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Original Research Article

Pregnancy outcome in isolated oligohydramnios diagnosed in third trimester

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ABSTRACT

Background: The aim of this study was to compare the outcomes of pregnancies complicated by isolated oligohydramnios with the low risk pregnancies with normal amniotic fluid volume.

Methods: The present study is a retrospective cohort study of singleton pregnancies diagnosed with Isolated oligohydramnios (AFI≤5) in their third trimester (N=35). Pregnancy outcome was compared with a matched control group of low risk pregnancies with amniotic fluid volume >5 (N=30).

Results: The overall incidence of Isolated oligohydramnios was 0.7-0.8%. In oligohydramnios group, significant association were found in null-parity (60% vs 23.33%, p-value<0.005), Fetal growth retardation (25.71% vs 0% p-value<0.02), preterm delivery (22.85% vs 3.33%, p-value 0.025), rate of Induction of labor (40% vs 10%) and cesarean rate for non-reassuring fetal heart rate (20% vs 3.33%, p-value<0.001). Likewise, the incidence of low birth weight was (54.28% vs 13.33%, p-value<0.001) and NICU admissions was (20% vs 0%, p-value<0.01), but there was no difference in Apgar score finding. NICU stay was of short duration and all babies discharged in stable condition, there were no stillbirth or early neonatal death in both groups.

Conclusions: Isolated oligohydramnios has an adverse influence on pregnancy and neonatal outcome in the form of FGR, preterm delivery, increased rate of Induction and cesarean section. Despite the high incidence of low birth weight and NICU admissions, the overall early neonatal outcome was similar to the other low risk pregnancies.

Keywords: Amniotic fluid index, Fetal growth retardation, Iatrogenic prematurity, Isolated oligohydramnios, Non-reassuring fetal heart rate

INTRODUCTION

Amniotic fluid is essential for the normal development of fetal Lung and gastrointestinal tract and also necessary for neuromuskuloskeletal maturation. It provides a physical space for fetal movement and has bacteriostatic properties.¹

During the first half of pregnancy, the major source of production of liquor amnii are amnion (trans membranous

flow), fetal vessels on placental surface (intramembranous flow) and across fetal skin (transcutaneous flow). In the second half of pregnancy, fetal urination and lung fluid secretion are the primary sources of production and fetal swallowing is the primary method of resorption of amniotic fluid.²

The Amniotic fluid index (AFI) is considered normal if greater than 5 cm and below 24 cm, the mean AFI between 16 to 40 weeks gestation lies in the range of 12-15.^{3,4}

Oligohydramnios is said when AFI is equal to or less than 5 cm.⁵

The ultrasonographic diagnosis of oligohydramnios is based on an AFI ≤ 5 cm or a single deepest pocket of amniotic fluid ≤ 2 cm.⁶ It can develop in any trimester but it is more common in the third trimester and usually accompanied by congenital malformations, hypertension, diabetes, PPRM and IUGR. In the routine second or third-trimester scan, ultrasound evaluation of oligohydramnios is commonly found in late-term and post-term pregnancies, commonly perceived as due to placental insufficiency.

The incidence of oligohydramnios is approximately 1.5% to 2.3%.^{7,8} The number of pregnancies diagnosed as oligohydramnios based on AFI was significantly more as compared to diagnosed based on measurement of single deepest vertical pocket < 2 cm, but there was no difference in neonatal outcome.⁹ It can be an isolated finding with no coexisting medical or obstetric conditions and not associated with adverse perinatal outcome.⁸ But in most cases, it is closely related to adverse pregnancy outcome in the form of stillbirth, IUGR, non-reassuring fetal heart rate pattern, meconium aspiration syndrome.^{7,10} There is a twofold greater risk of cesarean delivery for fetal distress and fivefold increased risk of apgar score < 7 at 5 minutes as compared to normal AFI pregnancies.¹¹

The risk of adverse neonatal outcome is related to lower gestational age at delivery, cesarean delivery because of the increased rate of Induction of labor at an earlier gestation, a higher rate of breech presentation, failed induction and non-reassuring fetal heart rate but not to the presence of Isolated oligohydramnios itself.¹² Therefore, the rate of Iatrogenic prematurity and birth of SGA baby is high in uncomplicated oligohydramnios pregnancies.^{13,14}

METHODS

The present study is a retrospective cohort study of singleton pregnancies diagnosed with Isolated oligohydramnios. The data source was the medical records of all births in the department of obstetrics and gynecology, AIIMS Jodhpur, Rajasthan over a period from October 2017 to January 2020. A mean of 2500 births is recorded annually at this tertiary centre.

Inclusion criteria

The study group consisted of all women in the third trimester from 35 weeks onwards till term gestations in which Isolated oligohydramnios (AFI ≤ 5 cm) was present, irrespective of age, parity and antenatal booking status.

Data were compared with a control group consisting of low-risk pregnancies matched with study group by gestational age and parity in their third trimester with the amniotic fluid volume of 5-25 cm) based on sonographic evaluation in the same ultrasound unit.

Exclusion criteria

In both case and control groups we excluded all pregnancies in the third trimester that had oligohydramnios with premature rupture of membranes, with known fetal or chromosomal anomalies, pregestational or gestational diabetes, chronic or gestational hypertension, cholestasis, placenta previa, suspected placental abruption, abnormal umbilical artery doppler study and multiple pregnancy.

The independent variable in this study was AFI, which was measured during routine ultrasonography in the third trimester of pregnancy. All ultrasound examinations were done by Radiologists specialized in obstetric ultrasound. The AFI was calculated according to the description published by Phelan et al.⁵ as the sum of the vertical diameters (in centimeters) of the deepest pocket of fluid in each of the four quadrants of the uterus. The result was categorized as oligohydramnios when AFI was ≤ 5 cm. These pregnancies were followed per the established clinical protocol at our center. We recorded variables of obstetric and neonatal outcomes in both case and control groups from our medical records.

As the variables for obstetric outcomes, we recorded mode of delivery, which we classified into three categories: normal spontaneous, induced, instrumental or cesarean and the indication for instrumental or cesarean delivery. Other obstetric variables were the type of amniotic fluid, which was recorded as clear, meconium-stained, blood-stained or absent.

The neonatal outcomes studied were neonatal birth weight, 1-min and 5-min apgar scores, and neonatal morbidities, NICU admissions and discharge status.

Small size for gestational age (SGA) was defined as birth weight below the tenth percentile for gestational age.¹¹ The 1-min and 5-min apgar scores were recorded. The score was classified as low if it was less than 7 at 5 min. We considered following conditions under neonatal morbidity: respiratory distress syndrome (RDS), meconium aspiration syndrome (MAS), transient tachypnea of the newborn (TTN), or need for ventilator support, infections, CNS morbidity, need for phototherapy, hypoglycemia or hypothermia and neonatal death.

Statistical analysis

The differences between groups were tested with the χ^2 -test for categorical variables and with student's t-test to compare continuous variables. The significance level for all analyses with bilateral comparisons was set at $p < 0.05$ and 95% confidence interval (95% CI).

RESULTS

This was a retrospective observational study, which included a total of 65 women, who had delivered in our

Institution in time duration of October 2017 to January 2020. Their data collected from the medical record.

Out of 65, 35 women were chosen as cases, in whom ultrasound examination showed isolated oligohydramnios (AFI \leq 5) and data of 30 women with AFI $>$ 5 were selected as control. Their demographic and obstetric characteristics, mode of termination of pregnancy and birth outcome were retrieved from the medical records.

Table 1 shows, the mean \pm SD of maternal age was 24.83 \pm 3.58 years in cases and 24.93 \pm 3.18 years in controls, both have no significant difference, booked and unbooked status under cases were 54.28% and 45.72%, and in controls, this was 53.33% and 46.66% respectively, which also showed no significant difference. Fetal presentations found to be Cephalic in 91.42% and Breech in 8.57% in cases, likewise 93.33% Cephalic and 6.67% Breech in Control group. This difference was also not significant, which confirms that in our study both groups were having similar demographic and obstetric

characteristics. Incidence of primigravida was high, 21(60%) in isolated oligohydramnios as compared to only 7(23.33%) in the control group, and in multigravida maximum, 76.67% had normal AFI. The difference was statistically significant.

Table 2 shows gestational age at termination of pregnancy was $<$ 37 weeks in 8(22.85%) and \geq 37 weeks in 27(77.15%) in Isolated Oligohydramnios cases, while in control group majority of women (96.67%) delivered at term and only 1(3.33%) women delivered preterm. This difference was statistically significant.

Table 3 compares the different mode of termination of pregnancy in both groups. Rate of induction and cesarean section for non-reassuring fetal heart rate was high in cases as compared to controls which were (40% vs 10%) and (20% vs 3.33%) respectively, while spontaneous delivery occurred more in the control group. This difference was statistically significant. Elective LSCS rate was 28.57% and 40% respectively in both groups.

Table 1: Maternal demographic and obstetric characteristics.

Parameters	Cases (AFI \leq 5); N=35	Controls (AFI $>$ 5); N=30	P value
Maternal age (Mean\pm SD in Years)	24.83 \pm 3.58	24.93 \pm 3.18	0.840
Booked	19 (54.28%)	16 (53.33%)	1.0
Unbooked	16 (45.72%)	14 (46.66%)	
Cephalic presentation	32 (91.42%)	28 (93.33%)	1.0
Breech presentation	3 (8.57%)	2 (6.67%)	
Primigravida	21 (60%)	07 (23.33%)	$<$ 0.005

Table 2: Gestation age at termination of pregnancy.

Gestational age (weeks)	Case		Control	
	N	%	N	%
$<$ 37 †	08	22.85	1	3.33
\geq 37	27	77.15	29	96.67
Total	35	100.00	30	100.00

P value=0.025; † 2- spontaneous PTVD, 3-LSCS for S.FGR, 3-LSCS for fetal distress.

Table 3: Mode of termination of pregnancy.

	Case		Control		P value
	N	%	N	%	
Spontaneous delivery	02	5.71	14	46.66	$<$ 0.001
Induction of labor	14	40	03	10	
LSCS for NRFHR	07	20	01	3.33	
Elective LSCS	10	28.57	12	40	NA
Failed induction	01	2.85	0		
NPOL	01	2.85	0		
Total	35	100	30	100	

In Table 4, low birth weight babies were 54.28% vs 13.33% in cases and control group respectively, while

maximum normal birth weight (86.67%), were in the control group. The difference was statistically significant. Low apgar score ($<$ 7 at 5 minutes) was present in only 2

newborns in cases had, while maximum (94.29% vs 100%) had a good apgar score in both groups respectively, no significant difference found.

In Table 5, incidence of FGR was 25.71% in isolated oligohydramnios group only, this showed a significant difference.

Table 4: Birth weight and apgar score.

	Case (N=35)		Control (N=30)		P value
	N	%	N	%	
Weight (grams)					
1500-2400 (LBW)	19	54.28	02	13.33	<0.001
≥2500	16	45.72	28	86.67	
Apgar score					
At 5 min <7	02	5.71	00	00	>0.10
≥7	33	94.29	30	100	

Table 5: Neonatal condition.

Neonate condition	Case		Control	
	N	%	N	%
FGR	09	25.71	0	0.00
SGA	02	5.71	03	10.00
Normal	24	68.57	27	90.00
Total	35	100.00	30	100.00

P value<0.02

Table 6: NICU admissions.

NICU admission	Case		Control		P value
	N	%	N	%	
Yes	07	20	0	0.0	<0.01
No	28	80	30	100.00	
Total	35	100.00	30	100.00	

Table 7: Reason for NICU admissions in isolated oligohydramnios group.

Respiratory distress syndrome (RDS)	02
Meconium aspiration syndrome (MAS)	01
FGR/LBW	04

Table 6 shows, 7(20%) newborns from Isolated oligohydramnios group were admitted to NICU and none was from control group, this showed significant difference. All babies stayed in NICU for short period and discharged in stable conditions, no stillbirth or early neonatal death occurred in either group.

DISCUSSION

The present study was aimed to know the effect of Isolated oligohydramnios in low-risk pregnancies, on labor and perinatal outcome. The overall incidence of isolated oligohydramnios was 0.7-0.8% in our study, Moore TR et al., Casey BM et al. and Zhang J et al. reported incidence of 1%, 1.5% and 2.3% respectively.^{2,7,8} We found no difference in demographic characteristics such as maternal

age, booked/unbooked status and cephalic/breech presentation among women with or without condition.

Isolated oligohydramnios was significantly high in primigravida as compared to multigravida and none was postdated pregnancy, this correlates with Naveiro-Fuentes M et al but Bhagat M et al. showed no significant association with null parity.^{13,14} Spontaneous preterm deliveries, preterm LSCS because of severe FGR and non-reassuring fetal heart rate and induction of labor were significantly high in the oligohydramnios group. Petrozella et al. showed oligohydramnios was significantly associated with major fetal malformations and in the absence of malformations, to be complicated by an increased rate of preterm birth, either indicated or resulting from spontaneous labor and cesarean delivery for non-reassuring fetal status between 24 to 34 weeks of gestation.¹⁰ Melamed M et al. in their retrospective cohort

study found similar finding of a higher rate of preterm deliveries, most were iatrogenic and a higher rate of induction and cesarean delivery.¹² Bhagat M also showed an increased rate of preterm deliveries and cesarean section for fetal distress but no difference in terms of meconium staining, 5-minute apgar score and cord blood PH. Naveiro-Fuentes M et al. in the retrospective analysis found an increased rate of cesarean delivery for non-reassuring fetal heart rate, which was an effect of the induction of labor rather than an effect of oligohydramnios per se.^{13,14} A multicenter clinical trial (RADIUS) by Zhang J et al. showed that oligohydramnios with unfavorable maternal and fetal conditions (such as IUGR, anomalies or hypertension) leads to a much worse perinatal outcome than a normal amniotic fluid volume with the same conditions.⁸ They found no difference in perinatal outcome in isolated oligohydramnios cases as compared to normal amniotic fluid volume except in isolated oligohydramnios, fetuses were slightly lighter by 100 g at birth.

Incidence of low birth weight neonate was significantly high in the oligohydramnios group, mainly because of preterm delivery. Though the incidence of the low apgar score at 5 minutes (≤ 7) was very low (5.71%) in the oligohydramnios group while none of the control has a low apgar score. This difference showed no significance. NICU admissions for the short duration was significantly more (20%) in the oligohydramnios group, while there was no such admission in the control group. Reasons for NICU admissions were respiratory distress syndrome, meconium aspiration syndrome and low birth weight neonates. This finding was similar to Melamed N et al. who found a significant association of low birth weight, mainly related to lower gestational age at delivery with no difference in 5-min apgar score and more NICU admissions due to higher rate of composite neonatal adverse outcomes such as transient tachypnea of the newborn (TTN) and hypoglycemia.¹² There was no neonatal death in their study. Likewise, in our study, all the babies were managed well and were stable at the time of discharge. There were no babies needed ventilator support and no perinatal death in both groups. Bhagat M et al. and Naveiro-Fuentes et al. also showed a significant association of low birth weight with isolated oligohydramnios though there was no difference in 5-min Apgar score and cord blood PH.^{13,14}

In the present study, we found that the pregnancies complicated with isolated oligohydramnios are strongly associated with null parity, this could be explained by probable association with nutritional factor and a higher number of unplanned conceptions. Significant association with fetal growth restriction (FGR) / low birth weight was due to uteroplacental insufficiency and premature termination because of non-reassuring fetal heart rate in CTG finding was because of cord compression. Causes for NICU admissions because of short term respiratory morbidity was similar to be present in any other type of pregnancies (RDS, MAS) and low birth weight. All babies were managed and discharged in stable condition and no

stillbirth or early neonatal death occurred. Subsequent neonatal outcome was good.

CONCLUSION

In the present study, isolated oligohydramnios diagnosed in third-trimester ultrasound is significantly associated with null parity, FGR, early interventions in the form of Induction of labor in view of fetal growth restriction, severe oligohydramnios and cesarean section due to non-reassuring fetal heart rate in CTG findings. This further contributed to a higher rate of NICU admissions. In conclusion, Isolated oligohydramnios itself should not be the cause of termination of pregnancy but when complicated with fetal growth restriction and fetal distress, then management needs to be planned according to detailed fetal surveillance and weighing the risks and benefits.

Limitation of the study was that this was of single center retrospective study with limited numbers of cases. In future there should be large scale multicenter, prospective study to find out the risk factors in development of isolated oligohydramnios and its adverse effect on pregnancy outcome.

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Ethical approval: The study was approved by the Institutional Ethics Committee

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