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Is borderline oligohydramnios a problem at term pregnancy? a prospective study of a tertiary hospital

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ABSTRACT

Aims: The objective of this study is to conduct a comparative analysis and ascertain the perinatal and early postnatal outcomes in term pregnant women who have a borderline amniotic fluid index (AFI) in comparison to those with a normal AFI.

Methods: This prospective study was conducted on 376 pregnant women of 37-42 weeks gestational age. Ultrasound evaluation was performed, and the AFI was calculated. Borderline and normal AFI were defined as 5.1 < AFI < 8 cm and 8.1 < AFI < 24 cm, respectively. Age, body mass index, gestational age at delivery, gravida, and parity were compared between the borderline and normal AFI groups, patient demographics, obstetric data, and information on delivery complications data were recorded. Newly born babies received a thorough physical evaluation and were followed up for two months by a neonatologist. Umbilical artery pH, birth weight, admission to neonatal intensive care unit (NICU), neonatal complications were also reported.

Results: There were 202 patients in the borderline AFI group and 174 patients in the normal AFI group. There was no statistically significant difference between groups in terms of normal delivery, operative vaginal delivery, elective cesarean delivery, or emergency cesarean delivery (p=0.088). Apgar score at 5 minutes, umbilical artery pH value, birth weight, admission to the NICU, small for gestational age, and cesarean delivery for non-reassuring fetal heart rate testing were not statistically different between the groups (p=0.139, p=0.644, p=0.790, p=0.317, and p=0.16, respectively)

Conclusion: Our study indicates that borderline oligohydramnios does not have an adverse effect on perinatal or early postnatal outcomes in term pregnancy.

Keywords: Oligohydramnios, term pregnancy, perinatal outcomes, postnatal outcomes

INTRODUCTION

Pregnancy management often consists of a series of predictions and decisions for both the mother and fetus. Some parameters can be used to predict the risks potentially encountered by the fetus and assess the length of pregnancy or the time of delivery. Amniotic fluid is one of these parameters and is an essential predictor of both pregnancy and fetal outcomes.[1,2] Therefore, changes in the volume of amniotic fluid should be monitored.

The most common method for assessing the volume of amniotic fluid is the amniotic fluid index (AFI). The volume of amniotic fluid varies based on the gestational week. Oligohydramnios can be defined as a volume of amniotic fluid <5% for gestational age, AFI <5 cm.[3] Borderline oligohydramnios is defined as an amniotic fluid index between 5 and 8 cm.[4,5] In addition, some authors have defined an AFI 5-10 cm as borderline.[6,7] However, the findings of these studies indicated a similar propensity associated with borderline AFI using both definitions.

Oligohydramnios has been associated with adverse outcomes, such as neonatal intensive care unit (NICU) admission, meconium aspiration syndrome, 5-minute Apgar score <7, low cord gas pH, low birth weight, and respiratory distress syndrome.[3] The results of borderline oligohydramnios are controversial. Although it has been associated with meconium staining, fetal hypoxia, and operative delivery in some sources, some studies have found the opposite results.[8-10] However, the management and risks in borderline oligohydramnios remain unclear, especially in term pregnancies.

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This study aims to compare and determine differences in the perinatal and early postnatal outcomes of pregnant women with borderline AFI with those with normal AFI.

METHODS

This prospective study was approved by Health Sciences University Adana Numune Training and Research Hospital Non-interventional Clinical Researches Ethics Committee (Date: 11.03.2015, Decision No: 123), and written informed consent was obtained from all participants. All procedures were carried out in accordance with the ethical rules and the principles of the Declaration of Helsinki.

The study population was selected from pregnant women who were admitted to our clinic. During the routine antenatal examination of all volunteers, a total of 378 pregnant volunteers with an uncomplicated singleton pregnancy at a gestational age of 37-42 weeks were included in the study between July 2015 and April 2016.

Patients were excluded if they had any of the following: preeclampsia, gestational diabetes, genetic disease or fetal anomaly, fetal growth restriction, maternal systemic disease, and membrane rupture before ultrasound examination. Ultrasound evaluation was performed with a 10-MHz Nemio XG system (Toshiba Medical Systems GmbH) by two obstetricians with at least five years of experience. The AFI was determined using the four-quadrant amniotic fluid measurement technique as defined by Phelan et al.[11,12] Borderline and normal AFI were defined as 5.1<AFI<8 cm and 8.1<AFI<24 cm, respectively.

The patients were followed up with an ultrasound examination every week until delivery. Patients in whom the AFI decreased to <5 cm during the follow-up were excluded from the study. We recorded data, including patient demographics, obstetric data, and information on delivery complications.

All patients' delivery techniques were documented. Patients were divided into four groups according to their delivery method: normal vaginal delivery, operative vaginal delivery, elective cesarean delivery, or emergency cesarean delivery. Elective cesarean delivery was applied to patients who had a previous cesarean section and refused vaginal delivery after previous cesarean section.

Adverse perinatal and early postnatal outcomes were recorded. Prematurity, Apgar score 5 min <7, cesarean delivery for non-reassuring fetal heart rate, transient tachypnea of the newborn (TTN), respiratory distress syndrome (RDS), meconium-stained amniotic fluid, meconium aspiration syndrome, admission to the neonatal intensive care unit (NICU) and length of stay on the NICU, hyperbilirubinemia, intubation, hypoxic-ischemic encephalopathy (HIE), necrotizing enterocolitis and neonatal death were evaluated.

Statistical Analysis

Data were analyzed using SPSS software, version 20.0 (SPSS Inc., Chicago, IL, USA). The normality of data was investigated using the Shapiro Wilk test, and values were expressed as mean±standard deviation, median, or n (%). Parametric comparisons were made using a student t-test for continuous variables, and nonparametric comparisons were made using the Mann-Whitney U test. For qualitative data, we used the $\chi 2$ test or Fisher's exact test as appropriate to test statistical significance and $p<0.05$ value was considered statistically significant.

RESULTS

We enrolled 202 patients in the borderline AFI group and 176 patients in the normal AFI group. **Table 1** shows the demographic and obstetric characteristics of patients. Age, body mass index, abnormal first trimester screening results, gravida, parity, gestational week of ultrasound examination for AFI, AFI, and gestational age at delivery were compared between the borderline and normal AFI groups. There were no statistically significant differences between the groups ($p>0.05$).

Table 1. Demographic and obstetric characteristics of patients

	Borderline AFI (n=202)	Normal AFI (n=176)	P value
Age (years)	28.79±5.66	29.16±5.41	0.650
BMI (kg/m²)	30.58±5.02	30.16±4.61	0.557
Gravida	2.85±1.38	3.17±1.46	0.136
Parity	1.66±1.19	1.81±1.05	0.356
Abnormal first trimester screening	None	None	-
Gestational week of ultrasound examination for AFI	38.2±0.876	37.6±0.725	0.062
AFI (cm)	6.72±0.98	10.67±2.94	<0.005*
GA at delivery (weeks)	38.65±1.2	38.8±0.67	0.333

Each characteristic was compared between the borderline and normal AFI groups. Data are presented as mean±SD. GA, gestational age; AFI, amniotic fluid index, BMI, body mass index. A p-value <0.05 is considered significant. t-test and chi-square test were used to compare qualitative and quantitative variables.

Table 2 presents perinatal outcomes in patients with borderline and normal AFI. Apgar score <7 at 5 minutes, UA pH value, birth weight, admission to the NICU, small for gestational age, meconium-stained amniotic fluid and cesarean delivery for non-reassuring fetal heart rate testing were not statistically different between the groups (p=0,812, p=0.139, p=0.644, p=0.790, p=0.317, and p=0.16, p=0,162 respectively). None of the newborns developed neonatal hyperbilirubinemia, hypoxic-ischemic encephalopathy, respiratory distress syndrome, or necrotizing enterocolitis.

Table 2. Perinatal outcomes in patients with borderline and normal amniotic fluid index.

	Borderline AFI (n=202)	Normal AFI (n=176)	P value
APGAR score <7 at 5 minutes	8 (4%)	6 (3.4%)	0.812
Umbilical artery pH	7.32±0.04	7.33±0.03	0.139
Birth weight (g)	3264.40±393.44	3292.87±448.76	0.644
NICU admission	8 (4%)	4 (2.3%)	0.790
SGA	4 (2%)	6 (3%)	0.317
Meconium-stained amniotic fluid	2 (1%)	2 (1.1%)	0.162
Cesarean delivery for non-reassuring fetal heart rate	2 (1%)	2 (1.1%)	0.162

Each perinatal outcome was compared between the borderline and normal AFI groups. Data are presented as n (%) as appropriate. NICU, neonatal intensive care unit; SGA, small for gestational age.
A p-value <0.05 is considered significant. t-test and chi-square test were used to compare qualitative and quantitative variables.

Table 3 compares the delivery types in patients with borderline and normal AFI. There was no statistically significant difference between groups in terms of normal delivery, operative vaginal delivery, elective cesarean delivery, or emergency cesarean delivery (p=0.088, p=0.262, p=0.754, p=0.823, p=0.088, respectively).

Table 3. Delivery type in patients with borderline and normal amniotic fluid index.

	Borderline AFI (n=202)	Normal AFI (n=176)	P value
Vaginal delivery	120 (59%)	135 (6.9%)	0.088
Operative vaginal delivery	6 (3%)	2 (1.1%)	0.262
Elective cesarean delivery	62 (30.6%)	28 (78.2%)	0.754
Emergency cesarean delivery	14 (6.9%)	13 (14.9%)	0.823

Each characteristic was compared between the borderline and normal AFI groups. Data are presented as n (%) as appropriate. xA p-value <0.05 is considered significant. t-test and chi-square test were used to compare qualitative and quantitative variables.

DISCUSSION

The present study has demonstrated that borderline amniotic fluid index (AFI) in an uncomplicated term pregnancy is not associated with an elevated risk of adverse perinatal and early postnatal outcomes. The present study had a prospective design. We found no statistically significant difference between the borderline AFI and normal AFI groups in terms of Apgar score <7 at 5 minutes, UA pH, birth weight, NICU admission, small for gestational age, meconium-stained amniotic fluid, and cesarean delivery for non-reassuring heart rate. There were no neonatal complications (neonatal hyperbilirubinemia, hypoxic-ischemic encephalopathy, respiratory distress syndrome, necrotizing enterocolitis). Six newborns followed up in the NICU were discharged with full recovery by one month.

There are limited studies in the literature to assess borderline AFI and adverse perinatal and early postnatal outcomes. According to some authors, borderline oligohydramnios can elicit perinatal and early postnatal complications included fetal distress, 5-minute Apgar score <7, meconium-stained amniotic fluid, Neonatal Intensive Care Unit (NICU) admission.[13] In a retrospective study with a large number of preterm pregnancies, fetal growth restriction, major malformation, and preterm delivery were more common in pregnant women with borderline oligohydramnios than those with normal AFI. However, the rate of stillbirths was higher in those with oligohydramnios than in those with borderline oligohydramnios.[14] In a comprehensive study involving 430 patients, researchers followed late preterm patients until birth and evaluated borderline AFI and normal AFI. They found that only fetal renal artery PI was significantly lower in the borderline AFI group. There was no difference in parameters such as adverse perinatal outcome (prematurity, 5-minute Apgar score <7, respiratory distress syndrome, etc.). The authors stated that borderline AFI does not increase the risk of adverse outcomes in uncomplicated late preterm pregnancies.[4] Lekkala et.al.[15] reported that, gestational age, induction, Apgar scores were not different between borderline and normal AFI groups. Nevertheless, the borderline AFI group had a higher rate of fetal distress, IUGR, and meconium-stained amniotic fluid. Gumus et al.[6] demonstrated an increased risk with borderline oligohydramnios for meconium-stained amniotic fluid, preterm birth, intrauterine growth restriction (IUGR), and frequency of NICU admission, which included preeclampsia, hypertension, and IUGR pregnancies.

In our study, the absence of additional conditions such as preeclampsia, gestational diabetes, and hypertension might have enabled us to evaluate the results of borderline oligohydramnios more specifically. We excluded from our study patients with preeclampsia, gestational diabetes, genetic disease or fetal anomaly, preterm and post-term pregnancy, and maternal systemic disease (diabetes mellitus, systemic lupus erythematosus, thyroid disease, etc.). This may explain the difference between our results and findings from some previous studies.

The study design and gestational age of the study population are also crucial in interpreting the results. The present study included only term pregnancies. When we focus on term pregnancies in this context, in a study including pregnant women at 37-42 weeks of gestation, gestational age and birth weight was low in the borderline group. The rates of cesarean delivery and cesarean section due to fetal distress were higher in the borderline AFI group than in the normal AFI group. However, the ratio of meconium staining, 5-minute Apgar score <7, UA pH <7, and admission

rate to the NICU were not statistically different between the groups.16 Vennila et al.[13] reported that; borderline oligohydramnios is associated with increased incidence of meconium staining of amniotic fluid, fetal distress, and cesarean delivery. Soo Ran Choi et al.[17] reported borderline AFI in uncomplicated term pregnancy was not associated with adverse perinatal outcomes.

When we evaluate the effects of borderline oligohydramnios on the delivery, Rathod et al.[10] compared the process of labor induction and delivery mode between the borderline AFI and normal AFI groups. In their study, more borderline oligohydramnios cases had meconium-stained fluid in labor than normal AFI cases (p=0.048) but no statistically significant difference between groups in terms of perinatal outcomes (Apgar score <7 at 1 and 5 minutes, birth weight, or NICU admission rate (p=0.234, 0.834, 0.481, and 0.810, respectively) and cesarean for non-reassuring fetal heart rate. Some studies were consistent with this data and reported no difference in the mode of delivery.[4,18] But others reported the opposite.[13-15,19,20] In our study, there was no difference in meconium-stained fluid, delivery mode or cesarean rate.

In another study, the degree of oligohydramnios was arbitrarily classified into mild (AFI=41-50 mm), moderate (AFI=21-40 mm) and severe (AFI=0-20 mm). They found that Low-risk pregnancies with isolated severe oligohydramnios at term have a higher tendency toward non-reassuring fetal monitoring requiring prompt delivery and adverse neonatal outcomes.[21] Clinicians should be careful about AFI measurements below 5 cm, as there was no statistically significant relationship between 5-8 cm AFI measurements and > 8 cm AFI measurements in our study.

Limitations

The results of studies on borderline oligohydramnios in the literature, which includes different gestational ages and different designs, still make this issue important. One of the limitations of the current study was the relatively small number of participants, and further research with larger sample size is needed in this field.

CONCLUSION

The present study suggests that in term pregnancies, borderline AFI is not associated with adverse perinatal and early postnatal outcomes. This issue will be further clarified by studies with a larger number of cases. However, given the present data, increased antepartum surveillance for these patients is not necessary.

ETHICAL DECLARATIONS

Ethics Committee Approval: The study was carried out with the permission of Health Sciences University Adana Numune Training and Research Hospital Non-interventional Clinical Researches Ethics Committee (Date: 11.03.2015, Decision No: 123)

Informed Consent: Written informed consent was obtained from the patient participating in this study.

Referee Evaluation Process: Externally peer-reviewed.

Conflict of Interest Statement: The authors have no conflicts of interest to declare.

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