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INCREASE IN AMNIOTIC FLUID INDEX (AFI) AND EFBW OF PATIENTS OF OLIGOHYDRAMNIOS TREATED WITH PANAMIN G

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Abstract

Background: *Oligohydramnios, characterized by low amniotic fluid, poses risks to maternal and fetal health. Conventional IV hydration has limited effectiveness in improving outcomes. Emerging treatments like IV Panamin G show promise in increasing Amniotic Fluid Index (AFI) and Estimated Fetal Body Weight (EFBW). This study was conducted in a local population to evaluate Panamin G's impact amidst existing literature controversy.*

Objective: *To compare amniotic fluid index (AFI) and EFBW in patients with oligohydramnios treated with IV amino acid infusion (Panamin G) versus IV hydration.*

Duration: *16-11-2024 to 15-03-2025.*

Methodology: *After the approval of the Ethical Committee at Ghurki Trust Teaching Hospital, pregnant women with oligohydramnios were enrolled in the study after informed consent. A detailed history and physical examination were conducted. A total of 140 patients were divided into two groups, with Group A receiving IV amino acid infusion and Group B receiving IV hydration. Study variables were recorded after two weeks. Data analysis was performed using SPSS version 26.0.*

Results: *The study included 140 patients with a mean age of 28.05 ± 3.93 years and a mean gestational age of 30.21 ± 2.56 weeks. Group A had a mean AFI of 3.83 ± 0.53 cm at admission, while Group B had 3.80 ± 0.51 cm. After two weeks, Group A's AFI improved to 6.94 ± 0.62 cm, while Group B's increased to 5.92 ± 0.60 cm. Group A showed a higher increase in both AFI and EFBW (341.09 ± 81.44 g) compared to Group B (265.69 ± 55.84 g). Fetal distress was observed in 12.9% of Group A and 20% of Group B.*

Conclusion: *Both groups showed significant within-group improvements in Amniotic Fluid Index (AFI) and Estimated Fetal Body Weight (EFBW) after two weeks. However, Group A demonstrated significantly greater improvements compared to Group B. Fetal distress rates were similar. Subgroup analysis further confirmed the superior efficacy of Group A in treating oligohydramnios.*

INTRODUCTION

Pregnancy is a unique and transformative experience for every woman. One of the essential aspects of a healthy pregnancy is maintaining adequate amniotic fluid volume, which plays a vital role in the normal

growth and development of the fetus.[1] Amniotic fluid, which surrounds the fetus in the amniotic sac, supports its movement, protects it from external pressure, and aids in lung development.[2] Despite extensive research, the regulation of amniotic fluid volume remains incompletely understood.[3]

Oligohydramnios, a condition characterized by reduced amniotic fluid, is often a sign of fetal distress and is associated with poor pregnancy outcomes such as intrauterine growth restriction (IUGR), fetal malpresentation, and post-maturity syndrome.[4,5] Even a moderate decrease in amniotic fluid can result in abnormal fetal heart rate patterns, meconium-stained amniotic fluid, and the need for cesarean delivery, increasing the risk of perinatal morbidity and mortality.[5]

The causes of oligohydramnios are diverse, often indicating underlying fetal abnormalities or maternal health issues.[6] The severity of oligohydramnios typically correlates with placental hypoperfusion and IUGR, with decreased urinary output being a common factor in IUGR pregnancies.[7] Hormones such as cortisol, antidiuretic hormone (ADH), and prolactin play roles in amniotic fluid regulation, while maternal plasma volume also significantly impacts fluid volume. A reduction in plasma volume tends to result in oligohydramnios, whereas an increase can lead to polyhydramnios.[8] As pregnancy progresses, amniotic fluid volume increases until around 32 weeks, after which it stabilizes and begins to decrease at 40 weeks, averaging only 400 mL by 42 weeks.[9,10]

Shinde et al.[10] compared IV amino acid infusion with IV hydration in women with oligohydramnios and found significantly higher AFI in the amino acid group (7.52±2.04 vs. 5.89±2.20; p=0.0001) and higher fetal weight (2000.19±376.70 vs. 1810.80±421.05; p=0.017) at 2 weeks. Similarly, Habib et al.[11] reported higher AFI (6.82±0.62 vs. 4.79±0.65; p=0.001). These findings suggest that IV amino acids may offer a more effective treatment for oligohydramnios than traditional methods.

However, while the evidence supporting IV amino acids is promising, it remains limited, and further research is needed to provide conclusive recommendations. This study was thus conducted in the local population to evaluate the effectiveness of IV amino acids in managing oligohydramnios. The results could help gynecologists adopt more effective treatments, ultimately improving maternal and fetal outcomes and reducing complications.

METHODOLOGY

This randomized control trial was conducted at the Department of Obstetrics & Gynaecology, Ghurki Trust Teaching Hospital, over four months following synopsis approval. The sample size was calculated to be 140 cases (70 in each group) with 80% power and a 5% significance level, based on expected EFBW 2000.19±367.7 vs. 1810.8±421.05 for IV amino acid infusion and IV hydration therapy, respectively.[10] Non-probability consecutive sampling was used, and participants were pregnant women between 24-34 weeks of gestation with a singleton pregnancy, an Amniotic Fluid Index (AFI) of <8 cm, intact membranes, and no labor pains. Exclusion criteria included fetal malformations, ruptured membranes, and associated fetal anomalies. Oligohydramnios was defined as a condition in which the Amniotic Fluid Index (AFI) was ≤5 cm in pregnant women. AFI was measured by evaluating the largest vertical pocket of amniotic fluid in each abdominal quadrant via transabdominal ultrasound, with the sum of these values representing the AFI in centimeters, assessed after two weeks of treatment. Estimated Fetal Body Weight (EFBW) was calculated using the Hadlock formula: EFBW = 10 x BPD (cm) + 3.26 x AC (cm) - 0.00326 x AC (cm) x FL (cm), where BPD was Biparietal Diameter, AC was Abdominal Circumference, and FL was Femur Length, with EFBW assessed after two weeks of treatment.

After ethical approval, informed consent was obtained from 140 women diagnosed with oligohydramnios. These women were divided into two groups: Group A (IV amino acid infusion) and Group B (IV hydration) using lottery method. Group A received 200 ml of amino acid IV infusion three times a week for two weeks, preceded by 500 ml of dextrose 5% solution. Group B received alternating IV fluids, including dextrose 10% and Ringer lactate, for the same duration. Post-treatment data on AFI and EFBW were collected by a senior consultant and recorded by a resident to minimize bias. SPSS version 26 was used for data analysis. Numerical variables (age, gestational age, AFI, and EFBW) were presented as mean ± SD, while categorical variables (fetal distress) were presented as frequency and percentage. Independent

and paired t-tests were used to compare the mean AFI and EFBW changes between and within groups, respectively, with significance set at $p \leq 0.05$. To control for potential effect modifiers, the mean change in AFI, EFBW, as well as the mean AFI and mean EFBW, were stratified by age and gestational age. Independent sample t test was then applied after stratification to assess the differences.

RESULTS

The study included a total of 140 patients, with a mean age of 28.05 ± 3.93 years. The majority of participants were between 18 and 30 years of age (65.0%, n=91), while 35.0% (n=49) were between 31 and 40 years old. The mean gestational age at admission was 30.21 ± 2.56 weeks, with the following distribution: 19.3% (n=27) were classified as very preterm (<25 weeks), 43.6% (n=61) were preterm (28-31 weeks), and 37.1% (n=52) were considered moderate to late preterm (32-36 weeks). The mean Amniotic Fluid Index (AFI) at admission was 3.82 ± 0.52 cm, and the mean Estimated Fetal Body Weight (EFBW) at admission was 1607.30 ± 79.85 grams. Data is given in Table 1.0. Both the groups were statistically comparable at baseline (p-value>0.05) as given in Table 2.0.

In Group A (n=70), the mean Amniotic Fluid Index (AFI) at admission was 3.83 ± 0.53 cm, and in Group B (n=70), it was 3.80 ± 0.51 cm (p = 0.787). After two weeks, Group A's AFI increased to 6.94 ± 0.62 cm, while Group B's AFI increased to 5.92 ± 0.60 cm (p = 0.000). The mean change in AFI was 3.12 ± 0.24 cm for Group A and 2.11 ± 0.25 cm for Group B (p = 0.000). Both groups showed significant within-group improvements (p= 0.000). For Estimated Fetal Body Weight (EFBW), at admission, Group A had a mean of 1600.04 ± 71.23 g, and Group B had 1614.56 ± 87.55 g (p = 0.284). After two weeks, Group A's EFBW increased to 1941.13 ± 108.67 g, and Group B's increased to 1879.53 ± 100.12 g (p = 0.000). The mean change in EFBW was 341.09 ± 81.44 g for Group A and 265.69 ± 55.84 g for Group B (p = 0.000), with significant within-group changes (p = 0.000). Data is given in Table 3.0. In terms of fetal distress, 12.9% (n=9) of patients in Group A (n=70) experienced fetal distress, compared to 20.0% (n=14) in Group B (n=70) as shown in Table 4.0.

Stratification of AFI and EFBW at 2 weeks and mean change on the basis of age and gestational age produced similar efficacy of group A over group B in majority of the sub groups except a few which may however be associated with small sample size, as given in Table 5.0 to 8.0.

Table 1.0: Demographic Characteristics of Women Suffering from Oligohydramnios

Characteristics	Total (n=140)
Age (years)	28.05±3.93
• 18-30 years	91 (65.0%)
• 31-40 years	49 (35.0%)
Gestational Age (weeks)	30.21±2.56
• Very Preterm (<25 weeks)	27 (19.3%)
• Preterm (28-31 weeks)	61 (43.6%)
• Moderate to Late Preterm (32-36 weeks)	52 (37.1%)
AFI at Admission (cm)	3.82±0.52
EFBW at Admission (g)	1607.30±79.85

Table 2.0: Comparison of Baseline Characteristics between the Groups

Characteristics	Group A (n=70)	Group B (n=70)	p-value
Age (years)	27.81±3.85	28.29±4.01	0.479
• 18-30 years	47 (67.1%)	44 (62.9%)	0.595
• 31-40 years	23 (32.9%)	26 (37.1%)	
Gestational Age (weeks)			
• Very Preterm	13 (18.6%)	14 (20.0%)	0.566
• Preterm	28 (40.0%)	33 (47.1%)	

• Moderate to Late Preterm	29 (41.4%)	23 (32.9%)	
AFI at Admission (cm)	30.40±2.63	30.03±2.49	0.392
EFBW at Admission (g)	1600.04±71.23	1614.56±87.55	0.284

Chi Square test/ Independent sample t test, taking p-value≤0.05 as significant.

Table 3 .0: Comparison of Study Mean AFI and EFBW at Different Times Intervals

Study Variable	Group A (n=70)	Group B (n=70)	p-value
AFI (cm)			
• At Admission	3.83±0.53	3.80±0.51	0.787*
• At 2 Weeks	6.94±0.62	5.92±0.60	0.000*
• Mean Change	3.12±0.24	2.11±0.25	0.000*
• AFI at admission vs. at 2 weeks within each group	0.000**	0.000**	-
EFBW (g)			
• At Admission	1600.04±71.23	1614.56±87.55	0.284*
• At 2 Weeks	1941.13±108.67	1879.53±100.12	0.000*
• Mean Change	341.09±81.44	265.69±55.84	0.000*
• EFBW at admission vs. at 2 weeks within each group	0.000**	0.000**	-

*Independent Sample t test, ** Paired Sample t test, taking p-value≤0.05 as significant.

Table 4 .0: Comparison of Frequency of Fetal Distress between the Groups

Fetal Distress	Group A (n=70)	Group B (n=70)	P-value
• Yes	9 (12.9%)	14 (20.0%)	0.254
• No	61 (87.1%)	56 (80.0%)	

Chi Square test, taking p-value≤0.05 as significant.

Table 5 .0: Stratification of Mean AFI and EFBW at 2 Weeks and Comparison of Mean Change for Age

Age Groups	Interval	SG	N	Mean	Std. Deviation	p-value
18-30 years	AFI_2Weeks	Group A	47	6.955	0.65	0.000
		Group B	44	5.950	0.58	
	Mean Change	Group A	47	3.109	0.24	0.000
		Group B	44	2.125	0.25	
31-40 years	AFI_2Weeks	Group A	23	6.922	0.57	0.000
		Group B	26	5.858	0.62	
	Mean Change	Group A	23	3.135	0.24	0.000
		Group B	26	2.081	0.25	

Independent Sample t test taking p-value≤0.05 as significant.

Table 6 .0: Stratification of Mean EFBW at 2 Weeks and Comparison of Mean Change for Age

Age Groups	Interval	SG	N	Mean	Std. Deviation	p-value
18-30 years	EFBW_2Weeks	Group A	47	1943.98	110.72	0.002
		Group B	44	1870.95	110.11	
	Mean Change	Group A	47	347.74	81.63	0.000
		Group B	44	268.23	56.40	
31-40 years	EFBW_2Weeks	Group A	23	1935.30	106.56	0.130
		Group B	26	1894.04	80.41	
	Mean Change	Group A	23	327.48	81.12	0.002

		Group B	26	261.38	55.72	

Independent Sample t test taking p-value≤0.05 as significant.

Table 7 .0: Stratification of Mean AFI at 2 Weeks and Comparison of Mean Change for Gestational Age

Gestational Age	Interval	SG	N	Mean	Std. Deviation	p-value
Very Preterm (<28 weeks)	AFI_2Weeks	Group A	13	7.05	0.67	0.000
		Group B	14	5.86	0.72	
	Mean Change	Group A	13	3.08	0.29	0.000
		Group B	14	2.11	0.28	
Preterm (28-31 weeks)	AFI_2Weeks	Group A	28	6.97	0.55	0.00
		Group B	33	5.97	0.56	
	Mean Change	Group A	28	3.11	0.22	0.00
		Group B	33	2.13	0.22	
Moderate to Late Preterm (32-36 weeks)	AFI_2Weeks	Group A	29	6.87	0.67	0.000
		Group B	23	5.86	0.59	
	Mean Change	Group A	29	3.13	0.24	0.00
		Group B	23	2.07	0.28	

Independent Sample t test, taking p-value≤0.05 as significant.

Table 8 .0: Stratification of Mean EFBW at 2 Weeks and Comparison of Mean Change for Gestational Age

Gestational Age	Interval	SG	N	Mean	Std. Deviation	p-value
Very Preterm (<28 weeks)	EFBW 2Weeks	Group A	13	1848.54	96.77	0.073
		Group B	14	1790.21	62.71	
	Mean Change	Group A	13	337.23	98.36	0.029
		Group B	14	264.93	60.81	
Preterm (28-31 weeks)	EFBW 2Weeks	Group A	28	1900.21	71.24	0.168
		Group B	33	1879.00	46.42	
	Mean Change	Group A	28	341.32	75.07	0.000
		Group B	33	266.82	50.40	
Moderate to Late Preterm (32-36 weeks)	EFBW 2Weeks	Group A	29	2022.14	87.98	0.006
		Group B	23	1934.65	133.14	
	Mean Change	Group A	29	342.59	82.17	0.000
		Group B	23	264.52	62.41	

Independent Sample t test, taking p-value≤0.05 as significant.

DISCUSSION

Oligohydramnios, characterized by low amniotic fluid, poses significant risks to both maternal and fetal health, often leading to complications such as preterm labor and fetal distress.[12,13] Conventional treatment typically involves IV hydration to increase amniotic fluid levels; however, this approach has shown limited efficacy in improving fetal outcomes.[12,14] Emerging treatments, such as IV Panamin G, have shown promise in enhancing both Amniotic Fluid Index (AFI) and Estimated Fetal Body Weight (EFBW).[9,10] Despite encouraging results, there is controversy in existing literature regarding its effectiveness.[10,11] To address this gap, this study was conducted in the local population to assess the impact of Panamin G on oligohydramnios.

Mean age of the patients in this study was 28.05 ± 3.93 years. Previously mean age reported by similar studies was 24.11±4.23 years by Shinde et al.,[10] 28.5±4.6 years by Habib et al.,[11] 32.2±3.1 years by Afzal et al.,[15] 27.33±3.87 years by Kiran et al.[16] and as low as 23.12±8.3 years by Shree et al.[17] However this

difference in mean age may be associated with inclusion criteria of each study.

In this study, mean gestational age at admission was 30.21±2.56 weeks which are quite close to mean age of 31.4±2.10 weeks reported by Afzal et al.[18] However, Shinde et al.[10] and Javaid et al.[18] reported a little higher gestational age of 32.73±2.21 weeks and 32.9±3.8 weeks at admission, respectively.

In our study, the mean Amniotic Fluid Index (AFI) at admission was 3.82 ± 0.52 cm, and the mean Estimated Fetal Body Weight (EFBW) at admission was 1607.30 ± 79.85 grams. AFI at admission was reported differently by various studies as 4.93±2.03 cm by Shinde et al.,[10] 3.78±0.56 cm by Habib et al. (2020),[11] 5.1±1.35 cm by Afzal et al.[15] and 5.56±2.23 cm by Shree et al.[17] As regards EFBW at admission, Shinde et al. reported it 1661.46±361.85 g in their study.[10]

In this study, after two weeks, Group A's AFI increased to 6.94 ± 0.62 cm, while Group B's AFI rose to 5.92 ± 0.60 cm (p = 0.000). The mean change in AFI was 3.12 ± 0.24 cm for Group A and 2.11±0.25 cm for Group B (p = 0.000), with significant within-group improvements for both groups (p = 0.000). Our findings are similar to results of Shinde et al.[10] where mean AFI after two weeks was 7.52±2.04 vs. 5.89±2.20 cm; p-value<0.001 between group A and B respectively. Habib et al.[11] reproved significantly higher mean change in AFI as 3.09±0.70 vs. 1.00±0.31 cm; p-value<0.001, between the groups A and B, respectively. Likewise, mean change was significantly higher in Group A than group B as reported by Shree et al. (2.57±.68 vs. 2.13±0.86; p-value<0.05). However, insignificantly higher mean AFI in group A than group B was reported by Kiran et al.[16] as 5.68±.49 vs. 5.53±0.96 cm; p-value=0.503.

At admission, the mean Estimated Fetal Body Weight (EFBW) was 1600.04 ± 71.23 g in Group A and 1614.56 ± 87.55 g in Group B (p = 0.284). After two weeks, Group A's EFBW increased to 1941.13 ± 108.67 g, while Group B's increased to 1879.53 ± 100.12 g (p = 0.000). The mean change in EFBW was 341.09 ± 81.44 g for Group A and 265.69 ± 55.84 g for Group B (p = 0.000). Both groups showed significant within-group improvements (p = 0.000). Our findings are similar to results of Shinde et al. where mean EFBW after treatment was significantly higher in group A than group B as 2000.19±376.70 vs. 1810.80±421.05g; p-value=0.017. Significantly higher mean change in EFBW was reported by Shree et al. 150±37.8 vs. 82.14±67.1g; p-value<0.001.[17]

Regarding fetal distress, 12.9% (n=9) of patients in Group A (n=70) experienced fetal distress, compared to 20.0% (n=14) in Group B (n=70). Stratification of AFI, EFBW at 2 weeks, and mean changes by age and gestational age showed similar efficacy of Group A over Group B in all subgroups, except one, which may be influenced by small sample size.

CONCLUSION

The study concluded that intravenous amino acid infusion was more effective than intravenous hydration in improving amniotic fluid levels and estimated fetal weight over a two-week period. The amino acid group also experienced fewer cases of fetal distress. These benefits were observed consistently across most age and gestational age subgroups, indicating the potential of amino acid infusion as a more effective therapeutic option.

LIMITATIONS & RECOMMENDATIONS

The study's strength lies in its comparison of IV amino acid infusion with IV hydration in women with oligohydramnios, demonstrating significant improvements in both AFI and EFBW in the amino acid group. Limitations include the small sample size and its restriction to a single center. Future research should include larger, multicenter trials to confirm these findings and explore long-term fetal outcomes. Further studies can also investigate the optimal dosage and timing of treatments.

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Authors Contribution

Author 1

Substantial contributions to study design, acquisition of data
Analysis & Interpretation of Data, Manuscript writing
Has given final approval of the version to be published
Agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved

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Has given final approval of the version to be published
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