to cesarean. Patients who were induced by dinoprostone but did not pass the bishop score of 6 within 24 hours were diagnosed as induction failure and excluded from the study. During the study period, 4240 patients were interned to the delivery room, of which 380 met the induction criteria and 20 declined to join the study. Eleven patients with isolated oligohydramnios and fifteen patients with post-term pregnancies were excluded due to induction failure. Seven patients with oligohydramnios were excluded due to protocol violation and three patients wanted to quit the study. As the patient flow diagram was shown (Fig. 1), 324 patients were analyzed (study group n=159; control group n=165).

Demographic and obstetrical variables were recorded: maternal age, body mass index (BMI), smoking, alcohol use, gravidity, parity, gestational age at delivery. Dilatation and effacement at the admission and induction type (dinoproston, oxytocin) were recorded. Features of birth calculated in composite outcomes included type of birth (vaginal or cesarean), in vaginal delivery first and second stage of labor (mimute), cesarean indications (Fetal distress, failure to progress in labor, failure to operative birth) and meconium-stained amniotic fluid. Neonatal factors calculated in composite outcomes include; neonatal birth weight, mean

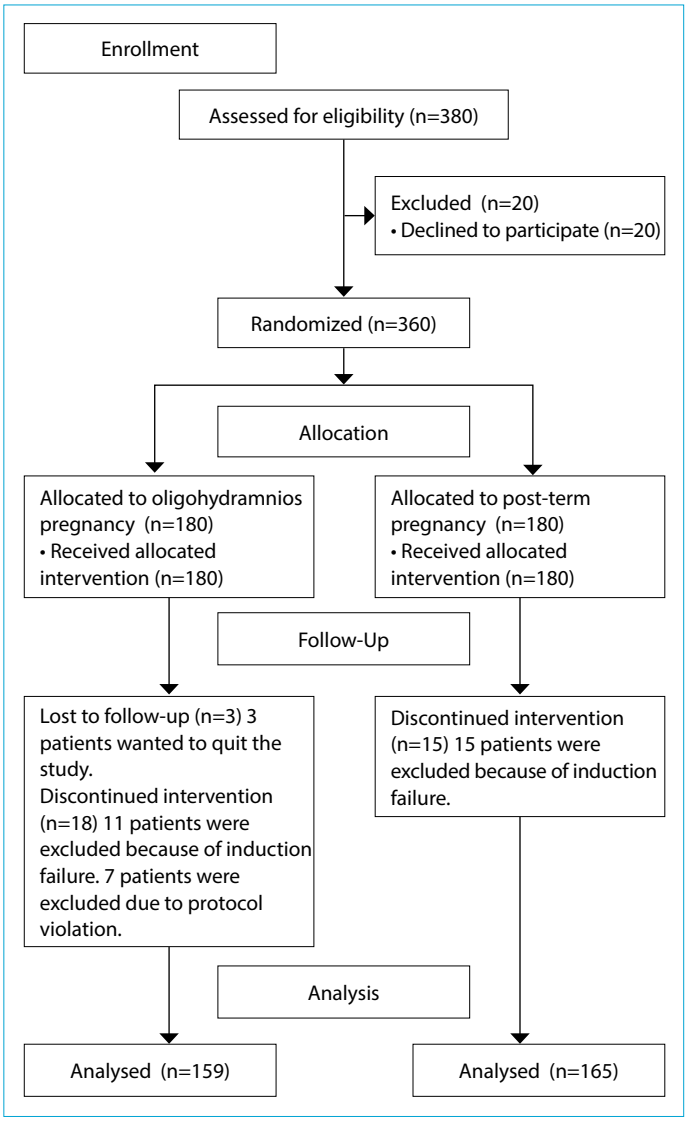

Figure 1. CONSORT 2010 flow diagram.

Apgar scores at first and fifth minutes, Apgar score of <7 at fifth minute, and admission to neonatal intensive care unit (NICU) (nutrition intolerance, neonatal jaundice, hypoglycemia).

The primary outcome measure was defined as cesarean section rates and cesarean section indications in pregnancies complicated with isolated oligohydramnios managed by induction of labor. The secondary outcome measures were duration of active stage of labor 1 and 2 in patients delivered vaginally, the presence of meconium and fetal outcomes.

Statistical Analysis

Power analysis was performed according to the cesarean rates of Manzanares et al.[11] In the study of Manzanares et al., The cesarean section rate was 5.8% in the control group and the caesarean rate in the oligohydramnios group was 15.5%. In our study, for the 0.05 alpha value and 80% power value, the number of patients calculated in our study for each group was found as 158.

Data analysis was performed with Windows SPSS v 19.0 package. Student's t test and Mann-Whithey U test were used to compare continuous variables between the groups with and without normal distribution, respectively. The Chi-square and Fisher's exact tests were used for categorical variables. Metric discrete and continuous variables are expressed as the mean±SD, where applicable. Nominal data were expressed as the number of cases and percentages. Relative risks for variables were calculated. A p value of <0.05 was accepted as the level of significance.

Results

Demographic characteristics of both groups were examined. The mean age of the patients was 27.1 and 26.2, the mean gestational age was 38.6 and 41.4, the mean number of cigarette smokers was 20 and 16, the number of nulliparous patients was 85 (53.5%) and 85 (51.5%), mean BMI was 26.9 and 27.1, in Group 1 and 2, respectively. It was not statistically significant (Table 1). There was no statistically significant difference between the two groups in terms of demographic characteristics.

Data from the parturition of the induced women in both groups are presented in Table 2. The mean cervical dilatation was 1.4 and 1.5 cm, cervical effacement was 37% and 35%, respectively. It was observed that 78.6% and 75.1% of the patients in Group 1 and 2 were induced with dinoprostone; 21.4% and 24.9% of the patients in group 1 and 2 were induced by oxytocin. 89 of the patients in the oligo-

Table 1. The demographic data of the study population

	Oligohidramnios group n=159	Control group n=165	p	RR
Mean age (n) (±SD)	27.1± 5.6	26.2±5.1	0.072	-
BMI (kg/m^2) (±SD)	26.9±1.41	27.1±1.75	0.413	-
Gest. Age (week) (±SD)	38.6±0.9	41.4±1.05	0.804	-
Smoke (n)	20 (10.7)	16 (9.7)	0.767	0.9 (0.4-1.9)
Primigravigas, n (%)	85 (53.5)	85 (51.5)	0.726	0.9 (0.7-1.1)

Number: n; Kilogram: kg; Squaremeter: m^2; ±SD: Standard deviation; RR: Relative risk; p<0.05 statisticallysignificant.

Table 2. Characteristics of delivery and type of delivery

	Oligohidramnios group n=159	Control group n=165	p	RR
Dilatation at the admission (cm)	1.4±1.1	1.5±0.7	0.535	-
Effacement at the admission (%)	37±17	35±15	0.706	-
Induction type Dinoprostone, n (%)	125 (78.6)	125 (75.1)	0.540	0.9 (0.8-1.0)
Induction type oxytocin, n (%)	34 (21.4)	40 (24.9)	-	-
Type of birth				
Vaginal delivery, n (%)	89 (56)	96 (58.2)	0.688	1.0 (0.8-1.2)
Cesarean, n (%)	70 (44)	69 (41.8)	-	-
In vaginal delivery	n=89	n=96		
First stage of labor (min)	177±20	180±24	0.807	-
Second stage of labor (min)	10±1.5	12±2	0.912	-
Cesarean indications	n=70	n=69		
Fetal Distress, n (%)	53 (75.7)	63 (91.3)	0.013	1.2 (1.0-1.4)
F.L., n (%)	10 (14.3)	2 (2.8)	0.017	0.2 (0.04-0.4)
F.V.B., n (%)	7 (10)	4 (5.9)	-	-
Meconium-stained amniotic fluid, n (%)	7 (4.4)	1 (0.6)	0.028	0.1 (0.01-0.1)

Minute: min; Number: n; Centimeter: cm; Failure to progress in labor: F.L.; Failuretovacuumbirth: F.V.B.; RR: Relative risk; p<0.05 statisticallysignificant.

hydramnios group were given birth with vaginal delivery and 70 with cesarean; on the other hand 96 of the patients in the control group had vaginal delivery and 69 had c-section. Stage 1 duration of those who gave normal birth in both groups was 177 minutes (min.) and 180 min; Stage 2 duration was 10 min and 12 min. There was no statistically significant difference. Of the patients in the study group, cesarean was applied in 53 patients due to fetal distress, in 10 patients due to failure of progression in labor, in 7 patients due to failure of vacuum birth indication. On the other hand, in the control group, 63 of the patients had cesarean due to fetal distress, 2 due to failure of progression in labor and 4 due to failure of vacuum birth indication. Fetal distress was statistically significant among these indications (p=0.013). The number of patients who had meconium stained baby was 7 and 1, respectively. It was statistically significant (p=0.028).

Mean neonatal birthweight was 3168 grams and 3330 grams in group 1 and 2, respectively (p<0.001) (Table 3). Number of patients with 5-min Apgar score <7 and NICU admission were similar between two groups. However, there was a statistically significant difference between the 1st and 5th minute Apgar scores of the two groups (p<0.001).

Discussion

In this cohort study, induction of labor in pregnancies complicated with isolated oligohydramnios is not associated with higher rates of cesarean delivery. As expected, the rate of cesarean section performed due to fetal distress is higher.

Global cesarean section rate (CSR) have been apparently rising in recent years.[5, 6] Researchers reported that the rate of postpartum hemorrhage and maternal mortality due to hemorrhage at cesarean delivery were significantly higher than vaginal delivery.[7, 8] In order to improve maternal outcomes, it seems clear that CSR should be diminished. Oligohydramnios is associated with fetal heart rate decelerations during labor and cesarean delivery.[9, 10] Woman with induced oligohydramnios means a high probability of cesarean section for many physicians. With our work, we wanted to break this prejudice.

Table 3. Postnatal neonatal outcomes

	Oligohidramnios group n=159	Control group n=165	p	RR
Neonatal				
Birth weight (gr) (±SD)	3168±450	3335±348	<0.001	-
Mean APGAR at 1.min (±SD)	8.9±0.3	9.1±0.3	<0.001	-
Mean APGAR at 5.min (±SD)	7.9±0.4	8.1±0.3	<0.001	-
5 min. apgar <7, n (%)	2 (1.3)	0 (0)	0.148	-
NICU, n (%)	7 (4.4)	3 (1.8)	0.179	0.4 (0.1-1.5)

Gram: gr; Minute:min; Number: n; ±SD: Standard deviation; RR: Relative risk; CI: confidence interval; NICU: Neonatal Intensive Care Unit; P<0.05 statistically significant.

Prior studies have attempted to evaluate the mode of delivery in pregnancies complicated with isolated oligohydramnios with varying results. A recent meta analysis extracted data from 18 studies in which CSR was applied in pregnancies with oligohydramnios.[11] 10551 patients were analyzed. AFI ≤5 was related with a higher risk of cesarean delivery because of fetal distress (pooled relative risk, 2.2; 95% confidence interval, 1.5-3.4) and Apgar scores below <7 at 5 minutes (pooled relative risk, 5.2; 95% confidence interval, 2.4-11.3). Unlike our study, diagnosis of the patients was not isolated oligohydramnios and high-risk pregnant women were also included. In another retrospective study; Similar induction methods were not applied in two groups and CSRs might be found to be high due to this difference. In addition, another reason for high CSRs in a former study was the use of dinoproston gel in repeated doses as a cervical ripening agent. Theoretically, gel form could rise up CSR because it cannot be removed in emergency.

Other retrospective and prospective studies that found CSR different from ours have shown that women with isolated oligohydramnios managed by induction of labor were characterized by a higher rate of intrapartum cesarean delivery due to non-reassuring fetal heart rate.[14, 15] However, they also found that the women who present with spontaneous onset of labor, either with isolated oligohydramnios or with normal AFI, had a similar ratio of CSR. At this point, we can say that induction may be effective in these results. Thus, isolated oligohydramnios at term pregnancies by itself may not be associated with higher CSR. In this way, we have increased the value of our findings by inducing both groups. Further, ultrasound data were not available in retrospective studies. Due to this, there is a risk of misclassification.

Our study found an increased rate for meconium stained AFI in women with oligohydramnios. The high rate of meconium can be related to increased meconium output by sympathetic activity or darker detection of light meconium as the AFI content decreases. This is contrary to findings of other studies.[14, 16] The reason for the increased risk is unclear. Similar to findings of many studies,[14, 17, 18] fetal birth weights in the study group were lower. Because postterm babies stay longer in the uterus. Studies that compare groups with similar gestational weeks can reveal the link between fetal weight and AFI more clearly. The strength of the present study was not including patients with chronic diseases, maternal diseases associated with pregnancy and obstetric complications. Thus, we eliminated the factors that could affect the duration of labor and the way of delivery. In addition, the diagnosis of isolated oligohydramnios was evaluated by the same physician and the diagnosis was made closest to the standard. This is due to the prospective design of our study. In addition, as far as we have reviewed the literature, it is a publication comparing the stage 1 and 2 labor periods of pregnant women with isolated oligohydramnios and normal amniotic fluid.

Our study has some limitations. First of all, patients are not all induced in the same way. In patients who were admitted during labor, only oxytocin was applied and in patients with a bishop score ≤6 dinoprostone and oxytocin were applied. Secondly, we did not group the pregnant women included according to age and BMI. Assuming that these maternal characteristics affect the caesarean indications, potential risk factors could not be standardized in all patients. Third we didn't analyze the blood pH in the neonates born after a cesarean section performed due to fetal distress. Eventually non-reactive test's positive predictive value is not 100%. Fetal distress ratio may be high because we do not crosscheck the diagnosis.

Conclusion

In conclusion, isolated oligohydramnios by itself is not associated with higher cesarean section rates. We suggest that the impact of induction of labor on the mode of delivery in the patients with isolated oligohydramnios is similar to those with low risk pregnancies. Consequently we can induce these patients with confidence. Prospective randomized studies should be conducted in order to better evaluate the best induction methods for isolated oligohydramnios.

Disclosures

Ethics Committee Approval: It was approved by the appropriate Ethics Committee (Ethical approval number: 304) and was therefore performed in accordance with the ethical standards described in an appropriate version of the 1964 Declaration of Helsinki, as revised in 2013.

Peer-review: Externally peer-reviewed.

Conflict of Interest: None declared.

Authorship Contributions: Concept – N.N.Y.; Design – N.N.Y., O.A.; Supervision – N.N.Y.; Materials – N.N.Y.; Data collection &/or processing – N.N.Y.; Analysis and/or interpretation – O.A.; Literature search – N.N.Y.; Writing – N.N.Y.; Critical review – N.N.Y., O.A.

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