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Efficacy of Intravenous Hydration Versus Amino Acid Infusion in Idiopathic Oligohydramnios

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ABSTRACT

Objective: To compare the efficacy of intravenous hydration and amino acid infusion in cases of isolated oligohydramnios.

Methodology: A single blind randomized clinical trial conducted in Dept of Obs/Gynae, Aziz Bhatti Shaheed Teaching Hospital, Gujrat, from 12-06-2019 to 11-12-2019. A total of 104 mothers having isolated oligohydramnios were randomized into two groups for the administration of 6 drips of normal saline (Group-A) or amino acid infusion (Group- B). The AFI was measured before and after the infusions. The total of these four values was AFI in centimeters. The normal AFI in term gestation is taken as 12.9±4.6cm. The rise in AFI was studied and analyzed.

Results: In group-A vs group-B, the mean maternal age was 32.1±4.4 vs 31.0±5.5 yrs, Mean Gestational age was 29.1±2.9 vs 29.0±3.1 wks, mean BMI was 34.6±9.7 vs29.1±5.7 Kg/m2. In both groups majority was multigravida. Mean AFI at first presentation was comparable in both groups (3.78±0.56 vs 3.73±0.36). Mean AFI after six drips was significantly higher in group B. (4.79 ±0.65 vs 6.82±0.62; p<0.001). Similarly, the change of AFI showed a significant increase in group-B when compared with group-A (1.0±031 vs 3.09±0.70; p<0.001). Stratification for age, gestational age, BMI and parity was also carried out.

Conclusion: Intravenous amino acid is an effective therapy for improving AFI and is beneficial in the management of isolated oligohydramnios.

Keywords: Amniotic fluid, Amino acid infusion, Intravenous hydration, Oligohydramnios.

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Introduction

The amniotic fluid bathing the fetus is a dynamic medium that undergoes marked turnover in its composition and volume as pregnancy advances. The amniotic fluid is rich in nutrients and growth factors essential for fetal growth and provides the mechanical cushioning and antimicrobial effect thereby protecting the fetus.[1] Reduction in the amniotic fluid (oligohydramnios) affects 1-5% of term pregnancies and is associated with significant maternal and neonatal morbidity. The role of intravenous hydration and amino acid infusion has been studied widely in treatment of fetal growth restriction and associated oligohydramnios with conflicting results.

The mechanism of amniotic fluid production, consumption, and volume changes with gestational age. During the first trimester the major source of amniotic fluid is maternal blood and maternal plasma volume is directly associated with amniotic fluid volume.[2] Fetal kidneys begin to make urine before the end of the first trimester, and then become the main source of amniotic fluid production thereafter, ever increasing till term.[3] The average amniotic fluid volume at term is about 800ml (range; 400-1500ml).[4] Variations in fetal homeostasis affect the volume of fetal urine production, swallowing, and lung liquid secretion. Hence amniotic fluid volume is a reflection of fetal status, making amniotic fluid assessment an essential part of an evaluation of maternal and fetal health. [5,6]

Amniotic fluid is usually quantified in terms of amniotic fluid index (AFI), which is measured on ultrasound by four–quadrant technique. It is the sum of deepest vertical fluid pocket (measured in cm) in four quadrants of abdomen. When AFI is <5cm or less than 5th percentile for the particular gestational age it is termed as oligohydramnios.[2,7]

Oligohydramnios affects 3-5% of total pregnancies.[8] Cause are both maternal and fetal factors like; pregnancy induced hypertension, maternal diabetes, placental insufficiency, fetal congenital gastrointestinal or urinary tract anomalies, premature rupture of membranes, post maturity syndrome, prostaglandin synthesis inhibitor, ACE inhibitors, while idiopathic cases are 10%.[9,10] Isolated oligohydramnios have no appreciable intrauterine growth retardation, have a normal umbilical artery Doppler velocimetry and have no recognizable underlying cause. It comprises almost 30-40% of all cases of oligohydramnios.[1]

Amniotic fluid also keeps the temperature of the fetus stable and due to its floating characteristics facilitates the movement and symmetrical growth of the fetus.[11] Effect of oligohydramnios on perinatal outcome had been conflicting.[12,13] However it is a significant sign of fetal malnutrition and results in placental insufficiency, impaired fetal lung development and fetal growth restriction. Long-term complications include cord compression, preterm delivery, and increased chances of operative deliveries.[14,15]

Treatment of oligohydramnios includes hospitalization, specialist consultation, bed rest, oral rehydration, intravenous (I/v) hydration, and I/v amino acids.[1] In literature whereas few studies[1] have shown that improvement of AFI either by I/V hydration or amino acid infusion is comparable, other studies have shown that I/V amino acids are better than I/V hydration.[7,8] To look upon this controversy, the aim of the present study to appreciate the effect of I/V hydration versus I/V amino acid preparations upon amniotic fluid volume.

Methodology

A single blind randomized clinical trial (with blinding of the patient) was conducted in Dept of Obs/Gynae, Aziz Bhatti Shaheed Teaching Hospital, Gujrat, from 12-06-2019 to 11-12-2019.

A sample size of 104 (52 in each group) was calculated at 95% confidence interval and 80% power of test and taking expected mean change in i/v hydration group of 0.83±0.07 and in amino acid infusion group of 0.42±0.058 [1]. Non-probability, consecutive sampling was done.

Inclusion Criteria: Women of any parity with age range of 18 to 40 years, Gestational age of 24 to 34 weeks and AFI <5 cm with intact amniotic sac.

Exclusion Criteria: fetal anomalies, Pregnancy induced Hypertension, Pre eclampsia/eclampsia, Diabetes Mellitus, Threatened preterm labour, PROM.

After getting approval from Institutional Ethical Review Committee and informed consent from the patients, women fulfilling the inclusion criteria were admitted and evaluated for feto-maternal well being. For AFI measurement, the largest vertical pocket in each abdominal quadrant was measured on transabdominal USG. The sum total of these four values was AFI in centimeters. The normal AFI in term gestation is taken as 12.9±4.6cm. Cases with AFI <5CM were selected and randomized into group-A and group-B by the chit method. Antenatal surveillance was carried out as per routine protocol. Patients in group-A were given i/v normal saline 500ml drip while in group-B I/V amino acid 200 ml infusion on alternate days up to 6 drips. AFI was measured at baseline and then after the 6th drip. The outcome variable of a change in AFI for both groups was measured and calculated by the researcher herself.

Data Analysis: Data was analyzed using SPSS version 22. Quantitative variables like age, gravidity, gestational age, and a change in AFI were expressed as mean±SD. Frequency and percentages were calculated for categorical variables. Mean Change in AFI in both groups was compared by using independent sample t-test. P-value of ≤0.05 was considered significant. Data were stratified for age, BMI, gestational age, and parity. Post-stratification t-test was used taking p-value ≤0.05 as significant.

Results

The mean maternal age was 32.1±4.4 and 31.0±5.5 years in group-A and B, respectively while age range was 20-40 yrs. Mean Gestational age in group-A was 29.1±2.9 and in group-B 29.0±3.1 weeks and gestational age range was from 24-34 wks. Mean body mass index (BMI) in group-A was 34.6±9.7 and

29.1±5.7 Kg/m^2 in group-B. In group-A primigravidas were 27% and multigravida were 73%, while in group-B these were 33% and 67% respectively. Mean AFI at first presentation was comparable in both groups (3.78±0.56 vs 3.73±0.36). Mean AFI after six drips was significantly higher in group-B (4.79±0.65 vs 6.82±0.62; p<0.001) (Table I). Similarly, change of AFI also showed a significant increase in group-B when compared to group-A. Stratification for age, gestational age, BMI and parity was also carried out and significant results are shown in Tables II & III.

Discussion

In present study we compared the beneficial effect of intravenous amino acid and normal saline in improving the amniotic fluid volume.

Since long different medical and surgical treatments are in use to increase the amount of liquor in case of oligohydramnios ncluding parentral amino acid and simple hydration therapy. The placental fluid transfer can be enhanced with improved maternal hydration and amino acid infusions. The net trans-placental water exchange between mother and fetus is influenced by osmotic pressure determined by electrolyte gradient.[1] The intravenous amino acid preparations improve the AFI by improving the maternal nutritional status, which is jeopardize in developing countries like ours due to several factors like non-compliance for the diet, socio-economic constrains, mal-absorption due to gut worm infestation. Amino acids cross the placenta by an active transport system with a resultant higher concentration in fetus compared with mother. Nevertheless, a lower serum concentration of amino acids was found in growth retarded fetuses having oligohydramnios as well, when compared with normally grown fetuses.[16]

Table I: Comparison of AFI in two groups.

Groups	Baseline AFI		AFI after 6 infusions		Change in AFI	
	Mean±SD		Mean±SD		Mean±SD	
Group-A (I/V Normal saline)	3.78	0.56	4.79	0.65	1.00	0.31
Group-B (I/V Amino acid)	3.73	0.36	6.82	0.62	3.09	0.70
P value	**P=0.567**		**P=<0.001**		**P=<0.001**	

In the current study, we described the better efficacy of amino acid preparations over intravenous plain hydration for improvement in AFI. There was no statistical difference in the maternal age, gestational age, BMI, and parity of all patients in two groups. The majority of enrolled women were multigravidas (70%) which is comparable to Kumar study[1] having 60% multigarvidas, while in a few other studies majority was of primigravidas.[7,8]

In present study mean maternal age was 31.5±2 yrs while in kumar study[1] this was 25.87±0.62 and other studies had younger patients with mean age of 23.3±3.49[7] and 23±2.54 yrs. [8]

Mean gestational age at the time of diagnosis of oligohydramnios was 29±2 weeks which is closely

Table II: Stratification of Maternal & Gestational age with regard to change in AFI

Groups	Maternal Age				Gestational Age			
	20-30 (years)		31-40 (years)		24-30 weeks		31-34 weeks	
	Change in AFI		Change in AFI		Change in AFI		Change in AFI	
	Mean±SD		Mean±SD		Mean±SD		Mean±SD	
Group-A (I/V Normal saline)	0.99	0.35	1.01	0.29	1.02	0.32	0.95	0.31
Group-B (I/V Amino acid)	3.17	0.57	3.03	0.79	2.91	0.71	3.54	0.43
P value	**P=<0.001**		**P=<0.001**		**P=<0.001**		**P=<0.001**	

Table III: Stratification of BMI & Parity with regard to change in AFI

Groups	Maternal BMI				Maternal Parity			
	<25		≥ 25		Primigravida		Multigravida	
	Change in AFI		Change in AFI		Change in AFI		Change in AFI	
	Mean±SD		Mean±SD		Mean±SD		Mean±SD	
Group-A (I/V Normal saline)	0.97	0.30	1.01	0.32	1.07	0.32	0.98	0.31
Group-B (I/V Amino acid)	2.85	0.83	3.16	0.65	3.06	0.63	3.11	0.74
P value	**P=<0.001**		**P=<0.001**		**P=<0.001**		**P=<0.001**	

comparable to studies done in Maharashtra and Wardha India[1,12,14] where mean gestational age was 30.6 wks to 31.1±2 wks, while few other studies reported still higher mean gestational age of 32.3 wks,[17] 33.4±1.9 wks,[18] and 34.61±1.53 wks.[7]

The mean AFI at the time of enrolment in our study was quite low (3.75±0.46 cm) which is comparable to another Pakistani study by Qureshi[19] reporting 4.7 cm. Prabha[8] found that the mean AFI in their study at time of enrolment was 5.782±1.089. Begum[7] and Hebbar[18] reported a mean AFI at the time of enrolment of 6.8±1.3 and 6.9±1.7 cm; whereas in kumar study[1] 73.2% cases had AFI of 7-8 cm.

While looking upon final increment in mean AFI after 6 drips, we observed a statistically significant increase in intravenous amino acid group compared with I/V normal saline group (6.82±0.62 Vs 4.79±0.65; p<0.001) with a mean change in AFI in amino acid group of 3.09±0.70. In Begum study[7] similar improvement in AFI after the infusion of amino acids was seen with a mean increase of AFI by 2.6±1.57 cm, which was statistically significant (P <0.0001), while Prabha study[8] also demonstrated a statistically significant(p=0.000) improvement in AFI after 06 infusion of amino acids. Multiple other studies[14,15,17,19] also showed same encouraging results. Nevertheless, in Kumar study[1] there was a marginal rise in AFI with both these interventions and with no statistically significant difference between the two groups (P value >0.05) for AFI.

Our study was having few limitations. Firstly, mothers were not followed up till the time of delivery to comment upon the length of prolongation of gestational age by our interventional therapy. Secondly, mode of delivery and feto-maternal outcome should have been followed for better generalization of the results of our study.

Conclusion

Improvement in maternal hydration is a key factor in treatment of oligohydramnios. Intravenous amino acid preparation is an effective therapy for raising AFI. The dietary improvement alone cannot be beneficial, owing to high level of non-compliance and socioeconomic constrains in developing countries like Pakistan. By such therapy the gestational age can be prolonged for an optimum time with a better pregnancy outcome. More controlled trials are recommended at larger scale and with extended follow up to comment better upon feto-maternal outcome.

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