Intravenous Versus Oral Maternal Hydration Therapy for Increasing Amniotic Fluid Volume

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Objective: To determine wether one (intravenous) route of maternal hydration is advantageous over the other (oral) to increase amniotic fluid volume in patients with third trimester oligohydramnios?

Study Design: Quassi experimental study.

Place and Duration of Study: Department of Obs & Gynae Unit III, Sir Ganga Ram Hospital, Lahore, in one year period from May 2002 to Apr 2003.

Material and Methods: Fifty women with third trimester oligohydramnios (AFI ≤ 5.0 cm) were prospectively recruited for this study. Study inclusion criteria was, singleton pregnancy, well established gestational age, intact membranes, no maternal complication (moderate to severe anemia, cardiac disease, renal disease, moderate/severe pre-eclampsia or hypertension and diabetes), no fetal structural malformation and no evidence of fetal distress. These fifty patients were randomized by probability sampling technique into two groups (intravenous hydration group and oral hydration group). Maternal urine specific gravity and amniotic fluid index were determined before and after hydration therapy by infusing 2 L of 5% D/W in 2 hours in intravenous hydration therapy group, and by asking them to drink 2 liters of water in 2 hours in oral hydration therapy group; and recorded on printed proformas. The data analysis was computer based using statistical package SPSS version 10.0 and sample independent "t" test was used to compare the mean AFI and urine specific gravity, and the post treatment AFI – pretreatment AFI (Delta AFI).

Results: Maternal hydration increased amniotic fluid volume in intravenous hydration group (mean change in amniotic fluid index 4.5 cm ± 1.25, C.I 4.00 to 5.00; P value < 0.05); as well as in oral hydration group (mean change in Amniotic fluid index 4.3 ± 1.23, C.I 3.80 to 4.79; P value < 0.05). However, percentage increase in mean AFI was 58.6% in the intravenous hydration group, which was not significantly greater (P value > 0.05) than the percentage increase of 58.2% in oral hydration group. Maternal hydration was associated with decrease in urine specific gravity in both groups.

Conclusion: Maternal intravenous as well as oral hydration increases AFV in women with oligohydramnios but neither appears to be advantageous over the other to increase amniotic fluid volume and both routes may be beneficial in the management of oligohydramnios.

Key Words: Maternal hydration, oligohydramnios.

Introduction

Oligohydramnios (too little amniotic fluid) has invariably been associated with increased rates of perinatal morbidity and mortality.[1-6] Although fetal congenital anomalies and a variety of disease states such as fetal infection are often associated with oligohydramnios, many times the fetus is normal except for the aberration in amniotic fluid volume (AFV).

Maternal hydration therapy has been suggested by many authors[7-14] to restore amniotic fluid volume to its normal range and thereby to reduce the associated perinatal morbidity and mortality. In recent studies Deka et al,[15] Kilpatrick et al[16] and Kilpatrick and Safford[17] reported that maternal oral hydration of 2 L of water in 1-2 hour period increased AFI in pregnancies with oligohydramnios as well as in those with a normal amniotic fluid volume. Similarly Nicola et al[18] reported that maternal intravenous hydration increases AFI in patients with oligohydramnios. The aim of this study was to determine wether one (intravenous) route of maternal hydration is advantageous over the other (oral) to increase amniotic fluid volume as intravenous route seems to have the advantage that a fixed amount of fluid can be infused at a relatively constant rate with ensured compliance.

Aims and Objectives

To determine wether intravenous (IV) route of maternal hydration is superior to oral route for increasing amniotic fluid volume in patients with third trimester oligohydramnios?

Patients and Methods

This study was carried out in unit III of Sir Ganga Ram Hospital LHR during, one year's period from May, 2002 to April, 2003. Each woman eligible for the study (eligibility determined by inclusion and exclusion criteriae) gave written informed consent. The study group consisted of fifty women with third trimester oligohydramnios defined as an AFI ≤ 5.0 cm. Women with oligohydramnios were recruited

from antenatal ward; and from the population attending the antenatal clinic. By probability sampling technique these patients with oligohydramnios were divided into two groups, intravenous hydration group and oral hydration group. Inclusion criteria for both groups was: patients with singleton pregnancy with well established dates at 28-42 weeks gestational age, fetus with no congenital anomalies, determination of AFV with technique of Phelan et al,[19] criteria for oligohydramnios, an AFI ≤ 5.0 cm. Exclusion criteria for both groups included: women at risk of fluid overload such as those with moderate(Hb 7 – 10 g/dl) to severe (Hb < 7 g/dl) anemia, cardiac disease, renal impairment, moderate/ severe pre-eclampsia or hypertension , diabetes, ruptured membranes, multiple pregnancy, and women receiving prostaglandin synthetase inhibitors.

Baseline maternal urine sample was taken immediately before the hydration therapy for direct measurement, which was performed by standard laboratory techniques. The AFI was measured by technique of Phelan et al[19] by dividing the uterus into four quadrants, measuring the deepest pool in each and calculating it as the sum of the four measurements. Equipment used in this study included Acuson model machine which was equipped with 3.5 and 5.0-MHz curvilinear transducers. All measurements were made with medium transducer pressure to reduce intraobserver variability.

Once basal measurements (amniotic fluid index and urine specific gravity) were taken, women were infused 2 liter of 5% D/W in 2 hours (from 02.00 p.m to 04.00 p.m) in intravenous hydration group and by asking them to drink 2 liters of water in oral hydration group. Throughout the study these women were supervised directly by the midwife in the antenatal ward to ensure compliance, and they had free access to toilet facilities.

At the end of the 2-hours hydration period, patient was instructed to micturate again and then the next sample was collected for analysis. The AFI measurement was repeated 2 hours after hydration therapy at 06.00 pm. on the same day. Study variables, including urine specific gravity and AFI were performed before and after hydration therapy by the same operator so that each woman acted as her own control. Each study took place at the same time of day (i.e. between 12.00 and 06.00 p.m , the hydration period was from 02.00 to 04.00 p.m, and post hydration AFI measurement was at 06.00 p.m - 2 hours after hydration therapy).

The study variables i.e maternal urine specific gravity and AFI, before and after maternal hydration were recorded on printed proformas. The data analysis was computer based using statistical package SPSS version 10.0 and sample independent "t" test was used to compare the mean AFI and urine specific gravity before and after hydration, and the post-hydration AFI – pre-hydrationt AFI (Delta AFI) between the two groups.

Results

All women compiled with the protocol and no maternal complications were found. Baseline urine specific gravity (USG) was comparable in the two groups; there was no significant difference in USG between the groups.

Table 1 summarizes the results. In intravenous hydration group, the mean AFI increased from 3.2 cm to 7.7 cm (mean Δ AFI 4.5 cm, 95% confidence interval 4.00 to 5.00; P value < 0.05). Significant change in AFI was observed in oral hydration group; mean AFI increased from 3.2cm to 7.5cm (mean Δ AFI 4.3cm, 95% confidence interval 3.80to 4.79; P value < 0.05). However, the percentage increase in mean AFI was 58.6% in the intravenous hydration group, which was not significantly greater (P value > 0.05) than the percentage increase of 58.4% in oral hydration group.

USG did not show any significant difference between the 2 groups after hydration.

Table 1: *Results of Maternal Hydration.*

	Intravenous Hydration Group (N = 25)	**Oral Hydration Group (N = 25)**
Pre-Treatment		
• AFI (cm)	3.2 ± 0.79	3.2 ± 1.53
• USG	1.011 ± 0.007	1.012 ± 0.009
Post-Treatment		
• AFI (cm)	7.7 ± 1.35	7.5 ± 1.68
• USG	1.005 ± 0.008	1.006 ± 0.007
Delta AFI (cm)	4.5 ± 1.25	4.3 ± 1.23
P-Value	< 0.05	< 0.05

- AFI = Amniotic fluid index
- USG = Urine specific gravity
- Delta AFI = Post treatment AFI – Pre-treatment AFI
- Data are presented as mean ± standard deviation.
- P < 0.05

Discussion

In this study an AFI ≤ 5.0 cm was specific in identifying women with oligohydramnios. Oligohydramnios has invariably been associated with adverse perinatal outcome such as fetal distress (ante/intrapartum fetal heart rate decelerations and meconium passage, cord compression), induction of labor, operative delivery, and poor APGAR score at birth. Various studies have demonstrated that maternal hydration increase AFI. The maternal hydration technique used in this study was simple to accomplish, did not require special equipment, and had no serious adverse side effects.

The effect of maternal intravenous hydration on amniotic fluid index in this study is consistent with that described by Nicola et al,[18] who demonstrated that with 2 liters of intravenous maternal hydration in patients with oligohydramnios (AFI ≤ 5.0 cm), the mean AFI increased from 4.3 cm to 7.5 cm (mean Δ AFI 3.2 cm, 95% confidence intervals 1.2 to 5.3; p < 0.01). The study results also confirm that of

Sarah et al[20] that maternal oral hydration increases AFI (mean Δ AFI 1.5 cm ± 1.4, data presented as mean ± standard deviation).

But the study results also demonstrate that although maternal hydration (intravenous as well as oral) increases amniotic fluid volume in patients with oligohydramnios, yet neither route appears to be advantageous over the other to increase AFI. This observation confirms that of Chandra[21] et al that intravenous (mean change in AFI + 0.6) as well as oral maternal hydration (mean change in AFI + 0.7) increase amniotic fluid volume, but neither appears to be particularly advantageous over the other.

However the study increased amniotic fluid index in patients with oligohydramnios, and may improve the adverse perinatal outcome associated with oligohydramnios.

Conclusion

In conclusion, this study demonstrates that maternal intravenous as well as oral hydration therapy increases AFI, but neither appears to be particularly advantageous over the other.

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