

Ultrasonographic evaluation of amniotic fluid volume and its correlation to perinatal outcome

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Abstract

Aim: To determine the perinatal outcome in normal and high-risk pregnancy with abnormal amniotic fluid volume monitored with ultrasonography.

Method: A prospective study was conducted at RMC, AJMER during the period from Dec.2018 to Nov.2019. The study group (cases) 250 women, and control group include 250 women. Ultrasonography was the screening method.

Result: In Hypertensive disorder & IUGR group, oligohydramnios present in 29.52% & 51.06% respectively. In high-risk women Polyhydramnios were 17.2% versus 4.4% in the control group. Preterm labor more significant in polyhydramnios group 48.83% vs 27.27% of oligohydramnios in high-risk women. There were increased chance of caesarean delivery in high-risk women with oligohydramnios were 57.14% vs 42.85% in the control group. Conclusion: Amniotic fluid assessment remains an important means of assessing fetal well-being. Oligohydramnios is associated with an increased

risk of caesarean delivery for fetal distress and perinatal morbidity. Polyhydramnios lead towards preterm birth.

Keywords: Amniotic fluid, Amniotic fluid index, Single deepest pocket, Oligohydramnios, Polyhydramnios

Introduction

The amniotic fluid serves multiple functions necessary for adequate fetal development ranging from biomechanical protection and Immunological properties, Hormonal regulation and the development of whole organ system as seen with pulmonary development.

The amniotic fluid volume is regulated by several systems, including the intramembranous pathway, fetal production (fetal urine and lung fluid) and uptake (fetal swallowing) and the balance of fluid movement.

The evaluation of amniotic fluid can be an indication of fetal well-being. Sonographic assessment can be qualitative or semi-quantitative.

The maximum vertical pocket (MVP) and four-quadrant amniotic fluid volume (AFI) are semi-quantitative

methods with established references common in clinical practice.

It is postulated that an "at risk" or abnormal pregnancy could affect the amniotic fluid volume of a pregnancy. Abnormalities of volume may result from fetal or placental pathology indicating a problem with fluid production or its circulation. These volume extremes may be associated with increased risk for adverse pregnancy outcomes.

This could be due to poor placenta perfusion, which causes blood to shunt to the brain, heart and adrenal glands at the expense of the rest of the fetal organ system, resulting in decreased renal perfusion and oligohydramnios.

Amniotic fluid can be increasing in pregnancies complicated with diabetes or with macrosomia. Maternal hyperglycemia causes fetal hyperglycemia, with resulting fetal osmotic diuresis into the amniotic fluid compartment.

Material & Method

The women for this study were selected randomly from a sample attending the ANC and those who are admitted in Raj Kiya Mahila Chikitsalya, Ajmer from Dec.2018 to Nov.2019. USG scan will be performed from 28 weeks onwards. 500 well-dated pregnant women with single tone pregnancy were recruited in the study as per inclusion / exclusion criteria after taking informed written consent. All women were observed by amniotic fluid volume estimation using maximum vertical pocket as observed by fortnightly USG.

Inclusion criteria

250 high risk pregnancies comprising of HDP, IUGR, Diabetes, Rh negative pregnancy, Thyroid disorder. While 250 patients with normal pregnancy were taken.

Exclusion criteria

Multiple pregnancy, preterm and post term pregnancies, PROM, Fetal anomalies had been excluded.

All participants were subjected to clinical examination and route in investigation after full history taking. Once meeting inclusion criteria data on maternal and perinatal outcomes, maternal demographics, medical history and antepartum complications were evaluated. Intrapartum assessment included mode of delivery, reason for operative vaginal delivery or cesarean Delivery if they occurred and meconium staining of the amniotic fluid. Neonatal outcomes included gestational age at delivery, Apgar score at 1& 5 minutes, admission to the neonatal intensive care unit (NICU) and reason for that admission. The reason for admission included prematurity, sepsis workup, Chorioamnionitis, respiratory depression, hypo glycaemia, meconium aspiration, respiratory morbidity and perinatal death.

USG examination was done with linear transducer frequency of 3.5 MHZ was used.

Amniotic fluid volume measurement was done by measuring the largest vertical point. Divide the uterus into 4 quadrant using the maternal sagittal midline vertically and arbitrary transverse line approximately Half way between them. The USG transducer is held perpendicular to the floor and parallel to the long axis of the women. Then, while scanning in the sagittal plane, the longest vertical point of fluid is identified and measured.

The single deepest pocket measurement is considered normal if above 2cm and less than 8 cm with value below and above this range indicating oligohydramnios, polyhydramnios respectively.

A normal pregnancy was defined as subjects without medical conditions that could influence amniotic fluid volume.

An at-risk pregnancy was defined as subjects with medical condition that could influence amniotic fluid

volume such as chronic hypertension, pre-eclampsia, pre or gestational diabetes, collagen vascular disorders, renal disorders and chronic placental abruptions.

Result

Table 1: Distribution of Cases

Type of cases	Total cases
Controls	250
HDP	105
Suspected IUGR	47
Rh negative pregnancy	28
Diabetes	41
Thyroid disorder	29

Use Total of 500 patients were studied in which 250 were controls and 250 were high risk patients. Maximum number of cases with HDP.

Table 2: Age distribution of patients

Age Group (in yrs)	Controls	High Risk
<=20	11	19
21-25	115	70
26-30	88	105
30-35	32	47
>35	4	9

Maternal age ranged from 19-40 years. Mean maternal age was in control and cases 23+-2yrs, 28+-2yrs respectively.

Table 3: Distribution according to Gravidity

Gravidity	Controls	Cases
G1	109	88
G2	73	63
G3	54	62
>G3	14	37

In control and high-risk group maximum patients were primigravida.

Table 4: Distribution of cases according to amniotic fluid volume using the maximum vertical pocket visible on USG

Maximum vertical pocket depth(cm)	Controls	Cases
<1	4	18
1 to <=2	17	52
>2 to <8	218	137
>8	11	43

Amniotic fluid volume was within normal limits(2-8cms) in control or cases 218(87.2%),137(54.80%) respectively.

Table 5: Distribution of high-risk cases according to AFV

Risk factor	Total no. of cases	AFV 1	AFV 1-2	AFV 2-8	AFV 8-10	AFV 10-12	AFV >12
HDP	105	8	23	66	5	3	0
Suspect d IUGR	47	7	17	23	0	0	0
RH neg. pregnancy	28	1	3	19	3	2	0
Diabetes	41	0	0	13	12	14	2
Thyroid disorder	29	2	9	15	2	1	0

Table 6: Mode of delivery in controls and high risk according to amniotic fluid volume

Amniotic fluid volume	Controls			Cases			P value
	Decreased	Normal	increased	Decreased	Normal	Increased	
Mode of delivery:							<0.001
(a)Vaginal delivery	12(57.14%)	167(76.60%)	8(72.72%)	30(42.85%)	88(67.69%)	19(44.18%)	
(b) LSCS	9(42.85%)	51(23.39%)	3(27.27%)	40(57.14%)	42(32.30%)	24(55.81%)	

Increased chances of LSCS in Abnormal amniotic fluid volume rather than normal amniotic fluid volume. In control group with oligohydramnios and normal amniotic fluid volume LSCS were 42.85%, 23.39% respectively

and 57.14% vs 32.30% in high-risk group. In control group with polyhydramnios and adequate AFV LSCS were 27.27%, 23.29% respectively and 55.81% vs 32.30% in high-risk group.

Table 7: Perinatal outcome

Perinatal outcome	Controls			Cases		
	Decreased	Normal	Increased	Decreased	Normal	Increased
Full term normal baby	17 (80.95%)	206 (94.49%)	8 (72.72%)	32 (45.71%)	102 (74.45%)	16 (37.20%)
IUGR	2 (9.52%)	4 (1.83%)	0	19 (27.14%)	8 (5.83%)	0
Preterm	1 (4.76%)	6 (2.75%)	3 (27.27%)	11 (15.71%)	13 (9.48%)	21 (48.33%)
Admission to NICU	1 (4.76%)	3 (1.37%)	0	23 (32.85%)	14 (10.21%)	11 (25.58%)
Still birth	0	0	0	3 (4.28%)	3 (2.18%)	1 (2.32%)
Neonatal death	0	0	0	4 (5.71%)	2 (1.46%)	1 (2.32%)

Discussion

This study aimed at monitoring of high-risk pregnancies by serial USG assessment of amniotic fluid volume. In the study, the women with oligohydramnios constituted 28% and polyhydramnios were 17.2% of the study sample similar to study done by Magaan et al and Rainford et al. In control group 1.6% showed severe oligohydramnios and in 6.8% patients amniotic fluid volume was marginally decreased. Incidence of polyhydramnios is 4.4% in control group.

In high-risk group which comprised of HDP, Suspected IUGR, Rh negative pregnancies, Thyroid disorder and diabetes amniotic fluid volume is within normal limits in 54.80% of patients and amniotic fluid volume marginally decreased in 20.8% of cases and 7.2% showed severe oligohydramnios.

Incidence of polyhydramnios was about 17.2% in high-risk group.

A significant relation was seen between oligohydramnios & hypertensive disorder with incidence of 29.52%, p value <1 & also for IUGR, with incidence of 51.06%. This agrees to some extent with studies of Akhter H., Chamberlain et. AL. Incidence of caesarean delivery in high-risk women with oligohydramnios women was 57.14%, the most indication was fetal distress with incidence of 32.85%. These results agree with Charu J., Casey et. Al, Chauhan et. Al. Incidence of cesarean delivery in high-risk women with polyhydramnios group was 55.81% versus control group which was 27.27%, the most common indication for LSCS was malpresentation & abnormal lie. Similar study done by Biggio.

In the present study 48.83% of high-risk women with polyhydramnios 27.27% of control group has preterm labour and delivery .15.71% of women have oligohydramnios and 4.76% of control group has preterm

labour and delivery. Increased chance of preterm labour in polyhydramnios group. Similar studies done by Desmedt EJ et al. 5.71% Neonatal death in high-risk group with oligohydramnios agree with Casey et. Al who noted 10% perinatal death.

2.32% neonatal death in high-risk group with polyhydramnios, there was a significant relation between increase amniotic fluid volume & perinatal morbidity & mortality, this finding goes with Hill et. Al study who recorded 13 cases of perinatal death.

Conclusion

Amniotic fluid estimation by sonography is a good method of estimation of foetal wellbeing. IN our study we have found that amniotic fluid volume is altered in high-risk pregnancies. Alteration in amniotic fluid volume also have an adverse effect on mode of delivery. NICU admission was more frequent amongst in high-risk pregnancies. The perinatal morbidity and mortality was also increased with extremes of amniotic fluid volume.

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