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Original Research Article

The role of intravenous aminoacid infusion in case of oligohydramnios in improving pregnancy outcome

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ABSTRACT

Background: Adequate amniotic fluid volume is essential for the normal growth and well-being of the foetus. Diminished liquor or oligohydramnios is quite often associated with abnormal foetal outcomes such as intrauterine growth restriction, foetal anomaly, malpresentation, post maturity syndrome and foetal distress in labour.
Methods: The present study was conducted in the department of obstetrics and gynecology, at PDZH, RNT Medical College, Udaipur in the year 2020-2021. The study group comprised sonographically proven cases of Oligohydramnios in third trimester attending antenatal clinic and those admitted in wards and clean labour room.
Results: Patient with severe oligohydramnios (AFI<5) 17% chance of persistent oligohydramnios and patient with borderline oligohydramnios (AFI 5-8) had 83% on 1st ANC visit, which improved at the time of delivery to 28% with normal AFI and 67% (5-8 AFI).
Conclusions: Antepartum AFI assessment is one of the most reliable and inexpensive standard technique for assessment of foetal wellbeing in antepartum period. This is a good predictor of foetal wellbeing. oligohydramnios means that the foetus is in a compromised condition. Amniotic fluid index assessment is a helpful tool in determine who is at risk for adverse outcome during labour and delivery. This helps in instituting appropriate corrective measures so that interventional procedures can be undertaken in the interest of unborn baby.

Keywords: AFI, Foetal wellbeing, Oligohydramnios

INTRODUCTION

Adequate amniotic fluid volume is essential for the normal growth and wellbeing of the foetus. Diminished liquor or Oligohydramnios is quite often associated with abnormal foetal outcomes such as intrauterine growth restriction, foetal anomaly, malpresentation, post maturity syndrome and foetal distress in labour.[1] Even a moderate reduction in amniotic fluid volume is associated with abnormal FHR, meconium-stained liquor which often requires caesarean section and results increased perinatal morbidity and mortality.

Amniotic fluid is faintly alkaline (pH 7.2, specific gravity 1.010), watery content fills amniotic cavity during gestation. Amniotic cavity is detected at 8 weeks of pregnancy and its average volume varies as 12 week- 50 ml, 20 week- 400 ml, 36 week- 1000 ml, 38 to 40 week- 600 to 800 ml, 43 week- <200 ml.[2]

Definition

Oligohydramnios is defined as the absence of an amniotic fluid pocket or one pocket measuring less than 2 cm in vertical diameter or AFI less than 5 cm.[2]

Composition

In the first half of pregnancy, the composition of the fluid is almost identical to a transudate of plasma. But in late pregnancy, the composition is very much altered, mainly due to contamination of fetal urinary metabolites. The

composition includes water 98-99% and solid 1-2%. Solid constituents are (i) organic (ii) inorganic (iii) suspended particles.

Organic

It includes protein- 0.3 gm%; glucose- 20 mg%; urea- 30 mg%; NPN- 30 mg%; uric acid- 4 mg%; creatinine- 2 mg%; total lipid- 50 mg%; hormones- (prolactin, insulin and renin).

Inorganic

Electrolyte (sodium, potassium, chloride) same as in maternal plasma except low values for sodium and chloride.

Suspended particles

Lanugo hairs, exfoliated squamous epithelial cells from the fetal skin, vernix caseosa, cast of amniotic cells and cells from respiratory tract, urinary bladder and vagina of the fetus.[2]

Origin of amniotic fluid

Amniotic fluid is the result of a balance between its absorption and production. Various factors have been described to be involved in the dynamic process, the most well-known being fetal urination and swallowing.[3] The water in the amniotic fluid is completely changed and replaced in every 8 hours. Amniotic fluid originates from maternal as well as fetal origin. The 6 proposed pathways for fluid movement in and out of the amniotic cavity includes-

Table 1: Pathways for fluid movement in and out of the amniotic cavity.

Pathways	To the foetus	To amniotic fluid
Fetal swallowing	500-1000	-
Oral secretions	-	25
Secretions from the respiratory tract	170	170
Fetal urination	-	800-1200
Intramembranous flow across the placenta, umbilical cord and foetal skin	200-500	
Transmembranous flow from the amniotic cavity into the uterine circulation	-	10

Volume ml/day

Functions

Amniotic fluid has a number of important roles during pregnancy and labour. During pregnancy it cushions the fetus against trauma. Protects umbilical cord compression. It maintains the embryo's body temperature. Has antibacterial property to lessen infections. Provides a short-term source of fluid and nutrients to the foetus. Permitting fetal movement and the development of the musculoskeletal system. Swallowing of amniotic fluid enhances the growth and developments of GIT. Amniotic fluid volume maintains amniotic fluid pressure, thereby reducing the loss of lung liquid- an essential component of pulmonary development.[9]

The most likely cause of oligohydramnios in IUGR babies is decreased fetal urinary output. When significant impairment of placental perfusion occurs, the fetus becomes hypoxic and autonomic nervous reflexes that consequently get activated, results in preferential shunting of the blood from the splanchnic circulation to the brain and heart and as a result of decreased pulmonary and renal perfusion, the amniotic fluid decreases.

A borderline oligohydramnios (AFI between 5-8 cm) observed in antepartum testing associated with an increased risk of IUGR and overall adverse perinatal outcome. In present study pregnancy outcome was assessed in respect to incidence of meconium staining, intrapartum fetal distress that required cesarean section, still birth, Apgar scores of <7 at 1 or 5 minutes, birth weights <10th percentile for gestational age, abnormal FHR, perinatal and neonatal mortality. Because of poor outcome associated with oligohydramnios, there is clinical need to increase amniotic fluid volume in pregnancies with oligohydramnios has prompted research into its normal regulation.

This study was conducted to study improvement in amniotic fluid index (AFI) by intravenous essential amino acid infusion with 500 ml RL, through improved maternal nutritional status, which could not have been achieved by diet because of non-compliance, nausea-vomiting and socio-economic factors.

METHODS

The present study was conducted in the department of obstetrics and gynecology, at PDZH, RNT Medical College, Udaipur during the period August 2020 to July 2021. The study comprised of 100 clinically and sonographically proven cases of oligohydramnios in third trimester attending antenatal clinic and those admitted in wards and clean labour room at random.

Inclusion criteria

Singleton pregnancy; four quadrant estimation of AFI; gestational age more than 28 weeks and less than 40 weeks of gestation; intact membranes.

Exclusion criteria

Patients with multifoetal gestation; polyhydraminos; ruptured membranes; associated fetal anomalies and

patients having major respiratory, cardiovascular and abdominal pathology were excluded from the study.

The AFl was determined with a B-mode real time scanner with linear accelerator operated at 3.5 MHz. AFI estimation done by four quadrant technique. This procedure was performed with patient in supine position. Uterus was divided into four equal quadrants.

The linea-nigra was used as the midline to divide the uterus into the right and left halves. The midpoint between fundus and pubic symphysis was obtained and straight line through the midpoint and perpendicular to the linea-nigra divided the uterus into upper and lower halves.

Detailed history including age parity, gestational age, history of present illness, past menstrual history, last menstrual period, antenatal care during pregnancy, past obstetric history, any pregnancy associated complication, past or present history of any infection or medical disorder, personal and family history were recorded.

Thorough general systemic and obstetric examination was conducted. Abdominal girth, fundal height and maternal weight was measured in centimeter weekly or fortnightly following manner:

Uterine height measurement

Uterine height was measured by a metric tape made up non elastic material. Patient was in supine position; legs was extended to prevent upward movement of symphysis pubis. The uterus was relaxed and bladder was empty. The measurement was taken from upper border of symphysis pubis to superior fundus of uterus.

The reading was recorded irrespective of the lie and presentation or degree of descent of presenting part into the pelvis. Symphysis fundal height (SFH) was measured on first visit after 28 weeks and then fortnightly.

Abdominal girth

Abdominal girth was measured with a non-elastic metric tape at the level of umbilicus at subsequent visits after 28 weeks.

Maternal weight

Weight (in kg) of mother was also recorded at each visit.

Daily foetal movement count (DFMC) and FHR record was maintained. DFMC done by explaining the patient to count foetal movements three times a day (morning, noon and evening) each of one hour duration, the total counts multiplied by four gives daily (12 hours) fetal movement count (DFMC). If there was diminution of the number of 'kicks' to less than 10 in 12 hours, it was noted, which indicates failing placental function. The count was performed 3 times a week.

Investigations of blood i.e. Hb gm%, total and differential cell counts, RBS, serum urea, serum creatinine, blood grouping and typing was done. After initial sonography patients in the study group was subject to repeat sonography after 1week or 2 weeks.

The study group patients were given intravenous amino acid 500 ml and Ringer lactate 500 ml drip on first to fifth day and then advice repeat USG.

After that, Oral iron, calcium and multivitamins was also given. Patients were followed up till their delivery.

Pregnancy outcome was assessed with respect to-incidence of meconium stained liquor; intrapartum fetal distress; mode of delivery; indication of LSCS was noted and fetal outcome was studied with regards to birth weight. Apgar score at one and five minutes and any other neonatal complications intrapartum or postpartum during stay in hospital and condition at the time of discharge.

The data observed was entered in MS Excel and evaluated using relevant statistical test by Graph Pad Prism 8. P value of <0.05 was considered significant.

RESULTS

Maximum number of patients 44 (44%) were in the age group of 21-25 years, followed by 36 (36%) in the 26-30 years of age group and only 5 (5%) patients were above 31 years of age.

Table 2: Distribution of cases according to age group, socio-economic status and residence.

		No. of patients	%
Age group (years)	<21	15	15.0
	21-25	44	44.0
	26-30	36	36.0
	31-35	5	5.0
Socio-economic status	Lower	48	48.0
	Middle	46	46.0
	Upper	6	6.0
Residence	Rural	46	46
	Urban	54	54

There was higher incidence of oligohydramnios cases in patients belonging to lower- and middle-class families i.e. 48 and 46 (94%) patients. Only 6 (6%) patients were from upper socio-economic status.

Maximum number of patients 54 (54%) were from urban area as urban population is more aware about perintatal care. 46 (46%) patients were from rural area.

There were 20% cases of severe oligohydramnios and 80% cases of moderate oligohydramnios at the time of 1st visit. On repeat USG after amino-acid infusion 28% patients with moderate oligohydramnios had improved AFI to

normal, whereas 15% patients with severe oligohydramnios had improved (AFI) to moderate oligohydramnios.

Table 3: Distribution of cases according to AFI at 1st visit and at the time of delivery.

AFI	On 1st visit	At time of delivery
Severe oligohydramnios (<5 cm)	17 (17%)	5 (5%)
Moderate oligohydramnios (5.1-8 cm)	83 (83%)	67 (67%)
Normal (>8 cm)	-	28 (28%)

32% of patients had undergone spontaneous onset of labour, while in 47% of patients labour was induced by dinoprostone gel followed by ARM in 12%, misoprostol in 6% and mechanical dilatation in 3%.

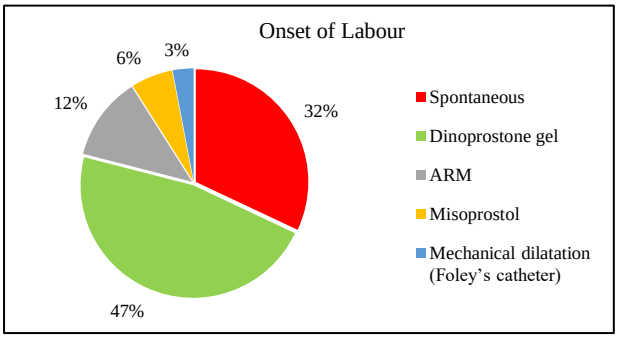

Figure 1: Distribution of cases according to mode and methods of onset of labour.

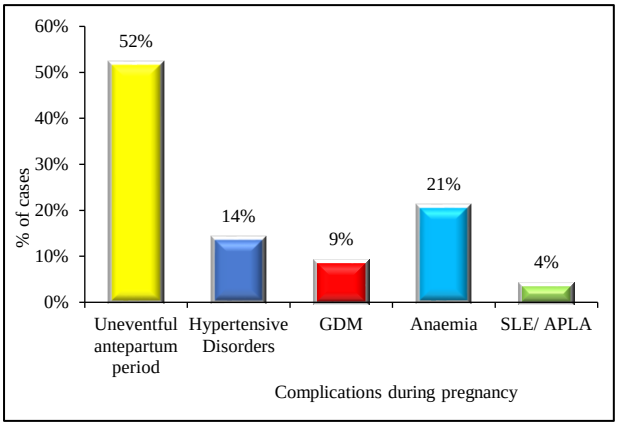

Figure 2: Distribution of cases according to antepartum associated conditions.

14% patients developed PIH during antepartum period, 9% had GDM, 21% had anaemia and 4% had SLE/APLA while 52% patients had uneventful antepartum period.

Five cases of severe AFI i.e. <5 cm underwent LSCS. In AFI 5.1 to 8 cm preterm vaginal delivery was done in 27 cases followed by term vaginal delivery in 23 cases, 1 each of assisted vaginal and breech vaginal delivery was done. For AFI>8 cm preterm vaginal delivery was done in 8 cases followed by term vaginal delivery in 7 cases, 4 cases of assisted vaginal delivery and 2 had breech vaginal delivery.

Table 4: Relationship between AFI and mode of delivery.

Pregnancy outcome	AFI <5 cm (n=5)	5.1-8 cm (n=67)	>8 cm (n=28)
Preterm vaginal	-	27	8
Term vaginal	-	23	7
Assisted vaginal (forceps/ vacuum)	-	01	4
Breech vaginal	-	01	2
Caesarean section indication	5	21	9

21 cases of AFI 5.1 to 8 cm underwent LSCS and 9 cases of >8 cm underwent 9 LSCS.

Table 5: Foetal outcome.

		No. of patients	%
Apgar score at 5 minutes	<5	2	2
	5 to 8	38	38
	8 to 10	60	60
Birth weight (in kg)	<1.5 kg	9	9.0
	1.5-2.49 kg	31	31.0
	> 2.5 kg	60	60.0
Foetal outcome at birth	Healthy	70	70
	RDS	19	19
	NICU admission	9	9
	Still borne	2	2

98% of babies had Apgar score of >5 at 5 minutes of birth, 2% had Apgar 0 as neonates expired and 60% had Apgar score 8 to 10.

60% of babies had birth weight >2.5 kg, followed by 31% had weight 1.5 to 2.5 kg. 9% had birth weight <1.5 kg.

98% babies were born alive and 2% were still birth, out of them 19% were RDS, 9% had NICU admission.

DISCUSSION

Maternal hydration status has an important role to play in the normal regulations of amniotic fluid volume, besides other factors such as foetal urination and foetal swallowing. Amniotic fluid volume regulation and response to fluid infusion or withdrawal has been studies in animal experiments. But very few studies have been carried out in humans.

Maximum number of patients 44 (44%) were in the age group of 21-25 years, followed by 36 (36%) in the 26-30 years of age group and only 5 (5%) patients were above 31 years of age. Majority of patients 54 (54%) were from urban area as urban population is more aware about perintatal care. 46 (46%) patients were from rural area. There was higher incidence of Oligohydramnios cases in patients belonging to lower- and middle-class families i.e. 48 and 46 (94%) patients. Only 6 (6%) patients were from upper socio-economic status.

Maximum number (72% of patients) were in age group of 20-25 years and only 2 patients were less than 20 years of age. 68% cases were from urban and 32% were from rural areas, as urban population is more aware about prenatal care.[4] Higher incidence of oligohydramnios cases were belonging to lower and middle-class families i.e. 44% and 40% respectively and only 8 patients were from upper socio-economic status.

There were 20% cases of severe oligohydramnios and 80% cases of moderate oligohydramnios at the time of 1st visit. On repeat USG after amino-acid infusion 28% patients with moderate oligohydramnios had improved AFI to normal, whereas 12% patients with severe oligohydramnios had improved (AFI) to moderate oligohydramnios.

In our study five cases of severe AFI i.e. ≤5 cm underwent LSCS. In AFI 5.1 to 8 cm preterm vaginal delivery was done in 27 cases followed by term vaginal delivery in 23 cases, 1 each of assisted vaginal and breech vaginal delivery was done. For AFI >8 cm preterm vaginal delivery was done in 8 cases followed by term vaginal delivery in 7 cases, 4 cases of assisted vaginal delivery and 2 had breech vaginal delivery. 21 cases of AFI 5.1 to 8 cm underwent LSCS and 9 cases of >8 cm underwent 9 LSCS.

The mean AFI prior to the amnioinfusion was 3.0±1.49 cm (range, 0-4.7). The mean AFI after the amnioinfusion was 8.9±2.9 cm (range, 5.1-14.3). A mean change in the AFI of 5.8±2.6 cm (range, 0.9-10.6) was noted. Among patients with AFI less than or equal to 5.0 cm and intact membranes, amnioinfusion of 250 ml of normal saline seems to be a safe and simple way to increase the AFI to greater than 5.0 cm.[5]

136 singleton pregnant females with gestation age 34 weeks with AFI. Among the 68 who were given intervention, 61 responded and 7were non responders.[6] With hydration therapy, mean increase in AFI was 4 cm and the minimum duration needed for improvement was one week. Hydration therapy showed significant improvement in the maternal and foetal outcomes. Intravenous route of maternal hydration has the advantage that a fixed amount of fluid can be infused at a relatively constant rate with ensured compliance.

A borderline amniotic fluid index observed in antepartum testing is associated with an increased risk of intrauterine growth restriction and overall adverse perinatal outcome.[7] These observations suggest that borderline amniotic fluid index merits twice-weekly antepartum testing.

Maternal hydration and the reset (lower) maternal and foetal plasma hypotonicity results in suppression of spontaneous foetal swallowing activity in ewes, probably from tonic dipsogenic stimulations.[8] Foetal swallowing being a major route of amniotic fluid resorption, suppressed swallowing activity increases amniotic fluid volume.[9]

The Cochrane Library (oxford) search of the Cochrane. Pregnancy and childbirth group trials register and the Cochrane controlled trials register showed only two studies of 77 women, with and without oligohydramnios.[10] The women were asked to drink two litres of water before having an ultrasound. Acute maternal hydration was associated with increase in amniotic fluid volume. The reviewer's conclusion was that simple maternal hydration appears to increase amniotic fluid in women with normal AFV. It may be beneficial in the management of oligohydramnios in pregnancy and labour.[11]

Comparison of the effect of three methods of maternal hydration on the AFI in oligohydramnios: i.v. isotonic fluid (2 litres >2 hours), i.v. hypotonic fluid (2 liters >2 hours) and oral water intake (2 litres >2 hours) demonstrated significant increase in amniotic fluid volume with i.v. hypotonic fluid infusion and oral water intake only (2.8±1.9, p<0.001; 3.8±1.9, p<0,001 respectively).[12]

This study has some limitations. When confronted with an abnormal test, clinicians should evaluate with a second antenatal test and appropriate workup to uncover the underlying etiology should be initiated as adverse fetal outcomes are sometimes associated with these variations from normalcy.

CONCLUSION

Antepartum amniotic fluid index assessment is one of the most reliable and inexpensive standard technique for assessment of foetal wellbeing in antepartum period. It is seen that institution of intravenous infusion of 10% Ringer lactate and aminoacid showed moderate cases improved to normal while in some remain in range of moderate oligohydramnios.

From the above study, it is suggested that for idiopathic oligohydramnios, intravenous aminoacid may prove useful in reducing maternal morbidity and perinatal morbidity and mortality and improving pregnancy outcome in developing countries.

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

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