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Evaluation Of Amniotic Fluid By Ultrasound In Oligohydromnia Managed By Oral Maternal Rehydation In 2nd And 3rd Trimesters In Mosul City

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Abstract
Amniotic fluid is an important component that engulfs the fetus inside the mother's womb. Oligohydramnios, means abnormally decreased in the amount of amniotic fluid It has a risk to the fetus during pregnancy, afect about 1 to 2 percent of pregnancies, iatrogenic preterm causes illness and death to the fetus before delivery. Operative deliveries are risky for both the fetus and the mother. They might cause problems due to some of the commonly known factors or Oligohydramnios association could be identified, there could be some other unknown factors that are termed "Isolated Oligohydramnios". Amniotic fluid's rate of evolution could serve as an indicator to how the fetus is growing, it can provide protection, and it helps predict the gender of the newborn. The mother should undertake a hydration therapy in order to improve her amniotic fluid and the fetus well been. Drinking good amounts of water found to be helpful in increasing the amniotic fluid volume without using any other supplements. The sonographic evaluation for all patients with oligohydramnios were reviewed to determine whether sonographically detectable fetal anomalies were present, and when these anomalies were present, how this information was used in maternal fetal management.

Keywords: sonographic, evaluation, amniotic fluid, Oligohydromnia Managed, Trimesters

INTRODUCTION

Amniotic fluid (AF) is a fluid with constant ratio of outflow (fetal swallowing and intramembrane absorption) and inflow (fetal urine and lung fluids) in the amniotic space [(1)], Amniotic fluid volume (AFV) monitoring gives a clear idea about the wellbeing of the fetus as it provides:

1. Supportive environment for growth
2. Protection from trauma and infection
3. A medium that allows fetal movement aiding the development of musuloskeletal system
4. Prevents compressions of umbilical cord and placenta providing vascular & nutritional protection

Amniotic fluid is an important fluid for the protection of the fetus, and its deficiency (oligohydramnios) could cause misleading effects on the prediction of the gender of the newborn. Sometimes there is no clear the mother for the deficiency of the amniotic fluid wither it causes reason or the fetus, this case is called isolated oligohydramnios (IO) [(3)]. The pathophysiology of IO itself is not clearly understood, but it reflects chronic or late-onset placental insufficiency. In cases of pregnancy with IO the baby should be delivered in a well maintained environment to lower the chances of morbidity due to fragility. Oligohydramnios is a case in which the amniotic fluid is decreased extremely leading to hard pregnancy; 1-2% of pregnancies in the world are Oligohydramnios [(4)]. Sonographically, it is the mass of amniotic fluid which should be less than 5% in gestational age; Amniotic Fluid Index (AFI) *<5 cm or Single Deepest Pocket of liquor (SDP) <2 cm* [(5)].

Oligohydramnios has been found in association with ruptured membranous, intrauterine growth retardation, preeclampsia, post maturity, fetal demise, and renal anomalies. Diagnosis of these cases was based on sonographic findings during pregnancy ([6]).

Oligohydramnios is at its most between 13 and 21 weeks, and between 34 and 42 weeks [(7)]. Due to the gradual increasing in the production of amniotic fluid in the mid-trimester [(8)], excessive oligohydramnios before the 22nd-24th weeks of pregnancy could occur causing mal-structuring of the lungs leading to perinatal death with a chance of 80%[(9, 10)], it could also cause a delay in growth, compression-related skeletal deformities (muscle hypotrophy or joint constriction), and pregnancy loss [(10)].

1.1 Symptoms of oligohydramnios

Disorders in the fetus cause about 50% of the cases in which the AFV levels lowers at the second trimester [(7)], but major disorders even the fatal ones causes severe oligohydramnios by anuria. An amnioinfusion procedure makes it possible to identify the urinary tract in 26% of the cases by sonographic, and it could improve the severe decrement in AFV [(11,12)]. In addition, amnioinfusion could prolong the pregnancy duration and aid in the survival of the newborn causing non-lethal disorders [(13)]. *A* uteroplacental insufficiency could occur due to hypertensive (high blood pressure) in the mother or some illnesses and pathogens in any case they should all be treated as they cause reduction in oxygen and nutritional supply. Fetal regulatory mechanisms causes the fetus to seize urinating leading to troubles in growth or even death of the fetus [(13.14)]. The risks associated with

oligohydramnios depends on the duration at which it has started, early oligohydramnios causes more dangerous cases such as:
1. compression of fetal organs resulting in birth defects
2. pulmonary hypoplasia
3. increased risk of miscarriage or stillbirth

If they were late to be discovered, they could cause IUGR, preterm birth, intrauterine fetal demise, intrapartum fetal distress, and birth asphyxia. At labor, oligohydramnios can cause:
1. cord compression
2. meconium-stained fluid
3. abnormal fetal heart rate
4. operative interventions
5. increased risk of cesarean delivery
6. lower Apgar scores
7. intensive care unit admission
8. Even neonatal death [15, 16].

1.2 Evaluation of amniotic fluid by ultrasonography

With the increasing use of ultrasonography, data on the development of the gestational and amniotic sacs began to appear. Now days when the vaginal ultrasonography became widely used a complete image of the gestational sacs, amniotic sacs, the fetus became available, and so calculations of the amniotic fluid for each week of pregnancy was possible (17). In many cases, the ultrasonic evaluation is used to determine the amniotic fluid volume (AFV) to detect the risks that may occur during delivery due to AFV abnormalities. As is well known, ultrasound is a non-surgical method, which can be used on a vast area in the practical field:
1. it can be used for routine monitoring of all pregnancies
2. repeat AFV determination in those cases where there is the suspect of amniotic fluid disorders

In a scientific point of view the sonographic quantification cannot pose a reliable *quantitative* method of measuring for AFV whether it was visual or bionic. Moreover, as the ultrasonic AFV evaluation is highly used in managing high-risk pregnancies yet it is not the most accurate in case of predicting the mortality or morbidity of the fetus before and after delivery. An expert sonographer can evaluate AFV by monitoring the amniotic fluid pockets; his experience is key roll to the whole process. In case of pathological AFV changes occurrence especially if the examination is performed by a not so expert sonographer, biometric measurements (Single Deepest Pocket, Amniotic Fluid Index, Two - Diameter Pocket) with their respective reference ranges might help confirm the diagnosis of oligohydramnios [18].

1.3 Treatment Strategies for Oligohydramnios

1.3.1 Oral Hydration Therapy

Maternal hydration (MH) is an effective treatment for managing the IO during pregnancy and before the onset of labor [19]. Drinking water at possible rates found to be helpful in increasing the volume of amniotic fluid. Intake of 250 mL of water (or can lead to an increase in fluid volume in both hypotonic solution) in 15 min, a total of 2 liters in risks to the mother, and 2 hours oligohydramnios and normohydramnios, with minimal the baby. Drinking sufficient amounts of water lowers the osmolality and in the same time, it increases the uteroplacental perfusion. Maternal hydration by drinking water has many advantages as it is:
1. cheap
2. available
3. non-invasive and does not require hospitalization
4. doesn't require extensive monitoring

However, it requires long-term therapy [5].

Many researches indicated that oral use of water can increase the AFI (amniotic fluid index) in normal pregnancies & in those suffering from oligohydramnios . The mechanism for this effect remains unclear. It may be associated with improved uteroplacental perfusion or changes in maternal and fetal plasma osmolality, which increases fetal urine flow [3].

Subjects and Methods

In this study, we assessed 100 low-risk pregnancies in our private clinic at 2nd & 3rd trimester complicated by isolated oligohydramnios (AFI < 5 or > 5 cm but < 2.5th centile for gestational age). We excluded pregnant women complicated by:
1. Preterm rupture of membranes.
2. Type 1, 2, and gestational diabetus.
3. Pre-eclampsia.
4. Intrauterine growth restriction.
5. Maternal illness.
6. Multiple pregnancies.

This study was approved by the medical college, Nineveh University, in Mosul city between February 2019 and July 2020. The included criteria were as follows;
1. The pregnancy were in its 13 to 40 weeks.
2. Only one child per pregnancy.
3. Non rupture membranes.
4. Initial AF index between (5 and 95%).
5. Healthy mother.
6. Healthy fetus.
7. No signs for fetal distress.

After the estimation of AFI for each lady, they were told to drink 1.5 liters of water daily for the next 2-4 weeks, and return for the second assessment of the AFI and scheduled all of them into 2 weeks, 4 weeks & no responsive. The AFI before treatment & after treatment were calculated for all the women, and they were asked to submit the liters of water they had consumed. 100 patients with oligohydramnios underwent ultrasound at the time of 1st visit to our outpatient private clinic, 2nd rechecked 2 weeks after 1500 mL of oral hydration therapy \ day. An AFI measurement, a nonstress test, and a biophysical profile using the modified Manning method were performed on day 0. Amniotic fluid index and biophysical profile assessments were repeated 2 weeks after. At the same time the patients are still following their usual regime eating and drinking water at the given orders.patients then were picked randomly by the computer and put into 3 groups (2 weeks, 4 weeks & non-responsive patients). Each patient's age, previous pregnancies, gestational age at birth, type of delivery, fetal birth weight, and fetal and neonatal outcomes (Apgar scores, and need for transfer to the neonatal intensive care unit).AFI were measured using 3.5 MHz transducer colour Doppler ultrasonography (DC-30, Shenzhen Mindray Bio-Medical Electronics Co., Ltd). By the same ultrasonographer. The AFI were measured by the method mentioned by Phelan et al. [20]. Two AFI's were measured in each visit and they were used in analysis. The values before and after using medication with water are presented as the 2weeks, 4 weeks & non-responsive interval groups and according to gestational age whether 2nd or 3rd trimester. The levels of consideration were expressed as P< 0.01 in all analyses. Statistical analysis: The Complete Randomized Design

C.R.D was used with a factorial experiment (Trimester x Interval), Duncan test was used to find the significant differences between the means; also percentages of groups were analyzed using Chi^2 test.

RESULTS

A prospective project in which 100 pregnant ladies were followed in the period from February 2019 to July 2020 in our out private clinic, in Mosul city.

The project includes 100 women with normal singleton pregnancies in the period between second & third - trimester gestation in whom congenital abnormalities excluded.

Table 1 and **Figure 1** show the change in AFI after oral hydration of 100 pregnant women and followed them in 2 weeks and 4 weeks intervals. The mean difference was (0,97 and 1,27)cm and show that the increase in AFI was significant as the P-value < 0.01 which increase in 2 weeks interval 1,27cm and the increase in 4 weeks interval 0.63cm and showed the response to increasing hydration on AFI percentage which was 50% in 2nd trimester but only 18% in 3rd trimester.

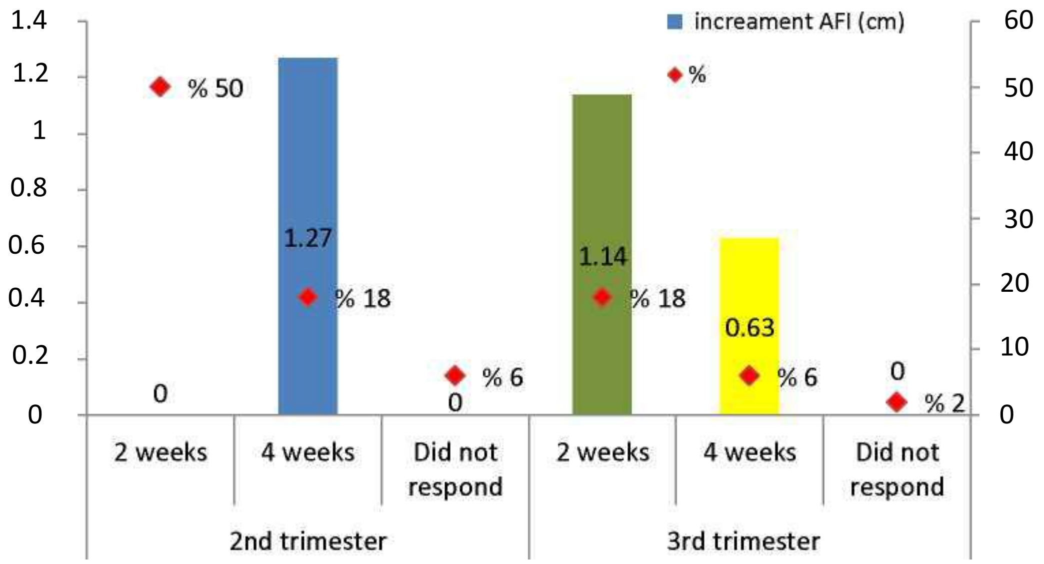

Figure 1. Interaction between trimester and interval on the increament of AFI, and Groups%.

Table 2 and **Figure 2** show the increament in the AFI in the 2nd and 3rd trimesters of pregnancy which show that the diference was significant as the P-value < 0.01 between both groups according to chi but not significant according to Duncan tests.

Table 2. The efect of trimester on the increament of AFI (mean ± SD) and percentage of Chi^2.

		AFI-1	AFI-2	Mean increament AFI in cm	Duncan Test	%
2nd trimester	mean	3 54	4.51	0.96	A	74
	SD			0.61		
	range			0.00-2.50		
3nd trimester	mean	3 96	4.90	0.94	A	26
	SD			0.53		
	range			0-00-2.30		
F value					0.04 NS	
X2 value						23.04**

NS not significant differences between groups, according to the Duncan test.
** refer to higher significant (P < 0.01) diferences between groups, according to the Chi^2 test.

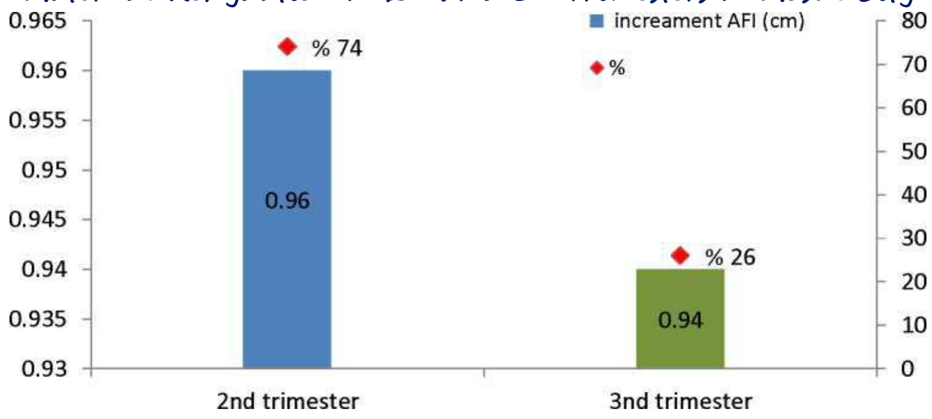

Figure 2. Effect of trimester on the increament of AFI, and Groups%.

Table 3 and **Figure 3** show the increase in AFI in follow up visits of our pregnant ladies and show that the increase was significant as the P-value < 0.01in both chi and Duncan tests.

Table 3. The efect of interval on the increament of AFI (mean ± SD).

		AFI-1	AFI-2	Mean increament AFI in cm	Duncan Test	%
2 weeks	mean	3.57	4.58	1.01	*A*	68
	SD			0.53		
	range			*020 250*		
4 weeks	mean	4 03	5.13	1.11	*A*	24
	SD			*056*		
	range			0.40-2.20		
Did not respond	mean	3.25	3.25	0.00	B	8
	SD			0.00		
	range			0.00		
F value					15.83**	
X^2 value						57.92**

** refer to higher significant (P < 0.01) differences between groups, according to Duncan test.
** refer to higher significant (P < 0.01) differences between groups, according to the Chi^2 test.

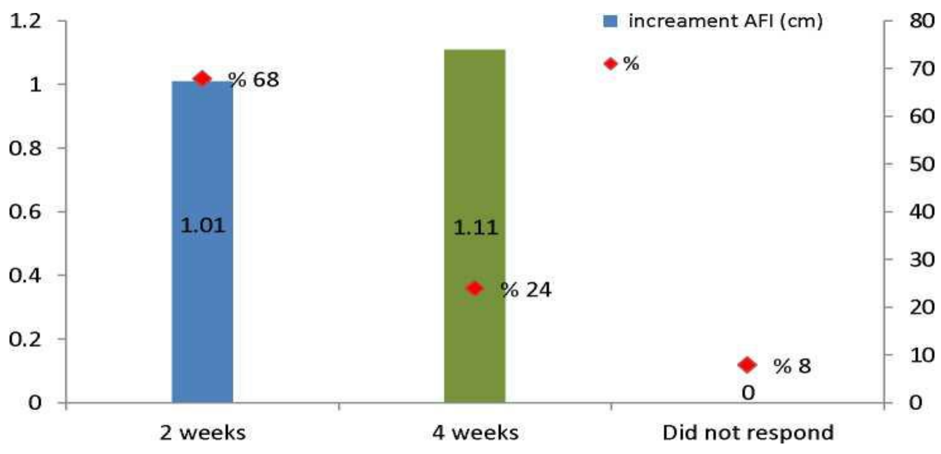

Figure 3. Effect of interval on the increament of AFI, and Groups%.

DISCUSSION

Amniotic fluid is substantial for fetus growth & health [21]. Maternal oral intake of water (2 liters) in pregnant ladies having normal amniotic fluid volume or oligohydramnios helprd increasing the AFI.

This study proved that ingesting water has substantial results in regulating the AFV, in addition to other factors like fetal urination and swallowing [22]. Increase maternal oral intake with hypotonic solution (water) causes osmotic changes, which associated with a parallel decrease in fetal osmolarity, an increase in fetal urine flow, and formation of amniotic fluid. Experiments and more studies needed to assess the real and clinical benefits and possible risks of maternal hydration for certain clinical purposes [23]. Although water intake do increase the AFI, but the time it takes or the method it uses to increase it are not clear. Even though it is unknown why the AFI decreases in some cases, it is acceptable the fetal urine output is the main contributor to amniotic fluid volume after the 24th week of gestation. In non-pregnant persons, diuresis is related directly with osmolality & intravascular volume. Clinical data shows that the fetus is responding to the mothers intravascular volume & osmolality changes [24-26]. Goodline et al. [27] showed the relationship between calculated the mothers intravascular volume and AFV. Many studies show that fetus urination cause changes in the osmolality of the mother. The infusion of mannitol in ewes or the deprivation of water caused a decrease of urination; this indicates that the mothers osmolality is a substantial factor [24-26, 28]. It is well known that the differences in fetus volume or the osmolality can change the urination rate, the AFV, and the volume of the fetus [25].

Ultrasound shows that the AFV. In 2008, Nabhan and Abdelmoula did a research to compare the two main ultrasonic ways to measure amniotic fluid index and the maximum vertical pocket. The results of the research showed that the AFI is more widely used now a day for measuring the amniotic fluid even though it is related to higher incidents of obstetric operations without any improves to the newborn. The presence of an AFI less than 5cm or maximum vertical pocket of lower than 2cm in depth and 1cm in width (20x10 mm) is considered oligohydramnios [29].

Whatever the route of administration of fluid, in uncontrolled trials, Sherer et al in 1990[30], Flack et al in 1995 [31], Chelmow et al in 1996 [32], Ross et al in 1996 [33], Oosterhof et al in 2000 [34], and Umber and Chohan in 2007 [35] show an increase in the amount of amniotic fluid after hydration. There are multiple experiments that showed an improvement in the amniotic fluid index, even though not even one showed any evidence of clear clinical benefits. A research done by Magann et al in 2003 [36] indicated that intravenous hydration of the mother improves both actual & ultrasonic AFV in the 3rd trimester of gestation. The complete part of water in the treatment of idiopathic oligohydramnios is still not fully revealed. In fact there is no unanimity on the usefulness of the forced hydration, or on the way water should be ingested to improve the pregnancy or the fetus's well been.

CONCLUSIONS

We simply confirm oral matemal oral rehydration treatment of 1500 mL/day over time greatly increases the quantity of amniotic fluid in isolated oligohydramnios and may be beneficial in the treatment of oligohydramnios and prevention of oligohydramnios at labour or before external cephalic version.

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