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Maternal Hydration with Intravenous Versus Oral Therapy in the Correction of Isolated Oligohydramnios in the Third Trimester of Pregnancy

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ABSTRACT

Objective: To compare the effectiveness of oral hydration versus intravenous hydration therapy in correcting amniotic fluid volume in women presenting with isolated oligohydramnios in the third trimester.

Methodology: A randomized controlled study was conducted at the Department of Obstetrics & Gynaecology, Pakistan Institute of Medical Sciences, Islamabad, from March 2021 to September 2021. One hundred and twenty-six patients were enrolled, with 63 in each group. Patients with AFI <5 cm in the third trimester, singleton pregnancies, and no associated maternal or fetal risk factors were included. Patients were divided into two groups: one received oral rehydration solution (ORS) every 30 minutes, and the other received intravenous (IV) lactated Ringers solution over one week. APGAR scores at 1 & 5 minutes were compared between the two study groups using independent samples t-test. P value ≤0.05 was taken as significant.

Results: Both groups were comparable in terms of demographic parameters and pre-intervention water intake. AFI increased significantly in both groups compared to baseline at various intervals and persisted even one week after the completion of the study. Birthweight and Apgar scores at 1 and 5 minutes were comparable in both groups.

Conclusion: Both oral and intravenous hydration significantly increased amniotic fluid volume and were equally effective in correcting isolated oligohydramnios in the third trimester. Oral hydration is a non-invasive, cost-effective, and convenient alternative to intravenous hydration, offering potential benefits for pregnant women without the need for hospital admission or IV lines.

Key Words: Isolated term oligohydramnios, Amniotic fluid, Intravenous maternal hydration therapy.

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Introduction

Oligohydramnios is defined as a decreased amniotic fluid volume during the gestation period. Adequate amniotic fluid volume is a crucial component of a healthy pregnancy.[2,3] It plays a vital role in fetal development and growth, serving as a protective barrier against trauma and infection, regulating fetal body temperature, supporting the development of fetal lungs, gastrointestinal, and musculoskeletal systems, and preventing compression of the umbilical cord and placenta, thereby safeguarding the fetus from vascular and nutritional compromise.[2,3]

The prevalence of oligohydramnios varies widely, ranging from approximately 0.5% to 5% of singleton pregnancies. This variation depends on the study population and the diagnostic criteria used.[2-4]

Oligohydramnios can have various causes, including fetal growth restriction, preterm rupture of membranes (PROM), congenital anomalies such as urinary tract obstruction, bilateral renal agenesis or cystic dysplasia, Meckel-Gruber syndrome, VACTERL syndrome (vertebral, anal, cardiac, tracheo-esophageal, renal, and limb disorders), fetal demise, post-term pregnancy, or twin-to-twin transfusion syndrome. When the cause is unknown, it is termed "isolated oligohydramnios.[1,3,4]

Oligohydramnios occurring during earlier gestation often leads to the compression of fetal organs, resulting in birth defects, pulmonary hypoplasia, and an increased risk of miscarriage or stillbirth. In the later stages of pregnancy, it is associated with preterm birth, low birth weight, intra-partum fetal distress, birth asphyxia, and intrauterine fetal death. During labor, oligohydramnios can cause cord compression, abnormal fetal heart rate, and meconium staining of the amniotic fluid. It also increases the risk of obstetric interventions, instrumental delivery, cesarean delivery, lower Apgar scores at birth, neonatal intensive care unit admission, and early neonatal death.[4-6]

In most obstetric units, intravenous (IV) hydration is predominantly used, necessitating admission to the facility. In comparison, oral hydration is a more cost-effective and safe option that requires fewer logistical arrangements, while still effectively increasing amniotic fluid volume.

Our study aims to compare oral hydration with intravenous hydration in improving amniotic fluid volume in third-trimester isolated oligohydramnios.

Methodology

This was a randomized controlled study conducted at the Department of Obstetrics & Gynaecology, Pakistan Institute of Medical Sciences, Islamabad, for six months from March 2021 to September 2021, after approval by the hospital ethics committee. Sample size was calculated using the WHO sample size calculator using following statistical assumptions: 95%Confidence interval, Level of significance 5%, Population standard deviation=1.0, Mean Amniotic fluid index value in oral hydration group = 3.5[7], Anticipated mean value in IV hydration group = 4.0.[8]

The sample size was calculated as 63 cases in each group, a total of 126 cases of oligohydramnios were enrolled in this study. One hundred and twenty-six patients were enrolled in the study, with 63 in each group. Sampling was consecutive non-probability. Women coming for antenatal check-ups or other routine visits in the third trimester were screened from the OPD and emergency department of MCH Center. Complete medical history and physical examinations were conducted. Patients who met the inclusion criteria were invited to participate in the study.

Informed verbal and written consent was obtained. Consenting women were divided into two equal groups using a lottery method. Patients with AFI < 5 cm in the third trimester (28-40 weeks gestation), with singleton pregnancies, and without associated maternal or fetal risk factors were included in the study. Patients with congenital anomalies in the fetus, intrauterine growth restriction, premature prelabor rupture of membranes, post-date pregnancies, and antepartum hemorrhage were excluded. Also, women with chronic medical conditions (heart disease, renal disease, preeclampsia, eclampsia, pregnancy-induced hypertension, chronic hypertension, diabetes, gestational diabetes, connective tissue disorder) were excluded. The maternal characteristics, such as age, gestational age at diagnosis, parity, gravida, pre-hydration water intake, and AFI at baseline, were noted on a specifically designed study proforma. The woman's ultrasound findings of AFI were quantitatively recorded after 1 day, 3 days, 1 week, and 2 weeks. Patients' urine specific gravity was assessed at the beginning of hydration and after a 1-week interval. Routine water intake was inquired about and documented in liters. In the oral arm, women were administered 250 ml of ORS every 30 minutes for 4 hours to complete a 2-liter intake. In the intravenous hydration group, women were infused with 2 liters of Lactated Ringer's solution over a 4-hour duration.

Both regimens were continued for 1 week. To minimize selection and other biases, all data collection and study processes were performed by the researcher herself. The study's outcome was the comparison of amniotic fluid index between oral and intravenous hydration therapy. Data were entered and analyzed using SPSS version 22.0. Mean and standard deviation (SD) were calculated for continuous numerical variables such as age, gestational age, parity, gravidity, AFI at baseline, day 1, day 2, day 3, 1 week, and 2 weeks. Birthweight and APGAR scores of babies were measured at 1 and 5 minutes after birth. For associations and comparisons, the baseline mean AFI was compared with post-hydration AFI at day 1, day 3, and then at 1 week and 2 weeks using a paired sample t-test. As per the study objective, the levels of AFI at baseline and intervals, birthweights, and APGAR scores at 1 and 5 minutes were compared between the two study groups using independent samples t-test. A p-value of ≤ 0.05 was considered significant.

Results

Both groups were comparable in terms of demographic parameters and pre intervention water intake as given in Table I. AFI at different intervals was comparable in both groups as given in Table II. In Both groups, AFI increased significantly when compared to AFI at baseline. This effect was seen when measured at different intervals and the increased persisted at 2 weeks, that is one week after completion of study (Table III)

Also specific gravity of urine was decreased significantly at end of week (Table III) In terms of pregnancy outcome, in both groups babies had comparable birthweight and APGAR scores at 1 and 5 minutes. (Table II)

Discussion

Both intravenous and oral hydration resulted in an increase in AFI. The changes were significant at all measured intervals when compared with the baseline. The resulting AFI was comparable at all intervals.

Table I: Comparison of demographic parameters and pre intervention water intake of both groups.

	Oral Hydration Group	IV hydration Group	P value
Age(Years)	32.2±3.1	32.1±3.2	0.848
Gestational Age(weeks)	32.9± 3.8	31.6± 2.9	0.309
Weight of mother(kg)	75.7±7.9	73.8±8.3	0.259
Gravida	3.3±1.8	3.5±2.1	0.589
Prity	2.01±1.3	2.08±1.5	0.888
Pre intervention water intake(L)	1.82±0.45	1.83±0.44	0.855

Studies have shown that maternal hydration leads to an increase in the Amniotic Fluid Index. Though the mechanism is not clear, several mechanisms have been postulated for it. An increase in maternal plasma volume due to hydration leads to an improvement in uterine placental perfusion, which would improve fetal renal blood flow and fetal oxygenation. Subsequently, decreased vasopressin and increased urinary output occur, leading to increased amniotic fluid volume. Also, the fetus responds to changes in maternal plasma osmolarity by decreasing its osmolarity and increasing urine output, thereby increasing amniotic fluid volume.

Previously, amnioinfusion was employed to increase amniotic fluid volume in patients with oligohydramnios. This method had certain limits, including its potential risks, being an invasive procedure, requiring catheters, application during labor only, and the need for continuous monitoring.[4,9]

Subsequently, intravenous hydration was used to increase amniotic fluid volume in most obstetric units to avoid risks associated with amnioinfusion.[9-11] Different studies have used different IV fluids: 5% Dextrose Water, Normal Saline, amino acid infusions, all resulting in an increase in amniotic fluid volume.9,10 However, IV hydration required IV lines, hospital admissions, or staying in daycare areas.

Oral hydration has been evaluated and shown to increase amniotic fluid volume when compared to routine oral intake. It also reduces the cesarean section rate and improves fetal outcomes despite being non-invasive, more cost-effective, and easier. [6,13,14] El Mosseff et al. in their study found that acute maternal oral hydration increased

Table II: Increase in AFI at intervals and Decrease in specific gravity at end of week 1

		Oral Hydration Group	P value	IV hydration Group	P value
AFI (ml)	Baseline	4.33±0.4	0.001	4.28±0.52	0.001
	Day 1	4.52±0.43	0.001	4.46±0.53	0.001
	Day 3	5.11±0.45	0.001	5.69±0.59	0.001
	Week 1	5.83±0.54	0.001	5.57±0.61	0.009
	Week 2	6.62±0.47	0.001	6.82±0.55	0.001
Specific Gravity Of urine	Pre Hydration	1.0161±0.0073	0.001	1.0170±0.0072	0.001
	Post Hydration	1.0051±0.0019		1.0053±0.0018	

Table III: Increase in AFI at intervals and Decrease in specific gravity at end of week 1.

		Oral Hydration Group	P value	IV hydration Group	P value
AFI (ml)	Baseline	4.33±0.4	0.001	4.28±0.52	0.001
	Day 1	4.52±0.43	0.001	4.46±0.53	0.001
	Day 3	5.11±0.45	0.001	5.69±0.59	0.001
	Week 1	5.83±0.54	0.001	5.57±0.61	0.009
	Week 2	6.62±0.47	0.001	6.82±0.55	0.001
Specific Gravity Of urine	Pre Hydration	1.0161±0.0073	0.001	1.0170±0.0072	0.001
	Post Hydration	1.0051±0.0019		1.0053±0.0018	

amniotic fluid volume, and renal and uterine arteries' pulsatility indices also improved with this strategy.[13]

Our study compared the effect of oral and intravenous hydration. Both oral and intravenous hydration led to a significant increase in amniotic fluid volume when compared to amniotic fluid volume at baseline. The increase was observed at all intervals and persisted one week after the completion of the study. This may be attributable to the study design. In this study, in the oral arm of the study, patients drank 250 ml of water at longer intervals compared to those seen in other studies (30 min vs. 15 min) and under the supervision of staff. This increased the compliance of the patients in the oral arm as evident in a significant decrease in urinary specific gravity. Oral hydration also resulted in an increase in amniotic fluid index similar to that of intravenous hydration in a study conducted by Aneela Umber.[15] Similarly, a study by Jamil M et al. also found a comparable effect of oral and intravenous hydration in improving amniotic fluid volume, although the study compared a multitude of oral fluids with an amino acid solution.[16] A study by Nada Zaka also revealed that intravenous and oral hydration resulted in a significant increase in Amniotic fluid volume.[17]

In other studies, the effect did not last long after acute hydration. In our study, the effect of hydration persisted even one week after the completion of the trial in both groups. This may be due to the fact that, the acute hydration therapy lasted for a longer period and was supervised in both groups. Also, a longer interval between oral aliquots facilitated compliance. A decrease in urinary specific gravity in both groups is an objective evidence of adequate hydration in both groups.[18] Also, fetal outcome and birth weight were comparable in both groups and reassuring, depicting the beneficial effect of hydration via both routes.

The fact that oral hydration produced results that were comparable to the intravenous group suggests that oral hydration can replace intravenous hydration, hitherto employed. It's non-invasive, cheaper, can be done entirely on a domiciliary basis, and requires fewer logistics.

Conclusion

Both oral and intravenous hydration significantly increased amniotic fluid volume and were equally effective in correcting isolated oligohydramnios in the third trimester. Oral hydration is a non-invasive, cost-effective, and convenient alternative to intravenous hydration, offering potential benefits for pregnant women without the need for hospital admission or IV lines

Strengths & Limitations: For ensuring and monitoring compliance, both groups were hydrated under medical supervision. Urinary specific gravity was done to get an objective evidence of compliance. The study included lower study population which is a limitation

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