Original Article

The Effect of Intravenous and Oral Fluid Therapy on Women with Third Trimester Oligohydramnios of Pregnancy and the Fetus

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Abstract

Background & Objective: Adequate amniotic fluid volume is one of the most important aspects of fetal health and Oligohydramnios refers to amniotic fluid volume that is less than expected for gestational age. The aim of this study was to compare the trend of amniotic fluid changes in the two groups of oral and injectable before and after fluid therapy.

Materials & Methods: In the present study, pregnant women with oligohydramnios in the third trimester referring to Amir Al-Momenin Hospital (Zabol, 2019) were randomly divided into two groups of case. The first group received oral water and the second group was treated with serum therapy. Eventually, all patients underwent ultrasonography and their AFI was recalculated and compared. Data was analyzed using SPSS 20 statistical software.

Results: The results of the study showed that there was no statistically significant difference between the amniotic fluid index before fluid therapy in the oral and injectable (serum therapy) groups ($p = 0.426$). After fluid therapy, the amniotic fluid index in the oral group was significantly higher than the injected group ($p <0.001$).

Although in both oral and injectable groups, the amniotic fluid index increased significantly after treatment ($p <0.001$), the increase in the oral group was significantly higher than the injectable group.

Conclusion: The results of this study showed that oral and intravenous fluid therapy improves the amniotic fluid index more than injectable fluid therapy.

Keywords: Amniotic Fluid Index, Intravenous Hydration, Isolated Oligohydramnios, Oral Hydration

Introduction

Amniotic Fluid is a complex of necessary and essential substances for the complete development of intrauterine life. Alterations in amniotic fluid volume may reflect a problem in fluid production or circulation which occurs in the presence of a fetal abnormality or maternal factors. Both its marked decrease (Oligohydramnios) and the exaggerated increase (polyhydramnios) are accompanied by an increased risk of an adverse perinatal outcome.

Examination of amniotic fluid volume has become an integral part of routine and diagnostic ultrasound in maternal fetal medicine. Taking into account that maximum vertical pocket (MVP) is the best method for evaluating amniotic fluid, we will make the definitions: Oligohydramnios: the MVP does not exceed 2 cm in pregnancy and polyhydramnios: greater

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vertical pocket is equal to or greater than 8 cm before 20 weeks and greater than 10 cm thereafter. Ultrasonography allows us to evaluate it easily to achieve adequate perinatal management, thus avoiding adverse perinatal results (1).

Amniotic fluid (AF) is maintained in a dynamic equilibrium and its volume is derived from the sum of inflow (from fetal urine and lung fluid) and outflow (fetal swallowing and intramembranous absorption) of fluid from the amniotic space (2, 3).

Oligohydramnios is defined as decreased amniotic fluid volume (AFV) for gestational age. The volume of amniotic fluid changes over gestation, increasing linearly until 34 to 36 weeks' gestation, at which point the AFV levels off (approximately 400mL) and remains constant until term (4). To calculate the amniotic fluid index (AFI), the anteroposterior diameters of the largest empty fluid pocket (no umbilical cord or fetal parts) in each quadrant are added together and are better than the deepest liquid package method (5,6). Normal amniotic fluid volume (AFV) changes with gestational age and ways of accurate estimation. Too little amniotic fluid (AF) represents oligohydramnios.

Moreover, oligohydramnios has been defined as follows: AFV is less than 500 ml at 32–36 weeks of gestation or maximum vertical pocket is less than 2 cm from late mid-trimester or AFI is less than 5 cm or less than the 5th percentile, from late mid-trimester (7, 8).

Low amniotic fluid volumes can be the result of numerous maternal, fetal, or placental complications and can lead to poor fetal outcomes. This activity will highlight the pathophysiology, etiology, evaluation, and treatment of oligohydramnios, and review the role of healthcare teams in the assessment and management of this condition (9-11). Oligohydramnios impede normal fetal movement, retarded fetal growth and development leading towards fetal deformities, umbilical cord compression, while in some cases death may happen depending on gestational age (12). In a study of women with oligohydramnios, it was found that maternal oral fluid therapy could increase amniotic fluid volume. The mechanism of this action is by decreasing the osmolality of the mother's plasma, which increases the amniotic fluid index (13, 14).

One of the non-invasive methods for amniotic fluid augmentation is oral and intravenous fluid therapy (15). In recent decades, a number of ultrasound methods have been used to measure amniotic fluid, including the vertical cleansing technique, amniotic fluid index, and theoretical estimation.

Since oligohydramnios is important in pregnant women and studies have been limited, therefore, the purpose of this study was to determine the effect of oral and intravenous liquid therapy on the amniotic fluid index in pregnant women in Sistan region.

The aim of this study was to compare the trend of amniotic fluid changes in the two groups of oral and injectable before and after fluid therapy.

Material & Methods

This interventional study was performed in 2018 in pregnant women with third trimester oligohydramnios referring to Amir Al-Momenin Hospital, Zabol and ultrasound and amniotic fluid index (AFI) were less than 5. Based on ultrasound, women with pregnancy poisoning, mothers with fetuses with congenital defects and mothers with premature rupture were excluded from the study.

Accurate history was taken from 100 mothers with oligohydramnios (mean age 35 years). After determining the exact gestational age (gestational age <35 weeks) and rejecting rupture, and clinical examination with speculum and nitrazine test, ultrasound and measurement of amniotic fluid index, patients were randomly selected, one group received oral water treatment and the second group underwent serum therapy. In the first group, an ultrasound was performed 2 hours after consuming 2 liters of drinking water.

In the second group, ultrasound was performed after 1hour injection of injected hypotonic fluid (5% dextrose serum). Also, it has been equalized in terms of the number of pregnancies. First, the possible advantages and disadvantages of the research were clearly explained. Certain factors may be involved in amniotic fluid volume.

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Mothers with kidney disease, diabetes, or congenital malformations were excluded from our study because these conditions could interfere with the volume of amniotic fluid. Diabetes and kidney disease also cause changes in plasma and maternal and fetal osmolality. Congenital fetal abnormalities can also alter the production or absorption of amniotic fluid. An important point in our study is the use of Sonographer at the beginning and the end of the study to determine the amniotic fluid index. Therefore, the relevant error is reduced as possible.

Written informed consent was obtained from all patients. The data obtained from the questionnaire were entered into the SPSS statistical software. Mean and standard deviation to describe quantitative data and the number and percentage to qualitative data were used. Independent t-test was used to determine the differences between the variables and One-way analysis of variance (ANOVA) to evaluate the differences between more than two groups. Chi-square test ($\chi 2$) was used to analyze the qualitative variables. For all tests, a statistically significant level of 0.05 was considered.

This study received the financial support of Zabol University, Iran with the code IR.ZBMU.REC.1400.132.

Result

In the present study, (75.8%), (50 people) of pregnant women participating in the study were 35 years old (and older) and (24.2%), (50 people) less than 35 years old. The frequency of mothers with body mass index above 19.8 was 33 people, (the most frequent), and body mass 19.8 - 26.1, 27 people, and body mass 26.1-29.9, 6 people.

The number of mothers with oligohydramnios who had a history of chronic underlying disease were 9 people and the rest of the pregnant women studied had no history of underlying chronic disease.

The number of mothers with oligohydramnios who had a history of diabetes mellitus disease was 7 people (10.6%) and the rest of the pregnant women studied had no history of diabetes mellitus disease.

The number of mothers with oligohydramnios who had a history of preeclampsia was 8 people (12.1%) and the rest of the pregnant women studied had no history preeclampsia.

Table 1. Comparison of amniotic fluid index trends in oral and injectable groups before and after fluid therapy

Type of fluid therapy	Before Mean (distance between quarters)	After Mean (distance between quarters)	P value	Mean difference Mean (standard deviation)	P value
Oral	4 (3.7- 4.2)	6(6- 6.4)	<0.001	2.1(0.5)	
IV	4(3.9- 4.5)	5.5(5.4- 6)	<0.001	1.5(0.3)	<0.001
P value	0.426	<0.001	-	-	

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As can be observed in the table above and the graphs below, the mean amniotic fluid index before fluid therapy was not significantly different between the oral and injectable groups (p = 0.426). After fluid therapy, the amniotic fluid index in the oral group was significantly higher than the injected group (p <0.001).

Although in both oral and injectable groups, the amniotic fluid index increased significantly after treatment (p <0.001), the rate of increase in the oral group was significantly higher than the injectable group.

Therefore, it is concluded that oral fluid therapy improves amniotic fluid index compared to injectable fluid therapy (Table1).

Table 2. Frequency of neonatal Apgar scores in the two groups (oral and injectable fluid therapy)

Apgar		Type of treatment		P value
		oral group	IV group	
9-10	Frequency	27	27	>0.99
	%	81.8%	81.8%	
8-9	Frequency	5	6	
	%	15.2%	18.2%	
7-8	Frequency	1	0	
	%	3.0%	0.0%	

As can be seen in the table2, the frequency of Apgar (less than 7) in the oral group was 3% and in the injectable group 0%. This difference was not statistically significant in the two groups (p> 0.99). Therefore, the type of fluid therapy had no effect on the infant Apgar score.

Table 3. Determining the frequency of maternal hospitalization in two groups of fluid therapy (oral and injectable) in mothers with oligohydramnios

Infant hospitalization in NICU		Group		P value
		oral Group	IV Group	
Yes	Frequency	4	6	0.492
	%	12.1%	18.2%	
No	Frequency	29	27	
	%	87.9%	81.8%	

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As can be seen in the table 3, the frequency of infant hospitalization in the NICU in the oral group was 12.1% and in the injectable group 18.2%. This difference was not statistically significant in the two groups (p= 0.49). Therefore, the type of fluid therapy had no effect on the infant hospitalization in NICU.

Table 4. Determining the frequency of types of neonatal consequences in two groups of fluid therapy (oral and injectable) in mothers with oligohydramnios

neonatal consequences		Group		P value
		Oral Group	IV Group	
neg*	Frequency	20	18	0.988
	%	60.6%	54.5%	
icter**	Frequency	7	7	
	%	21.2%	21.2%	
RDS***	Frequency	2	2	
	%	6.1%	6.1%	
seizer	Frequency	3	3	
	%	9.1%	9.1%	
hypoxia	Frequency	1	2	
	%	3.0%	6.1%	
other	Frequency	0	1	
	%	0.0%	3.0%	

* negative
** icterus
***Respiratory distress syndrome

As can be seen in the table 4, the frequency of Absence of neonatal consequences in the oral group was 60.6% and in the injectable group 54.5%. This difference was not statistically significant in the two groups (p= 0.988). Therefore, the type of fluid therapy had no effect in the absence of neonatal consequences.

Table 5. Determining the frequency of Types of maternal consequences in two groups of fluid therapy (oral and injectable) in mothers with oligohydramnios

Maternal consequences		Group		P value
		oral group	IV group	
neg	Frequency	20	20	0.761
	%	60.6%	60.6%	
Pph*	Frequency	3	5	
	%	9.1%	15.2%	
twin	Frequency	6	3	
	%	18.2%	9.1%	
bleeding	Frequency	3	3	
	%	9.1%	9.1%	
other	Frequency	1	2	
	%	3.0%	6.1%	

*postpartum hemorrhage

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As can be seen in the Table5, the frequency of Absence of maternal consequences in the oral group was 60.6% and in the injectable group 60.6%. This difference was not statistically significant in the two groups (p= 0.761). Therefore, the type of fluid therapy had no effect in the absence of maternal consequences.

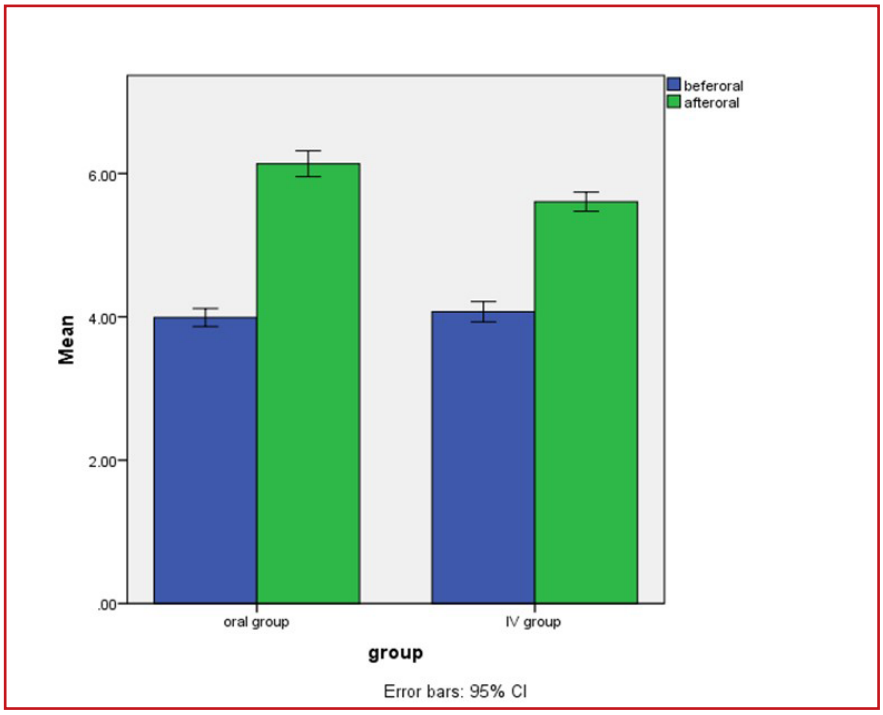


Chart 1. Comparison of the amniotic fluid changes in the two groups of oral and injectable before and after fluid therapy

As can be seen from the Chart 1 above, Chart 1 has suggested that oral and intravenous hydration can increase the amniotic fluid index. In comparison, oral hydration is more effective than intravenous hydration in patients with 3rd trimester oligohydramnios.

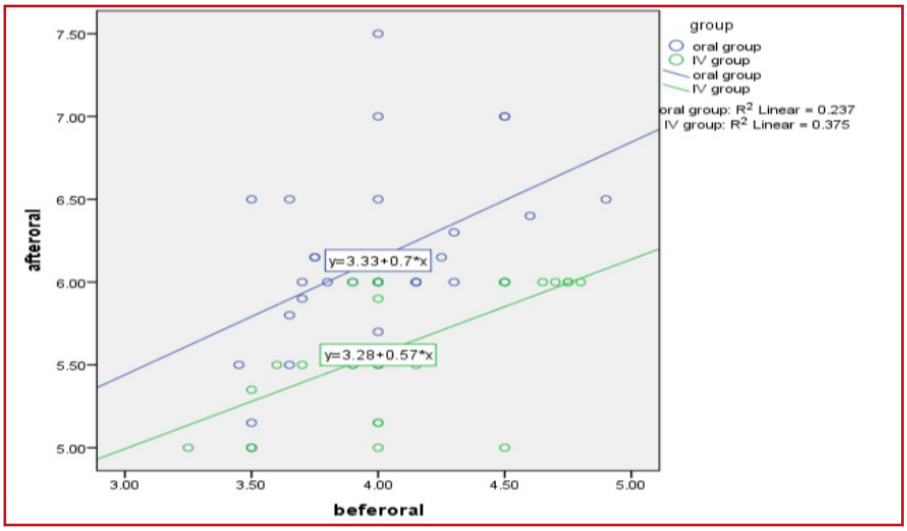


Figure 1. Comparison of the amniotic fluid changes in the two groups of oral and injectable before and after fluid therapy

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As can be seen from the figure1 above, the chart has suggested that oral and intravenous hydration can increase the amniotic fluid index. When we compared amniotic fluid index after hydration it was recorded as 3.33 ± 0.7 in Group – oral and 57 ± 3.28 in Group – intravenous, but in comparison, oral hydration is more effective than intravenous hydration in patients with 3rd trimester oligohydramnios.

Discussion

The results of the present study showed that the amniotic fluid index before fluid therapy was not statistically significantly different between the oral and injectable groups. After fluid therapy, the amniotic fluid index in the oral group was significantly higher than the injected group. Although in both oral and injectable groups, the amniotic fluid index increased significantly after treatment, the rate of increase in the oral group was significantly higher than the injectable group. Therefore, it is concluded that oral fluid therapy improves amniotic fluid index more than injectable fluid therapy.

Borna and colleague in a clinical study (2022, Tehran) showed that the results of this study disclosed that AFI in the third trimester of pregnancy was not significantly correlated with lung-to-head ratio (LHR). Therefore, it seems that normal AFI alone in low-risk pregnancies does not predict normal fetal lung volume in the third trimester of pregnancy. Future studies are recommended to examine the relationship of AFI with lung volume in high-risk pregnancies in the third trimester of pregnancy (16).

Pregnancies with diabetes had increased rates of oligohydramnios and polyhydramnios as well as increased gestational age-specific amniotic fluid volumes between 28 and 36 weeks. A higher prevalence of polyhydramnios was observed using DVP as compared to AFI; nevertheless, associations were similar using either method (17).

In the study of Azarkish and colleagues, in 2022 by investigating the effect of maternal hydration on the amniotic fluid index in oligohydramnios, they showed that forty-eight hours after taking the therapeutic drug, statistically significant differences were observed in the patients, as a result, Maternal Intravenous Hydration significantly increased amniotic fluid index in women with oligohydramnios. (18).

In the study of Biswas and colleagues, in 2022 by investigating to improve amniotic fluid index and its association with improved obstetric outcome, they showed that Majority were multigravida. About 60%–80% of women improved with hydration therapy and the proportion of women showing improvement increased with time. Women with uncorrected AFI (<5 cm) at 24 and 48 h had significantly higher odds of preterm delivery, cesarean delivery, low-birth-weight baby, baby having 5 min Apgar score < 6, higher likelihood of Sick Newborn Care Unit admission and neonatal death, therefore Maternal hydration therapy can be of value to improve the fetomaternal outcome in pregnancies with oligohydramnios by preventing preterm termination and reducing cesarean deliveries with good neonatal outcomes (19).

In the study of Kiran and colleagues, in 2019 by investigating Effects of oral maternal hydration and intravenous infusions on Amniotic Fluid Index in third trimester isolated Oligohydramnios, they showed that here is no effect of age, gestational age, history of oligohydramnios on improvement in amniotic fluid index, So Both treatment modalities i.e. oral maternal hydration and intravenous infusion are effective in terms of improvement of amniotic fluid index but there is no difference in both treatments in pregnant females with isolated oligohydramnios in 3rd trimester at current sample size. The results of this study are consistent with the results of the present study (20).

In the study of Falak et al with the aim of the effect of oral fluid therapy on amniotic fluid volume, uterine-placental perfusion and blood flow and fetal urinary output in women with oligohydramnios in the third trimester, it was shown that oral fluid therapy increases the Amniotic fluid index and a significant decrease in maternal plasma osmolality and urinary osmolality was observed after oral fluid therapy (21).

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In another study, Tito Silvio Patrelli and et al validated maternal intravenous and oral hydration therapy as a means for improvement of isolated oligohydramnios in the third trimester of pregnancy (22).

In the study of Hala Abd El-fttah Ali et al oral hydration was as effective as intravenous hydration in significantly increasing the AFI in the third trimester oligohydramnios. The AFI was more markedly increased in the oral water. Maternal and neonatal outcomes did not differ significantly among the groups (23).

In our study, we found that both maternal oral hydration and intravenous hydration were equally effective in increasing AFI. However, in some cases, oral fluid therapy improved the amniotic fluid index more than drinking therapy. As there is prolonged hospital admission and risk of complications like thrombophlebitis and fluid overload with intravenous hydration therefore it is not preferred by many patients. So oral maternal hydration can be advised in such cases. Maternal hydration definitely plays an important role in improving amniotic fluid volume in patients with oligohydramnios.

Conclusion

The results of our study strongly suggested that oral and intravenous fluid therapy in pregnant women with oligohydramnios is a suitable and recommended method to increase the volume of amniotic fluid index. Maternal oral hydration is more effective than intravenous hydration in patients with 3rd trimester oligohydramnios.

Suggestions

Due to the importance of fluid therapy in pregnant women with oligohydramnios and its effect on the treatment of oligohydramnios and few studies in this field, it is necessary to conduct larger studies in the future.

Ethical Permissions

This project was carried out in compliance with all the principles of ethical regulations in the research approved by the Ministry of Health and after the approval of the ethics committee of Zabol University of Medical Sciences, with the financial support of Zabol University, Iran with the code IR.ZBMU.REC.1400.132.

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Conflicts of Interests

There is no conflict of interest to declare.

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