

# To Determine The Role Of Intravenous Amino Acid Infusion & Maternal Hydration In Oligoamnios And To Study Its Effect On Maternal And Fetal Outcome – A Retrospective Study

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## Abstract

**Background :** Oligoamnios (AFI <5cm) and borderline oligoamnios (AFI 5.1-8CM) are associated with various maternofetal complications and iatrogenic preterm deliveries. A simple cost effective method to increase amniotic fluid volume is intravenous maternal hydration and amino acid infusion. The aim of this study was to evaluate its effect on improving amniotic fluid volume and measure the fetal and maternal outcome in oligoamnios treated with intravenous hydration and amino acid infusion.

**Methods:** It is a retrospective study done at S.G.R.D Medical college, Amritsar. Data was collected from ANC records of 30 patients sonographically diagnosed with oligoamnios during the period of Jan to December 2020. All the patients in the study had received intravenous fluids with one litre 10 % Dextrose and 200ml amino acid infusion (essential amino acids) for 3 alternate days.

**Results:** The mean gestational age at diagnosis of oligoamnios in our study was  $32.3 \pm 0.86$  weeks. The initial mean  $\pm$  SD AFI was  $5.77 \pm 1.11$  and repeat AFI after intervention was  $8.58 \pm 1.75$ . The mean AFI has improved significantly after intervention with a p value of  $< 0.000$ . In the study 72% of babies were delivered at term and 28% were delivered at late preterm. The percentage of mothers who had normal delivery was 40 % and 43 % had lscs, the remaining 17% were lost to follow up.

**Conclusions** Thus intravenous infusion of amino acids and maternal hydration increases A.F.I and hence prolongs the pregnancy reducing preterm deliveries and its associated neonatal morbidity. Thus the above intervention has a beneficial effect to both mother and fetus in case of oligohydramnios. However, larger prospective studies with controlled trial are needed to be done.

Date of Submission: 05-05-2022

Date of Acceptance: 20-05-2022

## I. Introduction

Amniotic fluid that surrounds the developing fetus has several benefits to the fetus. (1)

In the 2<sup>nd</sup> half of the pregnancy fetal urination forms a major source of amniotic fluid volume. Fetal urine osmolality is similar to amniotic fluid osmolality of 260mOsm/l, which is hypotonic to that of maternal and fetal plasma which are about 280mOsm/l. The hypotonicity of amniotic fluid leads to transfer of fluid towards hyperosmolar gradient in fetal vessels on placental membranes (intramembranous flow). If there is maternal dehydration, maternal osmolality increases which leads to further transfer of fluid from fetal vessels into mother, which in turn increases fetal osmolality leading to transfer of amniotic fluid into fetal vessels causing oligoamnios. (1)

Oligoamnios is reduction of amniotic fluid volume and is classified by Jeng et al as Borderline oligoamnios when AFI is between 5.1 to 8cm and oligoamnios as AFI  $\leq 5$ CM. (2-4) Its incidence is around 1 to 5% of pregnancies.

Amniotic fluid volume increases progressively, reaching its peak of 800ml at 32 weeks and plateauing at 1000ml at 38 weeks and starts declining after 40 weeks to 800ml. (5)

Ultrasound is one of the best simple methods to measure amniotic fluid volume. It is measured quantitatively either by four quadrant AFI (Amniotic fluid index) or SDP (single deep pocket). (2-4)

Oligoamnios could be due to various causes, either maternal, placental or fetal and cause can differ based on the gestational age. Oligoamnios is frequently an early warning sign of decreased placental perfusion in 2<sup>nd</sup> half of pregnancy. (9)

It has been associated with fetal hypoxia, preterm births, non reactive fetal heart tracings during labour, still birth, increased chances of caesarean sections, meconium stained liquor and NICU admissions. (7,8)

One of standard management of oligoamnios has been close monitoring of amniotic fluid volume. In various studies it has been observed that around 60 percent cases of severe oligoamnios persist to have severe oligoamnios and 5 percent of borderline oligoamnios develop into severe oligoamnios in few days. (6)

In cases of isolated oligoamnios with normal doppler changes, simple intravenous hydration and amino acid infusion has been tried in our study. Amino acid infusion improves maternal nutrition and acts as a vasodilator hence thought to improve placental perfusion. Maternal hydration decreases plasma osmolarity and due to osmotic gradient there is more transfusion to fetus intrun increase in amniotic fluid volume

## **II. Materials And Methods :**

The present study was conducted retrospectively on antenatal women who were diagnosed with isolated oligoamnios and had received intravenous maternal hydration, amino acid infusion as part of management and delivered in the year 2020 (from Jan 2020 to Dec 2020). The study comprised 30 antenatal mothers diagnosed ultrasonographically with isolated oligoamnios (AFI < 8) at SGRD charitable hospital.

This study was conducted to see retrospectively the effectiveness of maternal intravenous hydration and amino acid infusion in improving amniotic fluid index and return to check how many preterm births were prevented and pregnancies taken till term with good maternal and fetal outcome.

The treatment protocol that our study group of isolated oligoamnios with normal fetal doppler received was day care admission followed by intravenous maternal hydration with one litre 10 % Dextrose and 200ml amino acid infusion (essential amino acids) for 3 alternate days. Ultrasound had been repeated after a week to check AFI.

### **INCLUSION CRITERIA**

- SINGLETON PREGNANCY
- AFI < 8 CM
- GESTATIONAL AGE MORE THAN 28 WEEKS AND LESS THAN 36 WEEKS
- INTACT MEMBRANES
- USG –DOPPLER NORMAL

### **EXCLUSION CRITERIA**

- MULTIFETAL GESTATION
- RUPTURED MEMBRANES
- ASSOCIATED FETAL ANOMALIES
- PATIENTS HAVING MAJOR RESPIRATORY , CARDIOVASCULAR DISORDERS
- IUD

Data was retrieved from stored antenatal records. Antenatal card and files with mentioned diagnoses of oligoamnios were included in the study, their obstetric and ultrasound records reviewed. Gestational age of mothers at which diagnosis of oligoamnios and their initial AFI noted. The repeat AFI after 3 alternate doses of intravenous fluid and amino acid infusion noted. Gestational age of the mothers at time of delivery noted and mode of delivery noted. To evaluate fetal outcome, babies born to these mothers were classified into term or preterm, their APGAR score and if any NICU admissions noted. The results were recorded and tabulated

### **OBSERVATIONS/RESULTS/statistical analysis**

Data was entered into excel sheet. The results were tabulated. Descriptive data are presented as number and percentages with average (mean) and standard deviation wherever required. Chi-square test was used for analysing categorical data. and a p – value of 0.05 or less was considered statistically significant.

Total of 30 cases of isolated oligoamnios were studied in the year 2020. Table 1 and figure 1 describe the maternal age distribution in the study population. The majority of patients, (47% -14 patients) were in the age group of 25-30 yrs followed by 12 patients (40 %) in the age group below 25 and only 4 patients (13%) above 30 years of age. The total mean of age in years of the study population being 26 years.

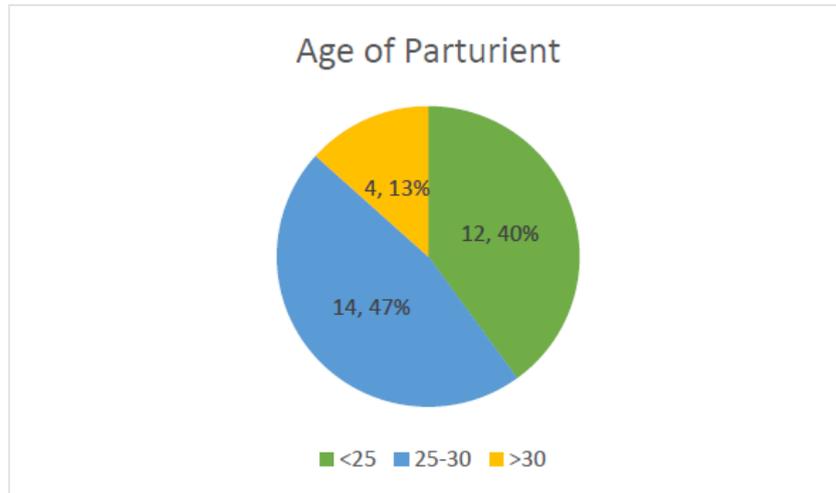


Figure 1

Table 1

Age in years	n	%
<25	12	40%
25-30	14	47%
>30	4	13%
Total	30	100%

Table 2 and figure 2 shows that maximum patients (13 patients ,43%) were diagnosed with oligoamnios at 30-34 weeks of gestation and 11 patients (37% )were diagnosed between 34-36 weeks and 6 patients (20%) between 28-30 weeks of gestation with the mean gestational age of the study at time of diagnosis of oligoamnios is 32.1 weeks.

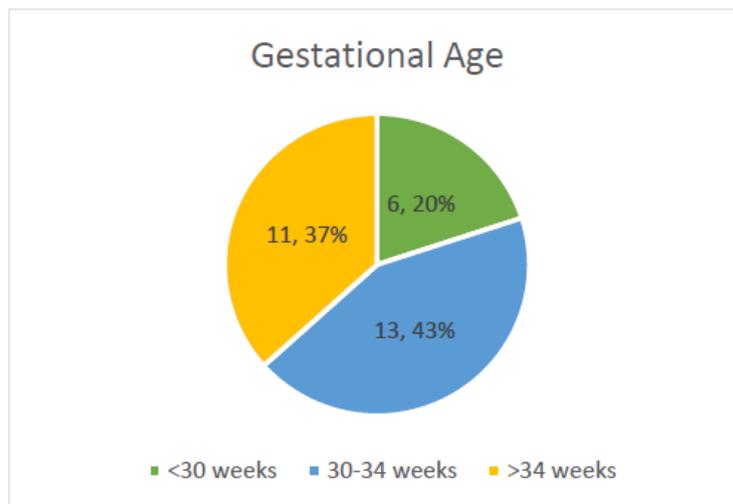


Figure 2

Table 2

Gestational Age	n	%
28-30 weeks	6	20%
30-34 weeks	13	43%
>34 weeks -36 weeks	11	37%
Total	30	100%

The oligoamnios patients were categorised into two groups based on AFI: severe oligoamnios (AFI <5) and borderline oligoamnios (AFI 5-8). In the study group 16 patients (53%) had borderline oligoamnios with their average AFI of 6.6 and 14 patients (47%) had severe oligoamnios with their average AFI of 4.6.

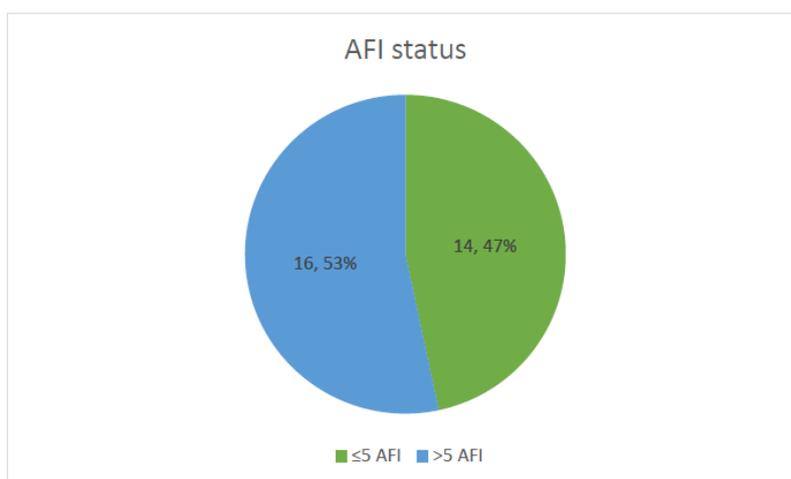


Figure 3

Table 3

AFI	AVERAGE AFI OF STUDY POPULATION
<=5 ( severe oligoamnios)	4.6
5.1 -8CM (borderline oligoamnios)	6.6

In the study Table 4 shows that out of 30 patients ,5 patients were lost in follow up after intervention and 25 patients were followed up till delivery.

Table 4

<b>TOTAL NUMBER OF CASES (ANTENATAL MOTHERS WITH OLIGOAMNIOS)</b>	<b>30</b>
NUMBER OF CASES LOST IN FOLLOW UP	<u>5 out of 30</u>
<b>NUMBER OF CASES FOLLOWED UP WITH AFI AFTER TREATMENT</b>	<b>25 OUT OF 30</b>
NUMBER OF CASES FOLLOWED TILL DELIVERY	22 OUT OF 30
NUMBER OF CASES IN FOLLOW UP BUT NOT DELIVERED YET	3

Among 25 patients who were followed up after intervention,23 patients (92%) showed improvement in AFI,whereas only 2 patients (8%) had no improvement in AFI.(Table 5 )

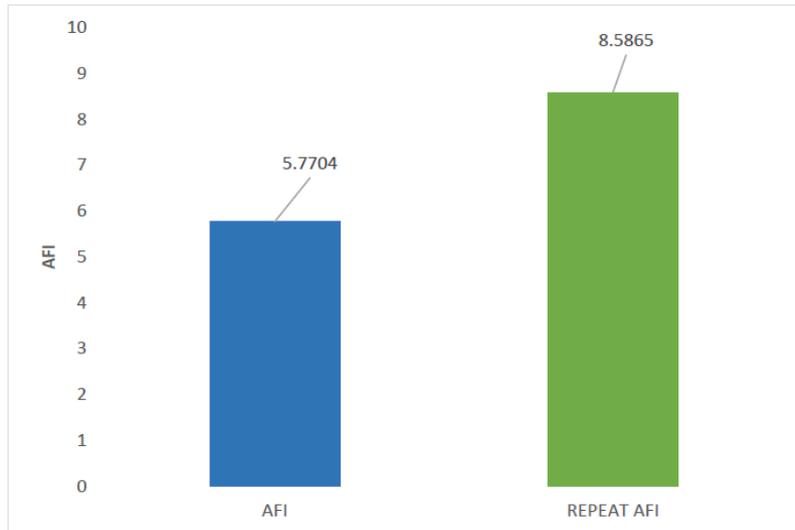
Table 5

IMPROVEMENT IN AFI	NUMBER OF PATIENTS
YES	23 (92 %)
No	2 (8%)

In the study initial mean±SD AFI was 5.77 1±.11 and repeat AFI after intervention was 8.58±1.75 with a mean difference of -2.81.The mean AFI has improved significantly after intervention with a p value of < 0.000

**Table 6**

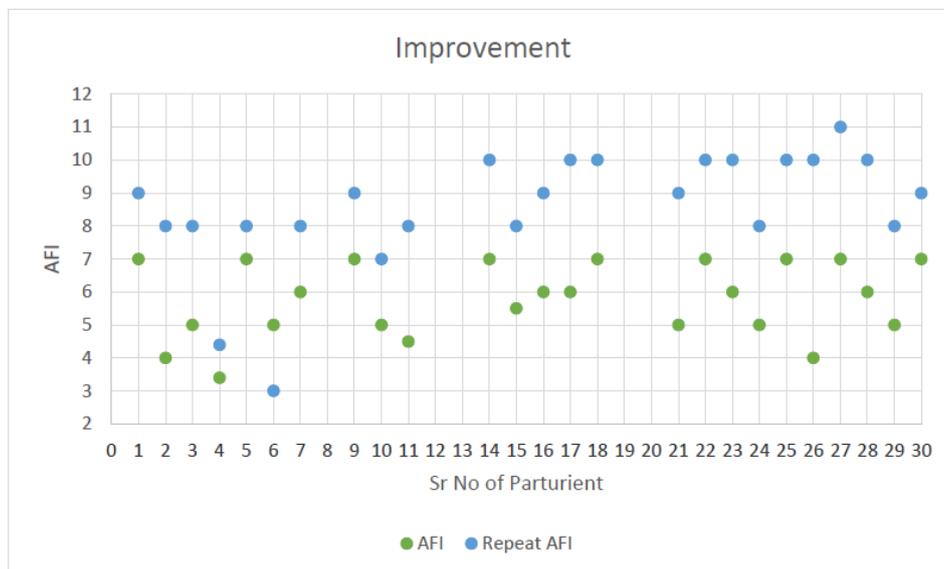
	Mean±SD	Mean Difference	p value
<b>AFI</b>	5.77±1.11	-2.81	<0.000
<b>REPEAT AFI</b>	8.58±1.75		



**Figure 4**

	AFI		After treatment		chi-square statistic	p-value
	n	%	n	%		
≤5 Oligomnios	14	47%	2	7%	21.83	<0.000
5.1-8 Borderline oligoamnio	16	53%	9	30%(AFI=8)		
>8 Normal			14	47%		
Lost of followup			5	17%		

**Table 7**



**Figure 5**

Table 7 and figure 5- shows that out of 14 patients with severe oligoamnios, only 2 patients had no improvement after intervention and remaining 12 patients had improved to normal levels or borderline levels. All the patients who fell into borderline group after intervention had an AFI of 8.

The patients with initial borderline group had normal levels of AFI after intervention. All our patients except for 2 had a final afi  $\geq 8$  after intervention.

From the above data collected, chi square analysis done and calculated p value is  $< 0.000$ , which is statistically significant. Hence intravenous hydration therapy and amino acid infusion is proven to improve AFI in cases of isolated oligoamnios.

**Table 8**

Maternal Outcome (mode of delivery)	N	%
LSCS	13	43%
NVD	12	40%
Lost of followup	5	17%

Table 8 shows that 43% had lscs, 40% had normal delivery and 5 patients were lost on follow up (17%). Out of 13 patients who underwent lscs, 3 underwent due to previous lscs, 1 was due to maternal request, 3 were non progress of labour, 1 was placenta previa, 2 were relative cpds and 2 due to non improvement of afi with severe oligoamnios and 1 was due to borderline oligoamnios with reduced fetal movements. The remaining 12 patients (40%) had normal vaginal delivery.

Out of 25 babies, 18 babies (72%) were delivered at term and 5 babies (20%) were delivered between 36 to 36.6 weeks and only 2 babies (8%) were delivered between 35-35.6 weeks with the mean gestational age at time of delivery of the study is 37 weeks. This is significant as the mean gestational age at diagnosis of oligoamnios in the study is 32.1 weeks. Therefore the intervention has helped in the prolonging the pregnancy by 4.6 weeks to deliver the baby at term.

**Table 9**

Maternal Outcome	n	%
$\geq 37$ WEEKS	18	72%
36 -36.6 WEEKS	5	20%
35-35.6 WEEKS	2	8%

NICU admissions

All the babies in the study had good apgar score and none had NICU admissions.

**Table 10**

	NUMBER OF BABIES
APGAR SCORE $\leq 7/10$	NIL (0%)
NICU ADMISSIONS	NIL (0%)
MEAN WEIGHT OF BABIES	2.75KG

### III. Discussion

The incidence of AFI ranging between 1-5%, 270 babies are delivered at SGRD charitable hospital in the year 2020 and out of which 30 mothers were diagnosed with oligoamnios. The mean age of the pregnant mothers in the study being  $26.4 \pm 1.357$ . Similar studies by Cicily T.J et al, mahnaz shahnazi et al, pragyashree et al were  $26.5 \pm 4.9$ ,  $23.81 \pm 4.49$ ,  $23.12 \pm 8.3$  years respectively. The mean gestational age at time of diagnosis of oligoamnios in this study was  $32.3 \pm 0.86$  weeks. Similar studies by Pragma Shree et al, Cicily TJ et al and Mahnaz shahnazi et al found that, the mean gestational age of diagnosis of oligoamnios were 30 weeks,  $35.2 \pm 7.9$  weeks, and (mean  $\pm$  SD) was  $37 \pm 0.78$  weeks respectively. The patients with isolated oligoamnios were managed with intravenous hydration of 1 litre 10% Dextrose and 200ml of amino acid infusion on alternate days for 1 week and reassessed AFI after 1 week. The results of this study has showed that this simple intervention has significantly improved AFI with mean difference of 2.81 and p value of  $< 0.000$  which is statistically significant.

Similarly Mahnaz shahnazi et al found a mean improvement of AFI of 1.55, a 32 % increase ,90 minutes after intravenous hydration therapy. Cicily T.J et al had mean improvement in AFI of 4cm after 5 days of 1 litre hydration treatment. In the Pragya shree et al study there was an average A.F.I gain of  $2.57 \pm 0.68$  cm after intravenous amino acid infusion which was significantly greater than those in the control group (  $t = 2.44$ ,  $p$  value  $<0.05$ ).

There are several studies where either intravenous hydration or intravenous amino acid infusion are studied for effectiveness in improvement of AFI. In this study we have studied the combined effectiveness of treatment of intravenous hydration and amino acid infusion in improvement of AFI. There are various theories regarding mechanism of action in the improvement of AFI with intravenous fluid infusion, mainly being changing the maternal plasma osmolality resulting in fetal diuresis thereby increasing the amniotic fluid volume. It also helps in improving placental perfusion. In 1995 Flack et al demonstrated maternal hydration affects amniotic fluid volume via increased transplacental passage rather than affecting fetal production. Studies have shown that human fetus can monitor acute changes in osmolality by increasing urine production to maintain its fluid homeostasis, hydration is associated with increase in mean uterine velocity. The intravenous amino acid infusion seems to improve the maternal nutrition and acts as a vasodilator thereby improving placental perfusion.

The other most significant finding in this study was, 72% of babies were delivered at term and 20% between 36-36.6 weeks with nil NICU admissions. Taking into consideration the mean age of diagnosis of oligoamnios in the study was 32.1 weeks, the intervention has therefore helped in prolonging the pregnancy by 4.6 weeks and the mean gestational age at delivery was 37 weeks.

Among the patients who underwent LSCs, none of them had meconium stained liquor or fetal distress as an indication for caesarean section which is seen commonly in patients with oligoamnios.

This study did not have a large sample size and was not a randomized control trial but in this retrospective study we have found that there is significant improvement in AFI with intravenous hydration and amino acid infusion and has prolonged the pregnancy safely which can be a boon for patients with oligoamnios, especially it being a cost-effective management affordable for all socioeconomic strata.

#### **IV. Conclusion**

We conclude from our study that simple cost effective intravenous maternal hydration and amino acid infusion over a week on alternate days in case of isolated oligoamnios with frequent assessment of AFI and fetal doppler can improve the AFI to normal levels and can prolong the pregnancy till term, reducing neonatal morbidity and having good perinatal outcomes. Under strict fetal surveillance, instead of delivering the baby at the time of diagnosis of isolated oligoamnios, the above intervention therapy suggested would give chance to the baby being born at term and to intervene for emergency delivery only if there is no improvement of AFI or there is fetal compromise. We recommend that intravenous hydration and amino acid infusion therapy should be offered to pregnant women with isolated oligoamnios as it is safe, day care affordable management and it prevents preterm births, NICU admissions, preterm neonatal morbidity and saves the parents from emotional and financial burdens that comes with preterm births.

Fundings : No funding sources

Conflict of interest : None declared

Ethical approval : The study was approved by the institutional Ethics committee

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