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Original article

Study of evaluation of effectiveness of acute maternal hydration therapy with hypotonic fluid (water) in pregnant females with low amniotic fluid

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ABSTRACT

Objectives: The present study was designed with the primary aim to evaluate the effectiveness of acute maternal hydration therapy with hypotonic fluid (water) in pregnant females with low AFI.

Methods: A total of 40 antenatal women complying with study inclusion criteria were included and randomly divided into two groups viz. Routine care with maternal hydration (Group A) and Routine care without maternal hydration(Group B). Detailed clinical histories, including medical, surgical and obstetrical information were taken from all the subjects. Samples were collected for baseline laboratory tests. In Group A, subjects received acute maternal hydration for low AFI. Whereas in Group B, study subjects did not receive any maternal hydration. The data was collected in a proforma and analysed using SPSS v20.0 statistical software.

Results: revealed that there was a statistically significant difference between the groups with regards to post hydration AFI and urine specific gravity values.

Conclusion: Oral hydration with water significantly increases the amniotic fluid volume in 4 hours; irrespective of etiology.

Keywords: Antenatal women, Maternal hydration, Routine care, Low AFI, Post hydration AFI

INTRODUCTION

Amniotic fluid serves several roles in pregnancy like fetal breathing, fetal swallowing, fetal movement, protects fetus from umbilical cord compression, trauma and also has bacteriostatic properties.Amnionic fluid volume increases from approximately 30 mL at 10 weeks to 200mL by 16 weeks and reaches 800 mL by the mid-third trimester.[1,2] This fluid is approximately 98-percent water. A full-term fetus contains roughly 2800 mL of water, and the placenta another 400 mL, such that the term uterus holds nearly 4 liters of water.[3]

In maternal dehydration, the resultant increase in maternal osmolality favors fluid transfer from the fetus to the mother, and then from the amnionic fluid compartment into the fetus. [4] Oligohydramnios complicates approximately 1 to 2 percent of pregnancies. [5, 6] The sonographic diagnosis of oligohydramnios is usually based on an AFI ≤ 5 cm or on a single deepest pocket of amnionic fluid ≤ 2 cm [7]. When evaluating twin pregnancies for twin twin transfusion syndrome, a single deepest pocket ≤ 2 cm is used to define oligohydramnios [8]. Use of AFI rather than single deepest pocket will identify more pregnancies as having oligohydramnios. [9, 10]

Sequelae of chronic oligohydramnios can be fetal demise, pulmonary hypoplasia, facial and skeletal deformities.[5] Because adverse outcomes occur in high risk pregnancies complicated by

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oligohydramnios commonly prompts labour induction which increases the risk of caesarean section particularly in Primigravida with unripe cervix.[11] Maternal hydration was suggested by many authors to restore amniotic fluid volume to its normal range in order to reduce the associated perinatal morbidity and mortality. [12, 13] Maternal hydration increase amniotic fluid volume by causing fetal diuresis and placental perfusion.

METHODS

It is a randomised control trial done at DR. D Y Patil medical college, Pimpri, Pune, India from January 2022 to March 2022, after the approval from ethical committee. Proper informed consent was obtained from all patients after explaining the benefits of the study.

Inclusion criteria

- Pregnancy with more than 28 weeks of gestation.
- AFI not less than 2 cm (severe oligohydramnios) for two consecutive USG examinations.
- Multiple gestations.
- A non-stress test (NST) not pathological for two consecutive times.
- Intact amniotic membrane.
- No indications for immediate delivery like impending eclampsia, scar tenderness, deranged lab parameters etc.
- No detectable fetal congenital anomalies.

Exclusion criteria

- Women at risk of fluid overload e.g. cardio-vascular disease, renal failure, pulmonary hypertension, uncontrolled nausea and vomiting.
- Those receiving Non-Steroidal Anti Inflammatory Drugs (NSAIDS) and drugs known to decrease amniotic fluid volume.
- Diabetes mellitus.
- Rhesus incompatibility with Indirect Coombs Test (ICT) Positive.
- Patients with fetal renal abnormality on USG and other anomalies known to cause low AFI and oligohydramnios.

OBSERVATIONS AND RESULTS

All patients with A.F.I. less than 8cm and consenting were admitted in the antenatal wards for the study. The data was collected from January 2022 to March 2022. Analysis was carried out in the 40 cases till the prelabor stage. The mean age of the study population was 22.9 years with a minimum age of 19 years and a maximum of 40 years. In present study the mean gestational age of our patients was 36 weeks 1day with maximum 43 weeks 6 days and minimum 28 weeks.

Table 1: Gestational age.

Mean	36weeks 1days
Minimum	28weeks 0 days
Maximum	43 weeks 6 days

Among 40 patients with low AFI, 16 of them have AFI less than 5cms and 24 of them have AFI greater than 5cms.

Table 2: Correlation of gestational age and AFI on admission in the two groups.

AFI in cm	**No of patients (%)**	**Mean gest age (wk)**	**Std. Deviation**	**t (unpaired)**
≤5	16 (40)	35.7619	4.57311	0.38836
>5	24 (60)	36.0873	4.16934	

The p-value is .349608.

The result is not significant at $p < .05$.

In our present study maximum patients were Primigravida, minimum were fourth gravida.25 patients of 40 were Primigravida, 8 patients were 2nd gravida, 5 patients were 3rd gravida and 2 patients were 4th gravida in our study.

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Table 3: Patients with various gravidity were as follows

Gravidity	No of patients (%)
G 1	25 (62.5)
G 2	8 (20.0)
G 3	5 (12.5)
>G 3	2 (5.0)
Total	**40 (100)**
The maximum gravida was 4	

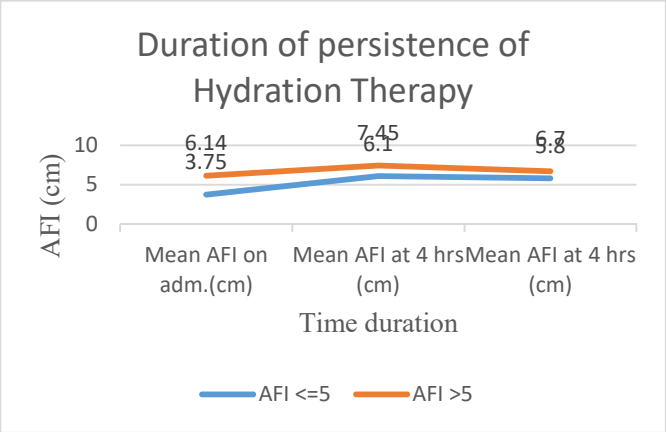
We have compared the mean AFI values before and after hydration among 20 patients (Group A) and according to the study before hydration mean AFI is 4.945 and after hydration mean AFI is 6.775. In the control group B there was no much significant difference in the AFI after 4hrs of regular hydration.

Table 4 : comparison of the mean values of AFI before and after hydration therapy in group A.

Parameter	Status of hydration	Mean	Mean change	No of cases	Std. Deviation	t (paired)
AFI(cm)	Before hydration	4.945	+1.830	20	1.699	8.87***
	After hydration	6.775		20	1.889	

***P<0.001 Difference was highly significant

This table shows that there is rise in AFI post hydration therapy at 4hrs which at 48hrs shows a gradual very small decline when hydration was stopped i.e.the effect of single hydration therapy.



In our present study various known etiologies were ruled out among 40 patients with low AFI. They included prolonged pregnancies, PIH, IUGR and others unexplained.

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Table 11: Various etiologies associated with low AFI.

Etiology	No of patients	Percentage
Unexplained	21	52.5
Prolonged pregnancy	5	12.5
PIH	6	15.00
IUGR	8	20.00
Total	**40**	**100**

Few side effects were noted in the patients during the hydration therapy among them most common side effect was fullness of stomach and others included nausea, vomiting, increased frequency of micturition….etc.

Table 5: Side effects of Hydration therapy

Side effects of acute hydration	No of patients
Fullness of stomach	15 (37.5%)
Vomiting	2 (5%)
Nausea	2 (5%)
Vomiting and nausea *	1 (2.5%)
Fullness and nausea	5 (12.5%)
Fullness and vomiting*	1 (2.5%)
Increased frequency of micturition	2 (5%)
Micturition and fullness	3 (7.5%)
No complaints	8 (20%)
Non-compliant	1* (2.5%)
Total	**40**

In our study among 40 patients 20 were given acute hydration therapy which lead to rise in the AFI and reduced the incidence of fetal distress, meconium stained liquor and cesarean section rate when compared to the rest 20 patients without acute hydration therapy lead to increase in the cesarean section rate with oligohydramnios.

Table 6: Mode of onset of labor (including termination of pregnancy).

Group	**Induced (%)**	**Spontaneous (%)**	**LSCS in latent stage Elective (%)**	**Total (%)**
A(acute hydration therapy)	5(25%)	14(70%)	1(5%)	20(50%)
B (control)	4(20%)	3(15%)	13(65%)	20(50%)
Total	9(22.5%)	17 (42.5%)	14 (35%)	**40 (100)**

DISCUSSION

A randomized study of 40 patients with low AFI were conducted and followed up throughout the pregnancy till delivery. The mean age of the studied cases was 22.9 years. The mean gestational age was 37 weeks 6 days in the studied patients. We chose 2 liters as the amount of water to be ingested in 2 hours as 250 ml of water can be ingested every 15 minutes with minimal discomfort. Post hydration AFI was repeated at 4 hours as the time for complete replacement of AF once is about 3 to 4 hours as shown by Goodlin et al. [14] Ultrasonography was always performed by the same observer on the same machine using a 3.7 MHz transducer probe using moderate pressures and at same working hours of the day.

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Silvio Patrelli and others conducted a prospective randomized controlled study on pregnancies complicated by idiopathic oligohydramnios with a control group. Group A underwent 6 days of IV infusion of 1500ml/day or home oral hydration therapy of 1500-2500ml/day. Finally, they made into a conclusion that in pregnancies complicated by isolated oligohydramnios, hydration therapy significantly improves the quantity of amniotic fluid. [(16)] In our study, the mean AFI on admission was 4.945cm and 4 hours after hydration the mean AFI was 6.77 cm. Student t test was applied and the p value of this test was < 0.001 which was highly significant. Thus the rise in AFI 4 hours after hydration is statistically significant, irrespective of the etiology or AFI on admission. There was a mean rise of 36.905% in the AFI of the studied 20 cases with an actual rise of 1.825cm, irrespective of the etiology or the initial AFI levels. Kilpatrick et al; have also shown a rise of 1.5 cm in patients with low AFI treated with hydration. [15]

The studied cases were young women in third trimester with increased risk to themselves and to their babies because oligohydramnios is often associated with Cesarean delivery (LSCS) for fetal distress (FD) and meconium staining of liquor (MSL) as shown by Casey et al; [5] and Chauhan et al. [2]Akter, Mymensingh and others conducted a randomized controlled trial on 64 pregnant women from 32-35wks gestation, in one year period to determine the effect of maternal hydration by oral water in oligohydramnios AFI <5. Group A were instructed to drink 2 liters of water within 2 hrs and from the next day extra 2 liters of water daily for 7 days. Group B women were allowed for routine water intake. AFI was done after 2hrs, 24hrs and 7 days of oral hydration therapy in both the groups. At last, it was concluded that maternal oral hydration therapy significantly increases the AFI, reduces the caesarean section rate and improves the fetal outcome. [(17)]

In our study among 40 patients, 20 patients for whom acute hydration therapy was given showed great results in increasing the AFI and decreased the cesarean section rate when compared to the control group. In group A 5% patients had caesarean section and rest delivered by induction or spontaneous. While in group B 65% patients delivered by cesarean section due to fetal distress, meconium stained liquor , IUGR…etc.

The rise in AFI after hydration was better with oligohydramnios (+1.8889 cm) (45.985 %) than with low AFI (+1.1591cm) (16.86 %) and this was statistically significant. The rise was 0.7298 cm more with oligohydramnios than in patients with low AFI which is actually a 29.125% more increase in patients with oligohydramnios than the increase in patients with low AFI. The error in calculating AFI by Ultrasonography in our set up is 5% which is much less than the observed values and hence the results are not by chance.

Marzieh Ghafarnejad and others did a randomized controlled trial on 44 pregnant women diagnosed by sonography to have oligohydramnios to assess the effect of acute oral hydration on maternal AFI. They were divide into two groups and study was done. Final conclusion was acute oral hydration is a cheap non-invasive, easily accessible and cheap intervention and a effective way of increasing AFI. [(18)]

Oral hydration with water (and not oral rehydration salt) increase the amniotic fluid volume in 4 hours by various mechanisms like osmolality changes in mother and fetus, maternal plasma volume expansion, increased uteroplacental perfusion, transmembranous flow, decreasing arginine vasopressin secretion due to fetal plasma volume expansion and better oxygen supply, increase fetal urine production (by increased blood flow via the dilated renal arteries and by decreasing the ADH levels) and decreased swallowing. If given regularly throughout pregnancy, it may also increase birth weight.Regularly Oral hydration may also help in decreasing the incidence of urinary tract infections, constipation and deep venous thrombosis and may serve to keep the intravascular volume in an expanded state in cases with preeclampsia. However, these parameters need to be assessed by further studies.

CONCLUSION

1) Oral hydration with water (and not oral rehydration salt) significantly increases the amniotic fluid volume in 4 hours; irrespective of the etiology. More severe is the decrease in amniotic fluid volume, better are the results.

2) Oral hydration with water benefits in the intrapartum and perinatal outcome by decreasing the fetal heart rate decelerations, meconium staining of the amniotic fluid, need of LSCS due to fetal distress and incidence of cord compression and stillbirths. It also helps in improving Apgar score.

3) The effect of oral hydration gradually starts to decrease after 48 hours of hydration.

4) There are no major side effects or water intoxication because of acute oral hydration with water. Minimal discomfort can be tolerated well.

5) Acute oral hydration is a cheap non-invasive, easily accessible and cheap intervention and an effective way of increasing AFI.

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