Sudan university of Sciences and Technology

College of Graduate Studies

Measurement of Amniotic Fluid in Diabetic Pregnant UAE

قياس السائل الامنيوني بمرضي السكري في الامارات العربية المتحدة

A these submitted for partial of the requirement of M.S.C degree in Medical diagnostic ultra sound

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Dedication

I dedicate this research to my beloved Family, parents, friends, lecturer and all individuals who participated the efforts which have been carried and by the participants led to the success of the research.

Acknowledgement:

Firstly Researcher would like to thank Allah because everything in this world belongs to him. Researcher is so grateful to extend his acknowledgement to all individuals who participated in data collection.

To my colleague in Alcornich hospital / Police Chinic in the different department, especially Radiology department UAE - U.A.E, Supervisor Dr. Mohamed Omer.

ABSTRACT

The Amniotic Fluid Index (AFI) has been mostly used in the assessment of fetal well-being. This research conducted to reassess and evaluate, compare the amniotic fluid index third trimester of all types of diabetic pregnant women in UAE and assess the correlation between the Amniotic Fluid Volume (AFV) and age, all pregnant status.

The study was conducted at Alcornich hospital / Police Chinic (UAE) on June 2015 by using ultrasound machine with convex transducer with variable frequencies ranging from (3-4 Mhrz).

The research studied 50 emirates diabetic mellitus pregnant women, 40 were controlled diabetes group classified into two subgroups,30 and 10 using medicine and special diet respectively.

It was found that Amniotic Fluid Index (AFI) declines from an average of 14.0 cm at 27 weeks to 11.0 cm at 42 weeks.

There is no correlation between the (AFI) and diabetic age, the (AFI) value remains stable from 27 to 40 weeks of gestational age. The mean (AFI) in normal pregnancies was less than the mean (AFI) in pregnancies complicated by diabetes throughout the gestational period.

Keywords:

Amniotic Fluid Index (AFI),Gestational, Ultrasound Machine.

مستخلص

مؤشر قياس السائل الأمنيوني (AFI) يستخدم في الغالب في تقييم حالة الجنين الطبيعي. هذه الدارسة أجريت لتقييم ومقارنة مؤشر السائل الأمنيوني في الربع الثالث من فترة الحمل. جميع أنواع مصابي السكري في الإمارات العربية المتحدة وتقييم العلاقة بين حجم السائل الأمنيوني (AFV) و العمر،في كل حالات مصابي السكري الحوامل.

اجريت هذه الدراسة في مستشفي الكورنيش – مستوصف الشرطة في شهر يونيو/ حذيران 2015 باستخدام جهاز الموجات فوق الصوتيه مع محول محدب مع ترددات متغيرة تتراوح بين (3-4 Mhz).

اجريت الدراسة ل 50 حالة من مرضي السكري الحوامل بالامارات ، 40 منها تم تصنيفها إلى مجموعتين فرعيتين، 30 منها تسخدم دواء و 10 تستخدام حمية غذائية.

اظهرت نتائج التحليل بصورة كبيرة بأن حالات ارتفاع نسبة السائل الامنيوني اعلي من حالات انخفاضها وذلك يدل علي حلات تاثير مرض السكري علي نسبة السائل الامنيوني (AFI) و وجد ان السائل الامنيوني ينخفض من 14سم في الاسبوع السابع والعشرون الي 11 سم في الاسبوع الثاني والاربعين.

ليست هناك علاقة بين (AFI) وعمر المصابات، تظل قيم (AFI) مستقرة في الفترة ما بين الاسبوع 27 و الاسبوع 40 من عمر الحمل.

كان متوسط (AFI) في حالات الحمل العادية أقل من متوسط (AFI) في حوامل مرضي السكري خلال هذه فترة الحمل.

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INTRODUCTION

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INTRODUCTION

1.1. Introduction

Now days the number of diabetics has increased and one out of every four citizens of the United Arab Emirates has diabetes. Dubai and Abu Dhabi have the second highest diabetes rate in the world. 40 percent of the national health care budget is spent on the treatment. (Kadry, 2009) The majority of people in the emirate are young, so they can still adopt healthy lifestyle measures and avoid diabetes onset. (Zaman, 2009) Measures are also being initiated to improve assimilation of data about diabetes prevalence in the UAE.

The chance of developing diabetes during pregnancy is very high, and cause health risk to both the mother and the unborn baby and diabetes may be more dangerous to females than males. Experts estimate that more than 10 percent of pregnant women in the UAE are affected by diabetes. (Zaman, 2009)

Diabetes is frequently referred to by doctors as diabetes mellitus, describes a group of metabolic diseases in which the person has high levels of glucose in the blood caused by a resistance to the effects of insulin to usher sugar into cells and muscles to be used as fuel, diabetes is commonly believed to be caused by excess consumption of sugary foods and processed, fast-releasing carbohydrates that continually raise blood glucose levels until our reaction to insulin released by the pancreas becomes increasingly ineffective.

Maternal diabetes or gestational diabetes is a condition characterized by high blood sugar (glucose) levels that are first recognized during pregnancy. As the pregnancy progresses, the placenta secretes hormones that make it harder for a woman's body

to use insulin normally, to turn glucose in the blood into fuel for the cells. Thus, the mother needs an increasingly large amount of insulin to maintain normal blood glucose levels. When the mother's pancreas can't keep up with the higher demand for insulin, the body falls behind in processing glucose, and gestational diabetes results. The condition occurs in approximately 4% of all pregnancies. (WebMD Medical, 2013).

The higher the amniotic fluid level, the increased chance of complications. The mother could complain of placental abruption, skeletal malformations due to growth restriction, cesarean delivery, membranes rupturing prematurely, preterm labor and delivery, postpartum hemorrhage or stillbirth. Other risks may include poor fetal positioning and there may bleed severely after giving birth. (Elizabeth.Kitchen, 2011).

Amniotic fluid assessment by ultrasound is one of the important tools in assessing the fetal health in all risk categories especially beyond the period of viability. Though there are several ways to assess quantity of amniotic fluid
ranging from clinical palpation to measurement of single deepest vertical pocket, amniotic fluid index (AFI) by four-quadrant technique as described by Phelan et al. in 1987 and among them AFI is popular and reliable method of quantifying amniotic fluid till today. AFI is one of the essential components of fetal biophysical profile (BPP) and its values correlate well with adequacy of fetal renal perfusion.

Normally it peaks at 32 to 34 weeks of gestation and thereafter there is a gradual reduction in amniotic fluid due to increase in concentrating capacity of fetal kidneys. However, a drastic reduction in its quantity may indicate underlying

placental insufficiency, which has definite implications on growing fetus. The values between 8 and 25 are considered to be normal, 5–8 low normal, and less than 5 oligoamnios.

1.2 The Problem of the Study

My research had several limitation or difficulties just like any other research, in the beginning of the research the biggest difficulty was finding the proper articles or previous researches that can help in answering my research's question

(Measurement of amniotic fluid in diabetic patients)

1.3 Objective of the study

The purpose of this research is to assess the amniotic fluid volume by specific methods as Amniotic fluid Index (AFI) and single deepest/largest pocket in different diabetes status for UEA population using ultrasound so as to evaluate the volume measurements when using those methods as well as to evaluate the amniotic fluid volume in normal and all types of diabetes patients.

1.3.1 General objective

Measurement of amniotic fluid in diabetic patients UAE in order to establish a normal idecies.

1.3.2 Specific objective

1- To measure the amount of amniotic fluid.

2- To evaluate the amniotic fluid amount and.

3- To correlate the findings in patients with regular and irregular medicine intake.

1.4 Significance of the study

To measure the amount of Amniotic Fluid through a few different methods.

The first way called Subjective Visual Assessment (SVA). A SVA of the entire uterus is done to compare the overall amount of fluid free of fetal parts and cord to the area that the baby and placenta are occupying. Using this method, the amount of fluid is described as normal, excessive or decreased.

Another used method is Deepest Vertical Pocket (DVP). The single deepest vertical pocket of fluid that is free of cord and body parts is measured. A normal single-pocket measurement is between 2 cm and 8 cm.

The third and the most commonly used method is through Amniotic Fluid Index (AFI) evaluation or deep pocket measurements. in this procedure the uterus is divided into four quadrants by two imaginary perpendicular lines, while holding the transducer perpendicular to the floor, the largest vertical pocket of fluid that is free of cord and body parts is measured in centimeters A data collection sheet designed to meet the purpose of the studyand filled by three mention observers. Then all sheets analyzed by using SPSS software.

CHAPTER TWO

LITERATURE REVIEW

CHAPTER TWO

LITERATURE REVIEW

Amniotic fluid is vital to the well-being of the fetus. It cushions the fetus from injury, helps prevent compression of the umbilical cord, and allows room for it to move and grow. In addition, its bacteriostatic action helps prevent infection of the intra-amniotic environment. The quantity of amniotic fluid at any time in gestation is the product of water exchange between the mother, fetus, and placenta, and is maintained within a relatively narrow range. Disorders of this regulatory process can lead to either polyhydramnios or oligohydramnios, in which too much or too little fluid exists, respectively. These disorders may result from abnormal fetal or maternal conditions and, conversely, may be responsible for alterations of fetal well-being as well. With the advent of real-time ultrasonography, assessment of amniotic fluid has been possible, resulting in earlier recognition of abnormal conditions and possible intervention. Because precise quantification of amniotic fluid volume is not possible with ultrasonography, various techniques for both qualitative and semiquantitative assessment have been proposed. This chapter reviews the dynamics of amniotic fluid volume (Fig. 1), discusses the causality and prenatal significance of volume disturbances, and reviews the techniques of ultrasonographic assessment of amniotic fluid volume, as well as their role in the antenatal testing of high-risk fetuses.(Zaman, 2009).

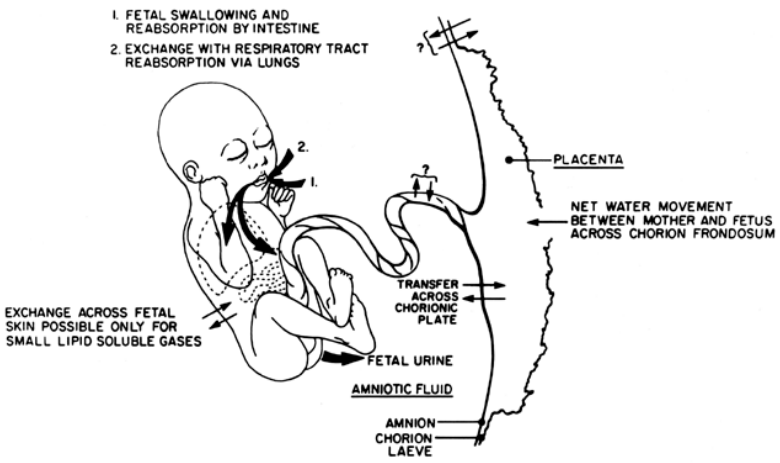

Fig.2.1 Amniotic fluid dynamics

2.1 Amniotic Fluid Dynamics

2.1.1 Amniotic Fluid Production

In the first half of pregnancy, amniotic fluid derived from fetal and possibly maternal compartments. Water and solutes freely traverse fetal skin and may diffuse through the amnion and chorion as well. Thus amniotic fluid in early gestation is a dialysis that is identical to the fetal and maternal plasma, but with a lower protein concentration. Active secretion of fluid from the amniotic epithelium had been previously suggested to play a role in early amniotic fluid formation, but this has not been demonstrated (Elizabeth.Kitchen, 2011).

By the second trimester, the fetal skin becomes keratinized, making it impermeable to further diffusion. At this time, a fetus contributes to amniotic fluid volume and composition almost exclusively through urination. Urine has been observed in the fetal bladder as early as11 weeks transabdominally and 9 weeks Transvaginally. Because fetal urine is hypotonic (80–140 mm/ liter), it results in progressively hypotonic fluid (250–260 mm/liter near term) that contains increasing

concentrations of urea, uric acid, and creatinine as the fetal kidneys mature. By term, a fetus produces on average from 500 to 700 ml/day with a slight decline in hourly fetal urine production after 40 weeks' gestation. (WebMD Medical, 2013).

2.2 Amniotic Fluid Elimination

Amniotic fluid is eliminated by at least three mechanisms. The primary source of elimination is through fetal swallowing, which has been observed as early as 16 weeks Studies using radio labeled red blood cells and radioactive colloid estimate that, on average, a fetus swallows from 200 to 450 ml/day at term, removing 50% of the amniotic fluid produced through fetal urination. This fluid is absorbed through the fetal gastrointestinal system and is either recycled through the kidneys or is transferred to the maternal compartment through the placenta.

A second, more debatable means of amniotic fluid removal may be by the

respiratory tract. Fetal respiratory activity has been observed as early as 11 weeks' gestation. At term, inspiratory flow in the fetus is approximately 200 ml/kg/day, up to 600–800 ml/day. Because amniotic fluid is more hypotonic than fetal plasma, it is postulated that exposure of amniotic fluid to the fetal alveolar capillary bed results in net movement of water from the amniotic cavity into the fetus. Although radioisotopes have been discovered in fetal lungs after intra-amniotic instillation, this quantity has been small and inconsistent, leading investigators to question the actual contribution of fetal respiration to amniotic fluid removal. In fact, surface-active phospholipids originating from the fetal alveoli are found in the amniotic cavity, leading to suggestions that the fetal lungs may actually be a net contributor to amniotic fluid volume.

Amniotic fluid may also potentially be removed by continuous bulk flow (i.e., via hydrostatic and oncotic forces). Exchange of fluid may take place at the chorionic plate, where exposure of the relatively hypotonic amniotic fluid to the fetal surface of the placenta may lead to net reabsorption of water by the fetus (up to 80 ml/day). Transport across the amnion may occur through intercellular channels between amniotic epithelial cells and may be modulated by amniotic fluid prolactin levels. Hebertson and colleagues provided presumptive evidence for the regulatory role of the amniotic epithelium in the transport of fluid. They observed ultrastructural changes in the amnion of pregnancies complicated by disorders of amniotic fluid volume. Whether these changes reflect a causative role in these disorders or rather a response to long-standing fluid imbalance remains to be determined. (Elizabeth.Kitchen, 2011).

A final, perhaps underestimated, pathway for volume regulation may occur within the placenta itself. The large surface area of the fetal capillary/ intervillous interface could magnify small osmolar gradients between a mother and fetus, resulting in large volumes of net water transfer. Exchange of water at this level would influence fetal intravascular volume and potentially affect renal blood flow and urine production.

In addition to bulk flow of fluid, which occurs through pathways that are both phasic (micturition and swallowing) and nonphasic (mediated by hydrostatic and oncotic gradients), there is also bidirectional flow of water between the amniotic and maternal compartments. This process occurs by diffusion, but with no net change in fluid volume. At term, water may leave the amniotic cavity at a rate of 400–500 ml/hour by diffusion plus bulk flow.

2.3 Normal Amniotic Following Volume

Amniotic fluid volume is most predictable in the first half of pregnancy, when it correlates with fetal weight. This may relate to the predominant contribution of fetal skin dialysis to amniotic fluid volume between 8 and 20 weeks. At 12 weeks' gestation, the average volume is 60 ml. By 16 weeks, when genetic amniocentesis is often performed, the mean volume is 175 ml. From 20 weeks on, there is greater variance of amniotic fluid volume. Based on numerous studies using dye or para-aminohippurate dilution, radioactive isotopes, and actual collection of amniotic fluid at amniotomy, it has been determined that amniotic fluid volume increases steadily throughout pregnancy to a maximum of 400–1200 ml at 34–38 weeks; however, wide variation does exist. Despite large fluxes of fluid between the various compartments near term (500–700 ml/day through urine; 200–450 ml/day through deglutition), the net increase of amniotic fluid is only 5–10 ml/day in the third trimester. After 38 weeks, fluid volume declines by approximately 125 ml/week, to an average volume of 800 ml at 40 weeks. After 43 weeks, this volume is reduced to 250 ml. In some instances, this reduction may possibly reflect a shift of cardiac output away from the kidneys as a result of a relative uteroplacental insufficiency. Figure 2 provides approximate volumes at various gestational ages, based on a compilation of 12 published studies of amniotic fluid volumes (Zaman, 2009).

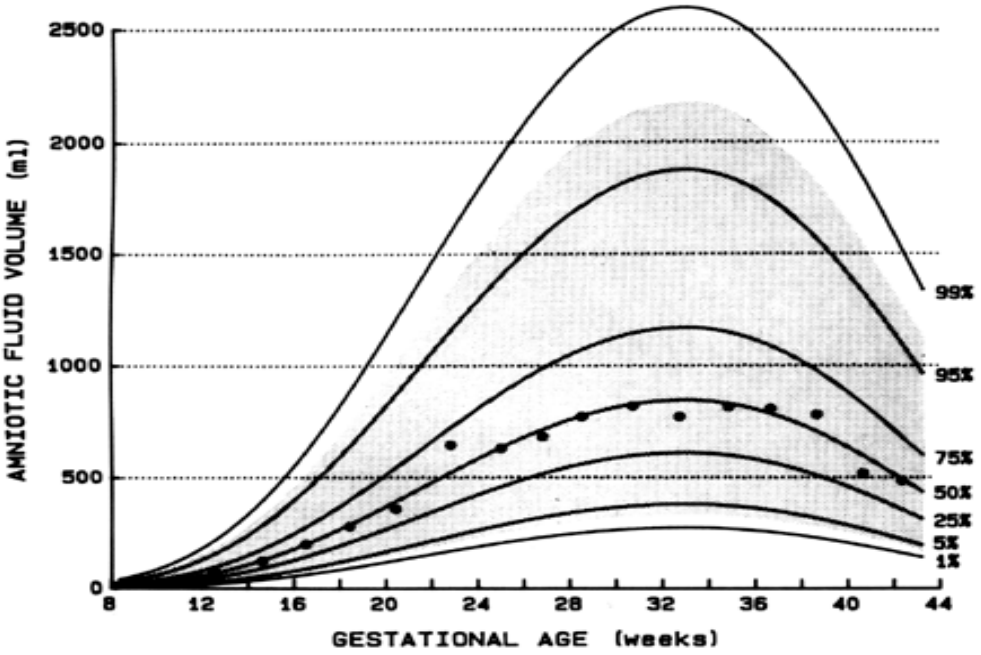

Fig.2 2. Amniotic fluid volumes as a function of gestational age. Shaded area covers 95% confidence interval. (Brace RA, Wolf EJ: Normal amniotic fluid volume changes throughout pregnancy. Am J Obstet Gynecol 161:382, 1989)

2.4 Polyhydramnios

2.4.1 Incidence and Origin

Polyhydramnios, or hydramnios, is defined as an excessive volume of amniotic fluid relative to the gestational age. Polyhydramnios may be acute or chronic. Acute polyhydramnios is usually a fulminant second-trimester process, with fluid accumulating rapidly over a period of a few days. Chronic polyhydramnios has a more gradual onset and course, often presenting in the third trimester. The incidence varies, depending on whether the diagnosis is clinical or sonographic. Overall, polyhydramnios complicates approximately 0.3–1.6% of all pregnancies. Chronic polyhydramnios is more frequent, exceeding the incidence of acute polyhydramnios by a 50: 1 ratio. (Elizabeth.Kitchen, 2011).

Risk factors for polyhydramnios may be broadly divided into maternal, fetal, placental and idiopathic origins (Table 1).

Table 2.1. Risk Factors for Hydramnios

Maternal conditions	Isoimmunization
	Diabetes mellitus
Placental conditions	Chorioangioma
	Circumvallate placenta
Fetal conditions	
Multiple gestations	Twin-to-twin transfusion syndrome
Gastrointestinal	Esophageal atresia, duodenal or jejunal atresia, annular pancreas, midgut volvulus, diaphragmatic hernia, omphalocele, gastroschisis
CNS lesions	Anencephaly, hydrocephalus, encephalocele, spina bifida, microcephaly, hydranencephaly
Skeletal malformations	Arthrogryposis multiplex, osteogenesis imperfecta, thanatophoric dysplasia
Fetal tumors	Cystic adenomatoid malformation of the lung, sacrococcygeal teratoma, cervical teratoma
Cardiac disease	Severe congenital heart disease, fetal arrhythmias
Genetic disorders	Down syndrome, trisomy 13 and 18, Pena-Shokeir syndrome, multiple congenital anomalies, myotonia dystrophica
Fetal renal and endocrine disorders	Vasopressin insufficiency
Hematologic	Homozygous α-thalassemia, fetomaternal hemorrhage

disorders	
Intrauterine infections	Rubella, syphilis, toxoplasmosis, parvovirus
Miscellaneous	Nonimmune hydrops fetalis, fetal retroperitoneal fibrosis
Idiopathic	
Maternal conditions	Isoimmunization
	Diabetes mellitus
Placental conditions	Chorioangioma
	Circumvallate placenta
Fetal conditions	
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Intrauterine infections	Rubella, syphilis, toxoplasmosis, parvovirus
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Idiopathic	

Diabetes mellitus is the most common maternal factor, occurring in approximately 25% of cases. The exact mechanism for polyhydramnios with diabetes is unclear. It may represent fetal polyuria secondary to fetal hyperglycemia. However, van Otterlo and colleagues, measuring fetal urinary output by ultrasonography, found no increase in urine output in 12 of 13 diabetic pregnancies complicated by polyhydramnios Alternatively, fetal glycosuria may lead to an increase in amniotic fluid osmolality, resulting in water transfer from the fetal compartment to maintain osmolar equilibrium. Pedersen, however, found no association between amniotic fluid glucose concentration and volume *(Williams & Wilkins, 1987).*

Isoimmunization is another, albeit decreasing, cause of polyhydramnios. The proposed inciting mechanism is extramedullary hematopoiesis in response to fetal anemia, which results in portal hypertension and hypoalbuminemia. The decrease in colloid oncotic pressure, as well as hydrostatic venous engorgement, leads to extravasation of fluid into the interstitium of the placenta. How this extravascular fluid results in hydramnios is unclear. The extracellular fluid could possibly be transferred across the placenta and membranes into the amniotic cavity. Alternatively, the interstitial fluid in the placenta could perhaps interfere with

water transfer between the fetal and maternal compartments, resulting in fetal volume overload, polyuria, and ultimately polyhydramnios *(Williams & Wilkins, 1987)*.

Fetal conditions have been observed in approximately 20% of polyhydramnios cases. Fetal malformations of the central nervous system (CNS) comprise almost 50% of fetal anomalies, with anencephaly being the most common. The postulated mechanisms for polyhydramnios due to CNS malformations include centrally-mediated reduction in fetal swallowing, fetal polyuria resulting from insufficient production of vasopressin from the fetal pituitary, and transudation of fluid across the uncovered meninges. Gastrointestinal anomalies constitute the second leading structural fetal cause. Any gastrointestinal obstruction proximal to the ligament of Treitz, such as duodenal or esophageal atresia, may interfere with the effective removal of amniotic fluid by the alimentary tract (WebMD Medical, 2013).

Fetal circulatory disturbances account for approximately 7% of fetal anomalies responsible for hydramnios. Structural cardiac malformations and persistent fetal arrhythmias may result in right and left heart failure. Presumably, the resulting increase in venous pressure causes an elevation in hydrostatic pressure in the fetal capillaries, with transudation of fluid into the interstitial space. This mechanism would occur systemically in the fetus, leading to the characteristic appearance of nonimmune hydrops (subcutaneous edema, ascites, pleural and pericardial effusions), as well as in the placenta, resulting in polyhydramnios.

Other circulatory disturbances can also result in polyhydramnios. In twin-to-twin transfusion syndrome, the recipient twin becomes plethoric and may develop hydramnios, either through volume overload, increased renal blood flow, and polyuria, or through a hydropic placenta. The donor twin becomes anemic, often

leading to oligohydramnios and the “stuck twin” syndrome. Placental chorioangiomas and sacrococcygeal teratomas are other abnormalities in which large arteriovenous shunts may lead to high-output cardiac failure and ultimately polyhydramnios (WebMD Medical, 2013).

Inadequate fetal respiratory activity secondary to anomalies may prevent fluid absorption at the alveolar/capillary interface, leading to polyhydramnios. Examples include compressing tumors, such as cystic adenomatoid malformations, displaced abdominal contents, such as congenital diaphragmatic hernia, and thoracic wall abnormalities, such as thanatophoric dysplasia.

Polyhydramnios not associated with an identifiable cause is labeled “idiopathic” and accounts for 30–60% of cases. Further research is necessary to identify other as yet undetermined causes. One such possibility is a disorder of intra-amniotic prolactin regulation by the chorion and decidua. Under normal circumstances, prolactin may be partially responsible for control of water homeostasis in the intra-amniotic environment. *In vitro* studies on human amnion have shown reduced diffusion of water in response to ovine prolactin administered on the fetal side of the membrane. Hence, an overproduction of decidual prolactin may impair diffusional flow of water away from the amniotic compartment, leading to polyhydramnios.

2.5 Clinical Presentation

The maternal signs and symptoms of polyhydramnios are usually caused by the overdistended uterus and its compressing effect on intrathoracic and intra-abdominal organs. Elevation of the diaphragm can result in dyspnea and occasionally respiratory distress. Back and abdominal discomfort are also frequent

complaints, as are nausea and vomitting. Edema of the lower extremities may result from compression of the inferior vena cava (WebMD Medical, 2013).

2.6 Diagnosis of Polyhydramnios

The diagnosis of polyhydramnios had formerly been a clinical one, retrospectively based on the presence of more than 2000 ml of amniotic fluid at the time of delivery or membrane rupture. Antenatal suspicion was raised by difficulty in palpating fetal parts, distant fetal heart sounds by unamplified auscultation, a tense uterine wall, and disproportionate growth of the fundal height. Historically, amniography was used to qualitatively assess amniotic fluid volume. This method was subsequently supplanted by static ultrasonographic imaging, which was used to calculate total intrauterine volume (TIUV). However, inaccuracies in measurement as well as the advent of real-time ultrasonography led to the abandonment of TIUV. Real-time ultrasonography is now the primary means of amniotic fluid volume assessment; however, strict ultrasonographic criteria have never been uniformly adopted. Chamberlain and colleagues arbitrarily defined polyhydramnios as a fluid pocket of at least 8 cm in vertical and transverse diameters. Using this criterion, the incidence of polyhydramnios in a select high-risk referral population was 3.2%. Those patients with polyhydramnios had a higher incidence of major congenital anomalies (4%), macrosomia (33%), and perinatal mortality (3.3%) compared to a control group with normal amniotic fluid volume. More recently, the amniotic fluid index (AFI), which is discussed in more detail later in this chapter, has replaced the largest vertical pocket in many ultrasound units. An AFI of greater than 20 cm was arbitrarily defined as excessive amniotic fluid volume. An alternative to the semi-quantitative techniques mentioned above is simply the subjective impression of increased amniotic fluid

volume. Subjective criteria have included the displacement of the fetus from the anterior uterine wall by amniotic fluid, as well as the presence of “floating extremities.” Simply put, if there appears to be excessively abundant fluid, it probably is. Bottoms and colleagues, using subjective criteria, found that the sensitivity and positive predictive value in detecting infants large for gestational age were similar to the 8-cm largest vertical pocket rule.

2.6.1 Perinatal Complications

The increased perinatal morbidity and mortality associated with polyhydramnios are due to both an increase in congenital/genetic anomalies and preterm births. Perinatal mortality used to approach 100% with acute polyhydramnios; however, with aggressive repetitive amniocentesis, survivors have been reported. Chronic polyhydramnios tends to have a better prognosis, especially if idiopathic in origin. Perinatal mortality has ranged from 34% to 69% in older studies. However, Chamberlain and colleagues quoted a 3.3% mortality when the diagnosis was made sonographically. Some of the variation in survival may be a function of diagnostic criteria differences and prenatal therapy, as well as improved survival of both preterm and anomalous infants. (Elizabeth.Kitchen, 2011).

Polyhydramnios may be complicated by preterm labor in up to 26% and premature rupture of membranes in up to 19% of cases. Both may occur as a result of overdistention of the uterus. Malpresentations are also encountered more frequently, as a result of both the abundance of amniotic fluid in which the fetus may maneuver and the earlier gestational age at the time of delivery. Other intrapartum complications may include placental abruption due to rapid decompression of the uterus at the time of rupture of membranes, dysfunctional labor patterns, and postpartum hemorrhage as a result of uterine atony.

2.6.2 Clinical Management

Treatment of polyhydramnios may be medical or surgical or both. The method chosen will depend on the etiology, severity, clinical symptoms, and gestational age at diagnosis, as well as the presence and type of associated anomalies.

If the diagnosis is made on the basis of ultrasonographic findings, an attempt should be made to establish the cause. In cases that are not acute or severe and are not associated with a fetal malformation, patients should be rescanned periodically to assess the progression or improvement of the fluid volume. Some reports have documented gradual resolution of polyhydramnios, either spontaneously or as a result of treating the underlying cause (*e.g.*, control of hyperglycemia, intrauterine transfusion of the anemic fetus). These pregnancies progressed uneventfully after resolution of the polyhydramnios, with no adverse sequelae observed (Elizabeth.Kitchen, 2011).

In the absence of rapidly progressive polyhydramnios or maternal symptoms, management is expectant. If a patient experiences increasing dyspnea, back pain, or preterm labor, hospitalization for possible tocolysis and amniocentesis should be considered. Medical management, including salt restriction, diuretics, and intra-amniotic vasopressin has not proved beneficial. Indomethacin has been suggested as a therapeutic modality to reduce the amniotic fluid volume, because it has been observed to decrease urinary output in neonates being treated for patent ductus arteriosus. A reduction in amniotic fluid has been observed in one series of eight patients with hydramnios treated with indomethacin, as documented by decreasing fundal height measurements and largest vertical fluid pocket by ltrasonography. This observation further confirms the important contribution of fetal urination in overall amniotic fluid dynamics. Although case reports and early studies suggested

the therapeutic benefit of indomethacin in the treatment of polyhydramnios, it is not typically used in the third trimester, due to its recognized affects of in-utero narrowing of the fetal ductus arteriosus, which can result in pulmonary hypertension postnatally.

Therapeutic amniocentesis, or amnioreduction, is an effective modality for acute decompression of the tense and distended uterine cavity.It is typically performed for relief of maternal symptoms or preterm labor. It should be performed under ultrasonic guidance to avoid fetal contact, using a long 20 gauge amniocentesis needle which is often connected via plastic tubing to a suction bottle. Amnioreduction is usually accomplished over 30–45 minutes, although no ideal time period for drainage has been established.During this time, uterine contractions may occur, which can be uncomfortable for the patient.Typically, these

contractions will abate spontaneously within 24 hours after the procedure has been completed. The quantity of amniotic fluid that should be removed has also not been established and may be dependent on gestational age, severity, and rapidity of reaccumulation. Volumes aspirated in various reports have ranged from 200 to 4000 ml There has been concern that too rapid or too extensive a decompression could result in placental separation. Amniocentesis may need to be repeated initially 2–3 times in the first week, followed by weekly amnioreduction or as clinically indicated. Periodic evaluation of maternal electrolytes and serum protein may need to be assessed if frequent amniocenteses are required although no studies have demonstrated the efficacy of such surveillance (Elizabeth.Kitchen, 2011).

2.7 OLIGOHYDRAMNIOS

2.7.1 Incidence and Origin

Oligohydramnios is defined as a decrease in the volume of amniotic fluid, relative to the gestational age. The incidence in an unselected population without membrane rupture ranges from 0.4% to 19%, depending on the criteria used for diagnosis and the study population. Oligohydramnios onset may be either acute or chronic. Acute onset is most commonly the result of membrane rupture, whereas chronic oligohydramnios may reflect a structural abnormality of the fetal urinary tract or a pathophysiologic response to chronic or intermittent fetal hypoxemia. Risk factors for oligohydramnios are shown in Table 2.

Table 2. Risk factors for oligohydramnios Chronic and/or intermittent fetal hypoxemia Fetal growth restriction Postterm pregnancy Repetitive cord compression Fetal anomalies Renal agenesis
Renal anomalies (e.g., multicystic dysplastic kidneys, polycystic kidneys)
Posterior urethral valves Bilateral ureteropelvic junction obstruction

Non-steroidal anti-inflammatory medications Twin-to-twin transfusion
Premature rupture of membranes

2.7.2 Pathogenesis

Spontaneous premature rupture of membranes (PROM) is the most common cause of acute oligohydramnios. The incidence of rupture of membranes before term is approximately 1–2%. Vintzileos and colleagues found that 35% of patients with PROM did not demonstrate a vertical amniotic fluid pocket greater than 2 cm, and this figure did not vary with gestational age.

Chronic oligohydramnios may be the product of major fetal anomalies or prenatal hypoxia. The importance of the contribution of fetal urine to amniotic fluid volume is demonstrated by several fetal anomalies in which there is either obstruction of the urinary tract or bilateral renal agenesis/dysfunction. These anomalies are associated with decreased amniotic fluid formation.

Chronic or intermittent fetal hypoxia may also result in reduced amniotic fluid volume. Chronic low-grade fetal hypoxia may be a consequence of long-standing uteroplacental insufficiency or maternal hypoxia, whereas prenatal cord compression may lead to either prolonged or repetitive episodes of acute hypoxia of varying intensity and duration. Corroborative evidence for this pathophysiologic process leading to oligohydramnios exists in both animal and human models.

Table 2.2 Amniotic fluid index values in normal pregnancy (in mm)

	Amniotic fluid index percentile values					
Week	**2.5th**	**5th**	**50th**	**95th**	**97.5th**	***N***
16	73	79	121	185	201	32
17	77	83	127	194	211	26
18	80	87	133	202	220	17
19	83	90	137	207	225	14
20	86	93	141	212	230	25
21	88	95	143	214	233	14
22	89	97	145	216	235	14
23	90	98	146	218	237	14

	Amniotic fluid index percentile values					
Week	**2.5th**	**5th**	**50th**	**95th**	**97.5th**	***N***
24	90	98	147	219	238	23
25	89	97	147	221	240	12
26	89	97	147	223	242	11
27	85	95	146	226	245	17
28	86	94	146	228	249	25
29	84	92	145	231	254	12
30	82	90	145	234	258	17
31	79	88	144	238	263	26
32	77	86	144	242	269	25
33	74	83	143	245	274	30
34	72	81	142	248	278	31
35	70	79	140	249	279	27
36	68	77	138	249	279	39
37	66	75	135	244	275	36
38	65	73	132	239	269	27
39	64	72	127	226	255	12
40	63	71	123	214	240	64
41	63	70	116	194	216	162
42	63	69	110	175	192	30

2.8 Comparison of Ultrasonographic Assessment of Amniotic Fluid Volume

To date, no single method to assess amniotic fluid volume has proved to be the most valuable clinically. Difficulty in comparing fluid assessment methods arises from differences in the population tested, the abnormal end point chosen, and the variety of ultrasonographic criteria. The 2 cm rule traditionally had been most widely used, predominantly as a component of the biophysical profile. Recently, however, the amniotic fluid index has appeared with increasing frequency in the literature and in clinical practice. The AFI, by measuring all four quadrants, would appear to more accurately assess serial changes in fluid volume over time, compared to a single vertical pocket, which might be subject to greater variation due to fetal positioning. Additionally, by using gestation-specific norms, the AFI may more accurately reflect abnormalities in fluid volume compared to the 2 cm rule. However, the AFI has not been evaluated as extensively in identifying the fetus at risk for IUGR, cord compression, and abnormal perinatal outcome. By comparison, the use of subjective criteria, which may be less dependent on fetal positioning in serial testing, relies more on a gestalt of fluid volume than on any one measurement value. As a result, the experience of the examiner may be more critical in determining if the amniotic fluid is appropriate for the gestational age, as the same subjectively normal amniotic fluid volume at 42 weeks might be decreased for 34 weeks. Additionally, subjective criteria may vary from individual to individual, making interobserver communication and statistical comparisons more difficult to express. At the author's institution, the amniotic fluid volume is initially assessed subjectively. If it is normal, no AFI or largest vertical pocket is measured. However, if the fluid subjectively appears decreased, an AFI is calculated.

The variability in definitions of ultrasound-based oligohydramnios was highlighted in a clinical commentary by Magann and colleagues, which included a plea for future studies that correlate amniotic fluid volume assessment to clinically relevant perinatal outcomes. Fischer and colleagues assessed postdate women and compared various ultrasound criteria for oligohydramnios with a composite perinatal outcome.The largest pocket in each quadrant was measured in two perpendicular planes. Indices evaluated included the largest vertical pocket, largest transverse pocket, AFI, largest pocket product (vertical x transverse), sum of all pocket measurements, and the sum of the pocket products. They found that the largest vertical pocket, the AFI, and the sum of all pockets were significantly different between the normal and abnormal perinatal outcome groups. Using receiver operating characteristic curves to establish optimal threshold values, a vertical pocket of 2.7 was ideal in identifying abnormal perinatal outcome. No optimal AFI cutoff based could be established based on the ROC curve.

Chauhan and colleagues performed a prospective randomized clinical trial comparing the AFI to the largest vertical pocket. They randomly assigned 1080 high risk gravidas to be followed with weekly nonstress tests and either an AFI or largest vertical pocket. They defined oligohydramnios as either an AFI of 5 cm or less, or the absence of a fluid pocket measuring at least 2 x 1 cm. Women followed by the AFI was significantly more likely to be diagnosed with oligohydramnios than those in the largest vertical pocket group (17% vs. 10%, $p = 0.002$). However, there was no difference between the two fluid assessment techniques with regards to cesarean delivery for non-reassuring fetal heart rate testing, Apgar score, umbilical artery pH <7.1, or admission to the neonatal intensive care unit. The authors concluded that using the AFI increases the number of interventions for oligohydramnios without improving perinatal outcome. They also observed that

both techniques of amniotic fluid assessment are poor diagnostic tests for predicting adverse perinatal outcome (WebMD Medical, 2013).

2.9. Clinical Significance of Oligohydramnios

The literature suggests that oligohydramnios does increase the risk in a fetus with no major anomalies. However, the clinical significance of oligohydramnios differs between studies, depending on criteria used and end points evaluated. Overall, decreased amniotic fluid is associated with a higher incidence of SGA infants (less than the 10th percentile for gestational age), postmaturity syndrome, variable and late decelerations in labor, cesarean section for nonreassuring fetal heart rate tracing, lower umbilical artery pH, lower Apgar scores, and higher perinatal mortality. Second-trimester oligohydramnios is especially associated with adverse perinatal outcomes, as a result of both pulmonary hypoplasia and lethal congenital anomalies .

The relative degree to which the increased morbidity results from either the underlying condition producing the oligohydramnios or from a direct effect of the reduced fluid (*i.e.*, umbilical cord compression) has not been determined. However, there is some suggestion that part of the risk of cord compression may be reversible, as indicated by studies in which fluid was removed versus those in which fluid was replaced (amnioinfusion) to determine clinical effect. Gabbe and colleagues noted that removal of amniotic fluid from the amniotic cavity of fetal monkeys resulted in variable decelerations secondary to cord compression. This pattern resolved after amnioinfusion. Confirmation of this finding in humans has been demonstrated by Miyazaki and associates, who observed a significant diminution of intrapartum variable decelerations in 5 1% of patients treated by amnioinfusion through an intrauterine pressure catheter. Nageotte and co-workers

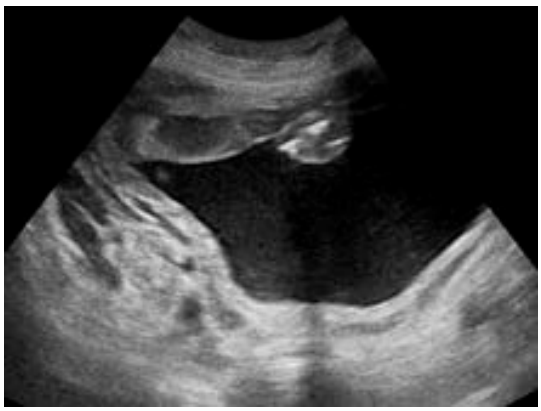
observed a significantly lower rate of variable decelerations and higher cord pH values in patients who had PROM and underwent prophylactic amnioinfusion.

Pulmonary hypoplasia, as measured by low wet lung weights, low lung DNA content, and low radial alveolar counts, can occur after PROM and oligohydramnios in the very preterm gestation (<24 weeks). It may result from limitation of lung expansion secondary to prolonged external compression, inhibition of fetal respiratory movements, and lack of fluid circulation into the terminal alveoli, which may require growth factors contained in amniotic fluid that are critical for alveolar development. In one study of PROM in which pulmonary hypoplasia was observed, the majority of cases were less than 26 weeks at the time of membrane rupture, suggesting that the developing terminal air sacs are more susceptible to the damaging effects of oligohydramnios. Further, prolonged oligohydramnios increases the risk of Potter's sequence, which, in addition to pulmonary hypoplasia, includes fetal skeletal and facial deformities due to prolonged external compression (WebMD Medical, 2013).

2.10.1. Polyhydramnios (**polyhydramnion**, **hydramnios**, **polyhydramnios**) is a medical condition describing an excess of amniotic fluid in the amniotic sac. It is seen in about 1% of pregnancies. It is typically diagnosed when the amniotic fluid index (AFI) is greater than 24 cm. There are two clinical varieties of polyhydramnios:

- Chronic polyhydramnios where excess amniotic fluid accumulates gradually
- Acute polyhydramnios where excess amniotic fluid collects rapidly

The opposite to polyhydramnios is oligohydramnios, a deficiency in amniotic fluid.



In most cases, the exact cause cannot be identified. A single case may have one or more causes, including intrauterine infection (TORCH), rh-isoimmunisation, or chorioangioma of the placenta. In a multiple gestation pregnancy, the cause of polyhydramnios usually is twin-to-twin transfusion syndrome. Maternal causes include cardiac problems, kidney problems, and maternal diabetes mellitus, which causes fetal hyperglycemia and resulting polyuria (fetal urine is a major source of amniotic fluid).

A recent study distinguishes between mild and severe polyhydramnios and showed that Apgar score of less than 7, perinatal death and structural malformations only occurred in women with severe polyhydramnios. In another study, all patients with polyhydramnios, that had a sonographically normal fetus, showed no chromosomal anomalies.

Few cases are associated with fetal anomalies that impair the ability of the fetus to swallow (the fetus normally swallows the amniotic fluid), but these anomalies include:

- gastrointestinal abnormalities such as esophageal atresia, duodenal atresia, facial cleft, neck masses, tracheoesophageal fistula, and diaphragmatic hernias. An annular pancreas causing obstruction may also be the cause.

- Bochdalek's hernia, in which the pleuro-peritoneal membranes (especially the left) will fail to develop & seal the pericardio- peritoneal canals. This results in the stomach protrusion up into the thoracic cavity, and the fetus is unable to swallow sufficient amounts of amniotic fluid.
- fetal renal disorders that results in increased urine production during pregnancy, such as in antenatal Bartter syndrome. Molecular diagnosis is available for these conditions.
- neurological abnormalities such as anencephaly, which impair the swallowing reflex
- chromosomal abnormalities such as Down syndrome and Edwards syndrome (which is itself often associated with GI abnormalities)
- Skeletal dysplasia, or dwarfism. There is a possibility of the chest cavity not being large enough to house all of the baby's organs causing the trachea and esophagus to be restricted, not allowing the baby to swallow the appropriate amount of amniotic fluid.

2.11. Measurement of amniotic fluid volume

Initial studies to objectively measure amniotic fluid volume (AFV) involved dye dilution techniques. The techniques were accurate, although they required amniocentesis, an invasive procedure that increased the risk of perinatal morbidity.

The routine use of ultrasonography has created a safe, reliable, and repeatable method of measuring AFV. Early methods of assessing AFV with ultrasonography involved nonquantitative assessments, including sonographers' subjective impression of AFV.

Subjective oligohydramnios criteria have included the following:

- The absence of fluid pockets throughout the uterine cavity
- Crowding of the fetal limbs
- The absence of pockets surrounding the fetal legs
- Overlapping of the fetal ribs (in severe cases)

The 2 most commonly used objective methods of determining AFV include measurement of the single deepest pocket (SDP) and the summation of the SDPs in each quadrant, or the amniotic fluid index (AFI). These tests are routinely performed with the patient in the supine or semi-Fowler position, although studies have demonstrated accuracy in the lateral decubitus position as well.

The ultrasound transducer is held along the maternal longitudinal axis and maintained perpendicular to the floor while the SDP of the amniotic fluid is measured. Pockets should be free of fetal limbs and the umbilical cord, although some authors allow for a single loop of cord to be within the fluid pocket. AFV may be artificially increased if the transducer is not maintained perpendicular to the floor. Excessive pressure on the maternal abdomen with the transducer may lead to an artificially reduced measurement (see the image below).

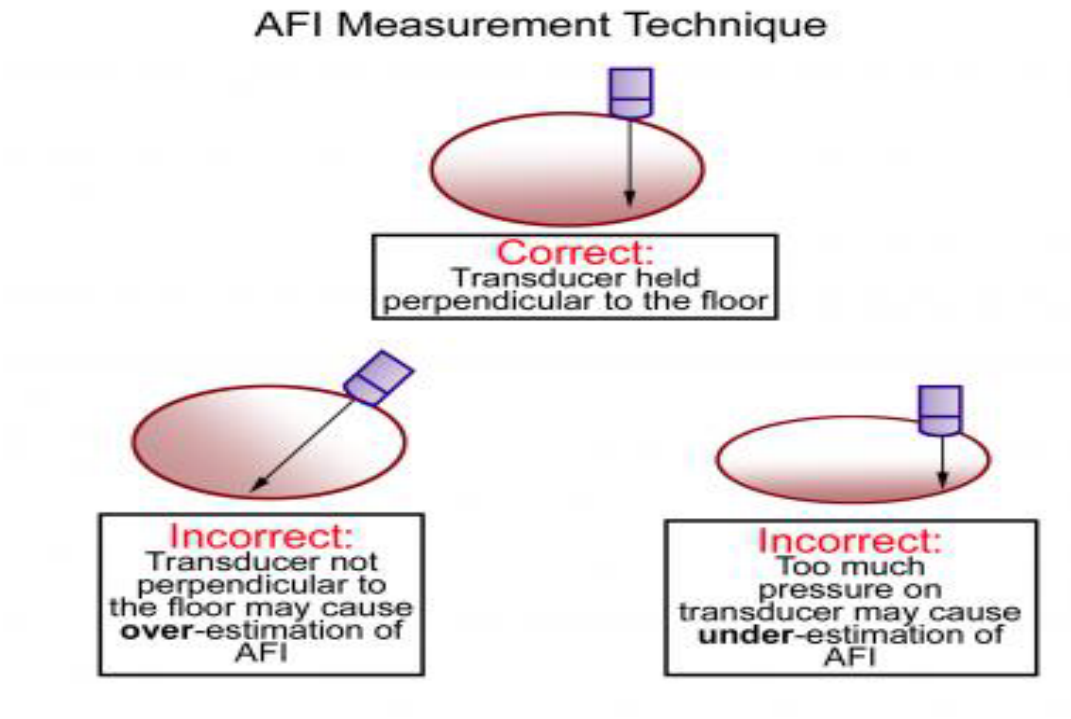


Fig.2. 3 Amniotic fluid index (AFI) measurement technique.

Phelan et al described the AFI as a quantitative measurement to predict a poor pregnancy outcome and the success of external cephalic versions. The pregnant abdomen is divided into 4 quadrants by using the umbilicus as a reference point to divide the uterus into upper and lower halves and by using the linea nigra to divide the uterus into left and right halves. The 4 measurements are summed to obtain the AFI in centimeters.

In gestations earlier than 20 weeks, measurements from the 2 halves are divided by the linea nigra to obtain the AFI. Tables of the normal limits for AFI, based on the gestational age (see the Gestational Age from Estimated Date of Delivery calculator), have been published for singleton and multiple pregnancies (see an example below). The mean AFI for normal pregnancies is 11-16 cm.

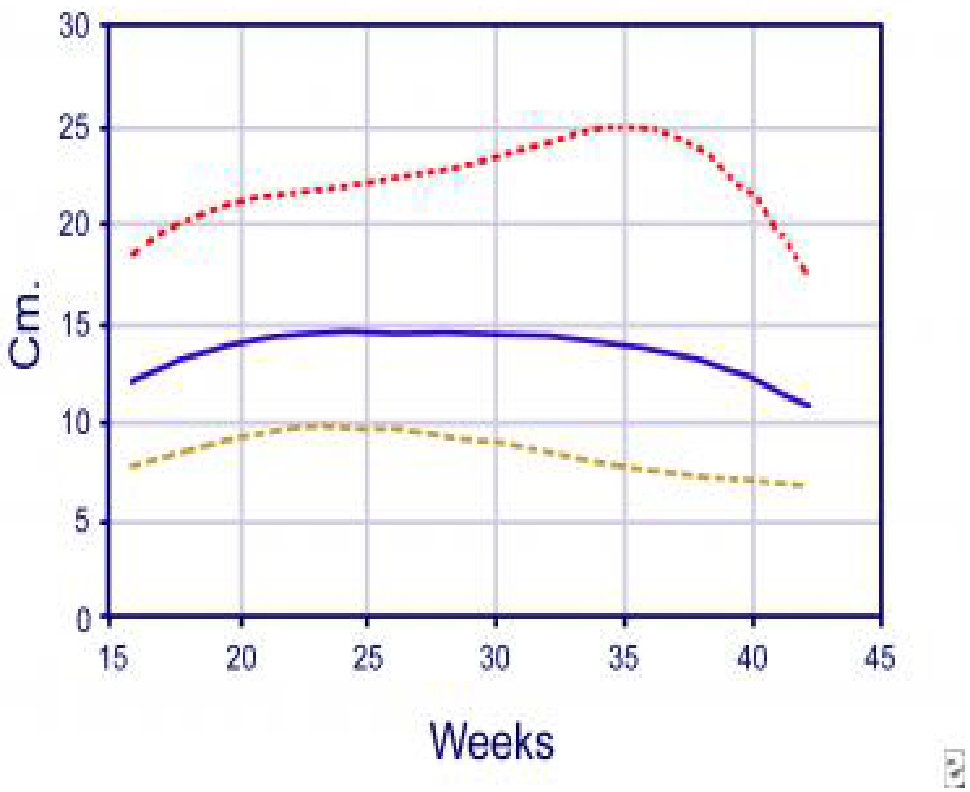


Fig.2. 4 Amniotic fluid index (AFI) during a normal human singleton pregnancy.

The solid line is the mean AFI, the lower dotted line is the 5th percentile value, and the upper dotted line is the 95th percentile value (data adapted from Moore, 1990). Image courtesy of Christopher L. Sistrom, MD.The test is reproducible, with interobserver and intraobserver variations of about 10-15% or 1-2 cm in pregnancies with normal AFVs. The margin of error is less in patients with decreased amounts of amniotic fluid

CHAPTER THREE

MATERIAL AND METHODS

Chapter Three

Material and Methods

- This research implemented by an ultrasound machine with convex transducer with variable frequencies ranging from (3—4 Mhrz)

3.1 Designs of the study

This an analytical case controlled study, consisted of female clinical diabetic in three cases groups (Using medicine - With diet – non medicine & diet)

3.2 Population of the study

Adult Female patient evaluate clinical diabetic (all types) with pregnancy as well as those female patients findings measuring of AFI and refer to ultrasound to distinguish AFI,… etc.

3.3 Sample of the study

The samples of this research were 50 diabetic pregnant patients.

3.4 Duration and place of the study

The study conducted on June 2015 in Khalifa .A Center.(UAE).

3.5 Technique of data collection

- All pregnant patients were seated supine and a gel introduced on patient abdomen .
- Sagittal and transverse scanning done .
- The big pocket without any fetal parts measured and stated
- Another method of measurement including the statement of four quadrents with umbilical dot as a reference mark**.**

3.6 Method of data analysis : The data analyzed by using Excel and SPSS high-frequency technology.

CHAPTER FOUR

RESULTS

Chapter four

Results

4.1 Results

The following tables from (3.1- 3.7) illustrate the cases of demographic data, diabetes mellitus, age, type of diabetes and ultrasound results:

Table (4.1) showing ages, frequencies and percentages.

Ages	Frequencies	Percentages
15-19	01	02%
20-24	14	28%
25-29	07	14%
30-34	16	32%
35-39	06	12%
40-44	06	12%
Total	50	100%

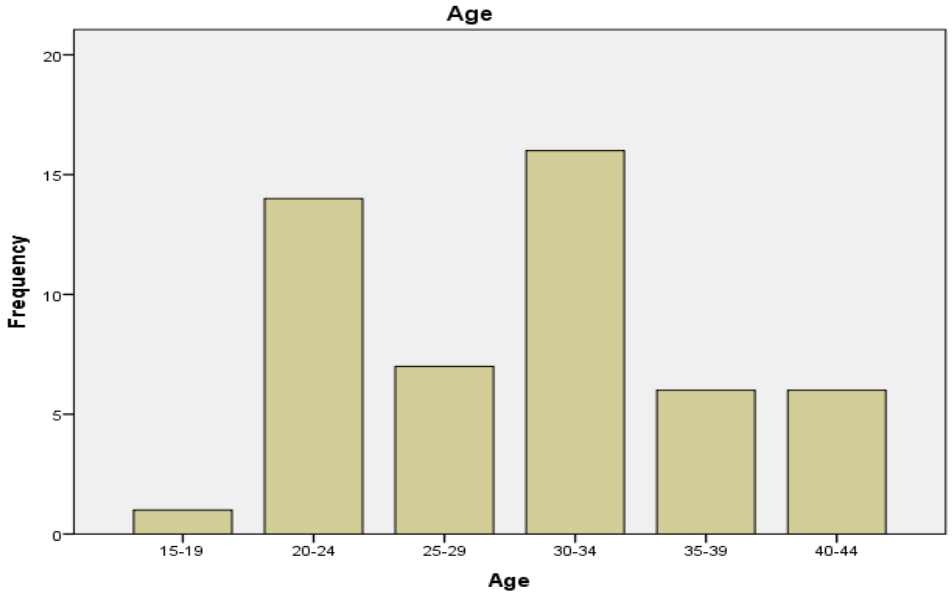


Fig (4.1) Bar diagram above showing age, frequencies and percentages.

Table (4.2) showing classes of diabetes mellitus, frequencies and percentages:

Diabetes Classes	Frequencies	Percentages
Gestational	14	28%
Type 1	13	26%
Type 2	23	46%
Total	50	100%

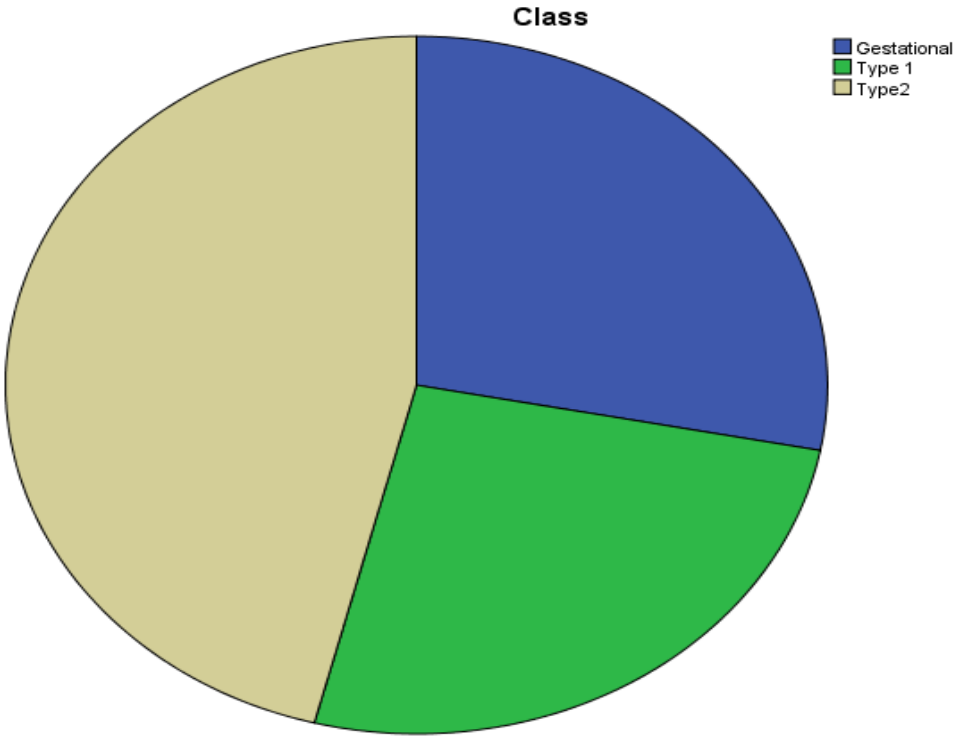


Fig (4.2) Pie diagram above showing diabetes classes, frequencies and percentages.

Table (4.3) showing ultrasound results, frequencies and percentages.

Ultrasound	Frequencies	Percentages
Normal	16	32%
Polyhydramios	31	62%
Oligohydramios	03	06%
Total	50	100%

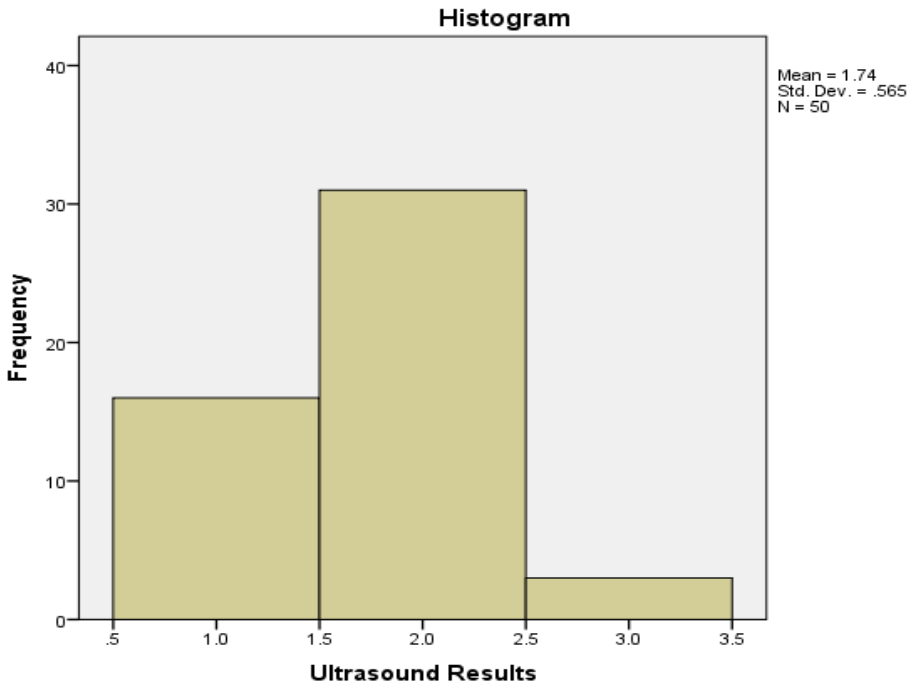


Fig (4.3) Histogram above showing ultrasound results, frequencies and percentages.

Table (4.4): showing Diabetic Status, Frequencies and Percentages:

Diabetic Status	Frequencies	Percentages
Controlled	40	80%
Uncontrolled	10	20%
Total	50	100%

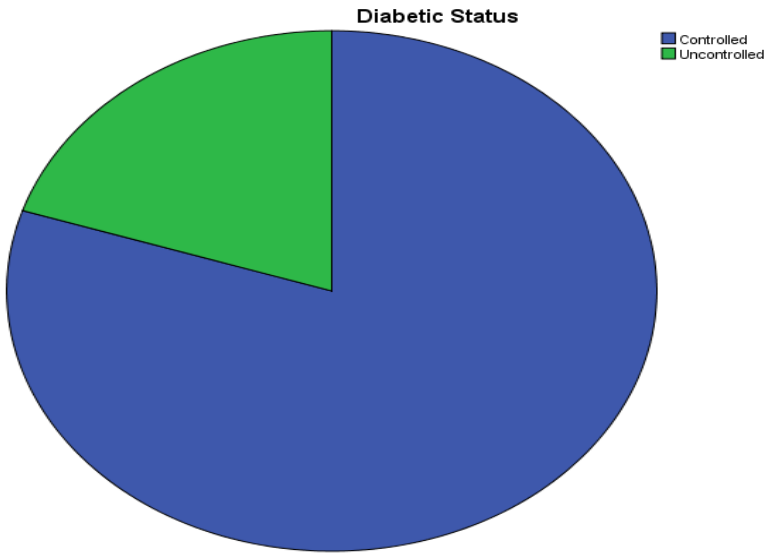


Fig (4.4) Pie diagram above showing diabetic status, controlled and uncontrolled.

Table (4.5) showing cross tabulation between diabetic Classes and ultrasound results:

Diabetic Classes	Normal	Ultrasound Results		Total
		Polyhydamios	Oligohydramios	
Gestational	14	00	00	14
Type1	02	11	00	13
Type2	00	20	03	23
Total	16	31	03	50

Note:

All values of (AFI) less than 5 cm and higher than 25 cm are considered as Oligohydramios and Polhydramios respectively.

Table (4.6) showing cross tabulation between ultrasound results and diabetic status:

Diabetic Status	Ultrasound Results			Total
	Normal	Polhydramios	Oligohydramios	
Controlled	16	24	00	40
Uncontrolled	00	07	03	10
Total	16	31	03	50

Note:

All values of (AFI) less than 5 cm and higher than 25 cm are considered as Oligohydramios and Polhydramios respectively.

Table (4.7): showing cross tabulation between diabetic classes and diabetic status:

Diabetic Classes	Diabetic Status		Total
	Controlled	Uncontrolled	
Gestational	14	00	14
Type1	13	00	13
Type2	13	10	23
Total	40	10	50

Table (4.8): showing cross tabulation between age and diabetic classes:

Ages	Diabetic Classes			Total
	Gestational	Type1	Type2	
15-19	01	00	00	01
20-24	13	01	00	14
25-29	00	07	00	07
30-34	00	05	11	16
35-39	00	00	06	06
40-44	00	00	06	06
Total	14	13	23	50

CHAPTER FIVE
DISCUSSION, CONCLUSIONS AND RECOMMENDATION

Chapter five

Conclusions

5.1 Discussion:

The Amniotic Fluid Index (AFI) provides a semi quantitative analysis of the amniotic fluid volume.

The technique is simple and highly reproducible. The intra-observer and inter-observer variations have been found to be small and correlate to fetal movement.

This study provides gestational age specific values of the (AFI) in normal pregnancies in third trimester, which are in somehow disagree with some previous reports e.g. Elsafi A. Abdalla et al: evaluate of Amniotic Fluid Volume among Sudanese Diabetic Patients in third trimester using ultrasound too.

Resemble to other previous studies in diabetic pregnancies during third trimester this research indicating from correlation analysis, the (AFI) diabetic patients follows a different pattern than (AFI) of normal patients.

This findings have significant implications in term of clinical applications of (AFI)measurements in the fetal well-being measurements.

The research studied pregnant diabetic woman, their ages ranged between fifteen and forty four years old, frequency and percentage shown in table (4.1) and diagram (4.1). All cases were classified in to three classes: Gestational, type 1 and type 2 and their frequency and percentages were (14-28%) , (13-26%) and , (23 - 46%) respectively. Shown in table (4.2) and pie diagram (4.2)

The results of ultrasound frequencies and percentages were as follows: Normal (16-32%), poolyhydramios (31 – 62%) and oligohydramios (03-06 %) ,shown in table (4-3) and histogram (4-3)

All the fifty cases were classified into two groups; controlled (40%) and uncontrolled (10-20%), and the controlled group classified into two sub groups,

(30) were using medicine and (10) were using specific diet. Shown in table (4 – 5) and pie diagram (4-4). Cross tabulation was carried out to classify the relation between ultrasound results and diabetic classes, shown in table (4-5) also tables (4-6) and (4-7) illustrate diabetes classes and diabetes status respectively, putting in account that all values of (AFI) less than 5 cm are considered as oligohydramios and higher than 25 cm are polyhydramios.

The table (4-8) illustrates cross tabulation between ages and diabetes classes where numbers of diabetes type 2 were found to be the highest compared with Gestational and diabetes type 1.

5.2 Conclusion:

This research studied all types of diabetic pregnant women (UAE), Their ages varied between (15-44yrs) and was conducted in Khalifa A.Center in United Arab of Emirates.

All screening procedures and measurement of Amniotic Fluid Index (AFI) done by using ultrasonography which is universally reliable and guaranteed.

Measurements of Amniotic Fluid Volume(AFV) It is important for detecting any alteration due to all types of diabetic mellitus which jeopardize lives of the mother and unborn infant.

5.3 Recommendations:

My first recommendation goes to all physicians and other workers in medical domains to facilitate the means of sample collecting, because it would help in carrying out the experiments and researches, which was one of the obstacles I faced.

I strongly urge all the people in arabs countries and in United Arabs of Emirates in particular to manage and change their life styles, because that's help in reduction and eradication of many diseases including diabetes mellitus, thus saving lives.

I also encourage continuous pregnancy examinations and early detecting of (AFI) or (AFV) for safety of both mother and the baby.

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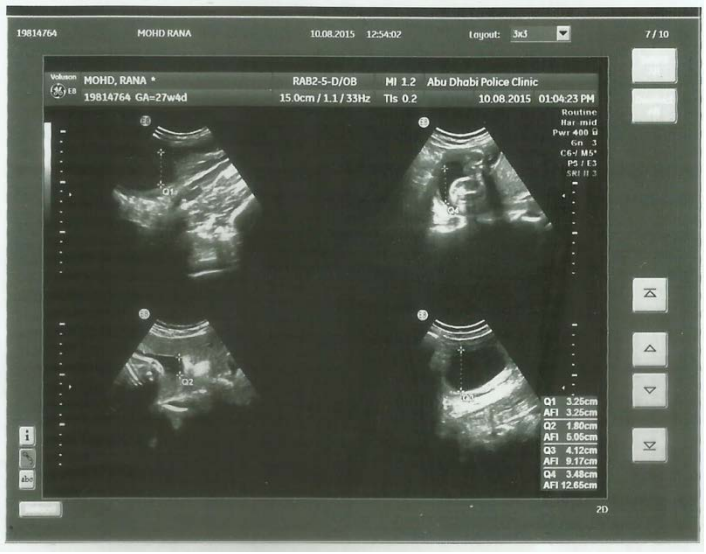
Appendices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AFI 12.65cm
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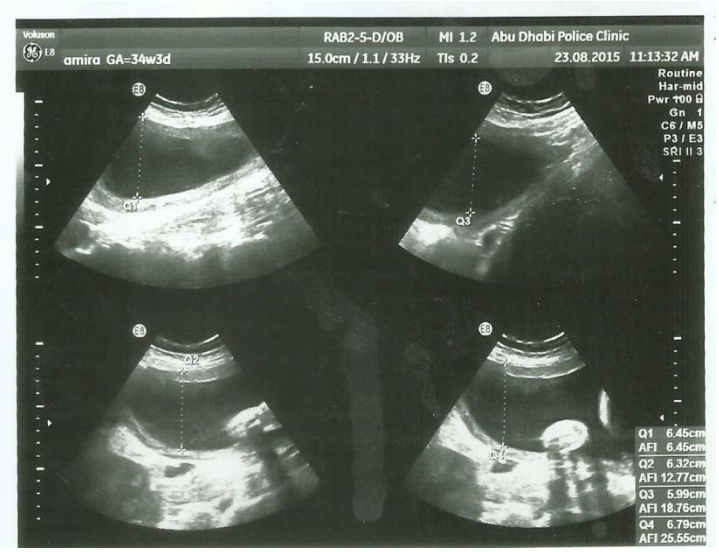
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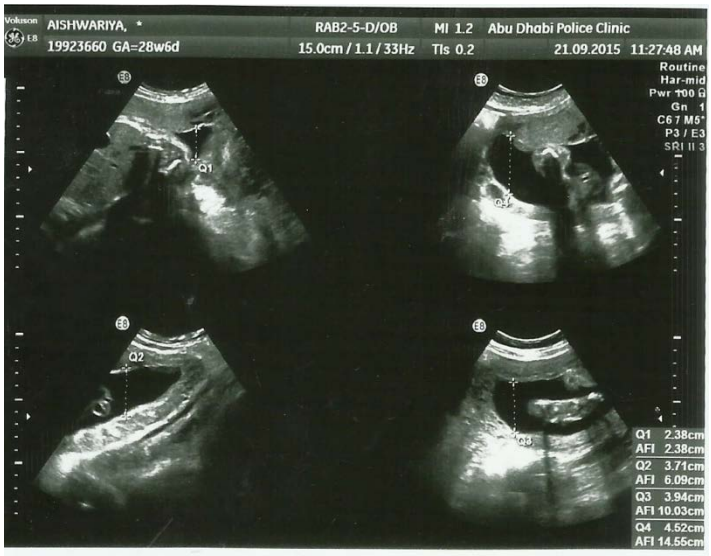
AFI 18.76cm
Q4 6.79cm
AFI 25.55cm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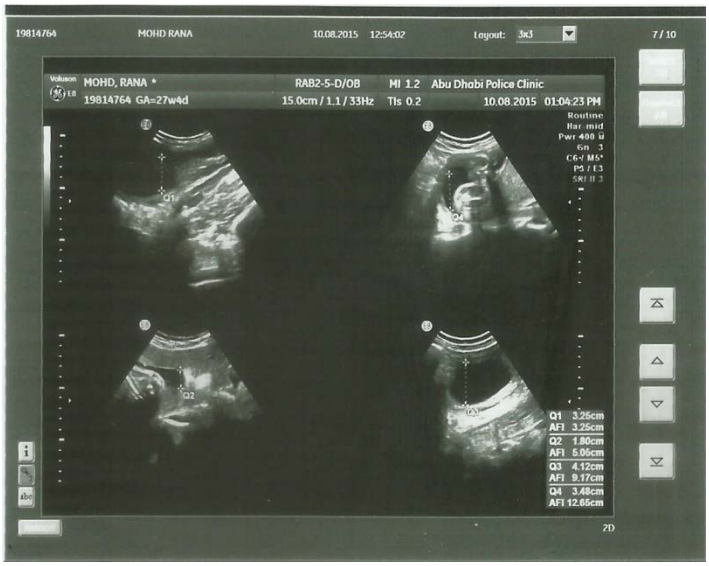
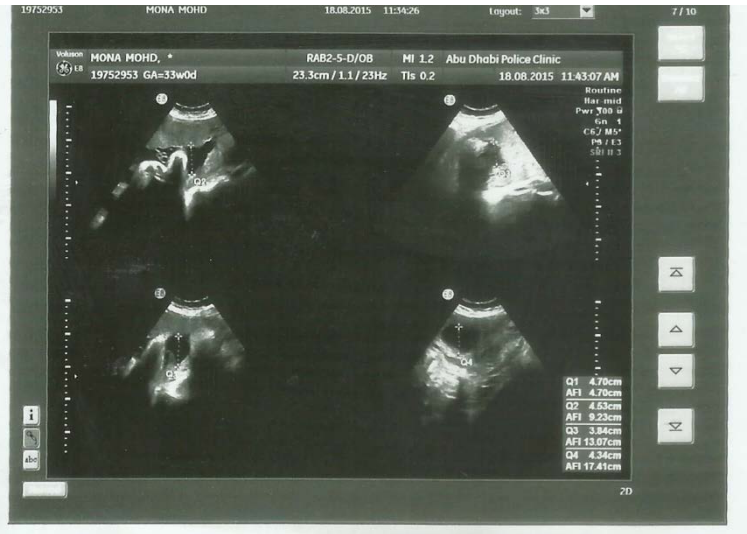
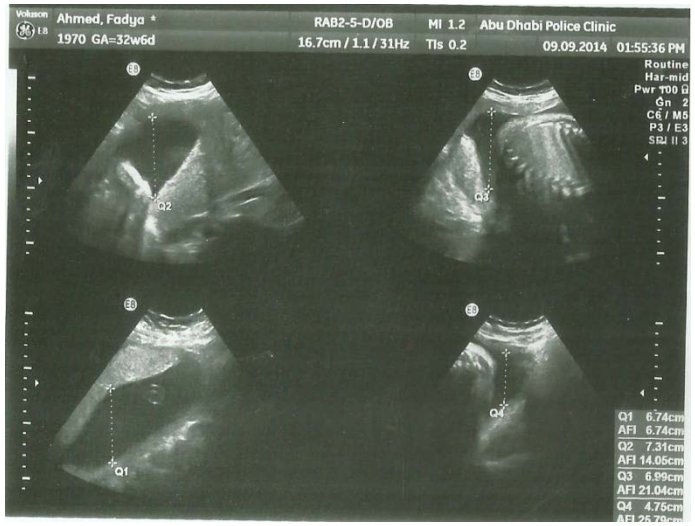
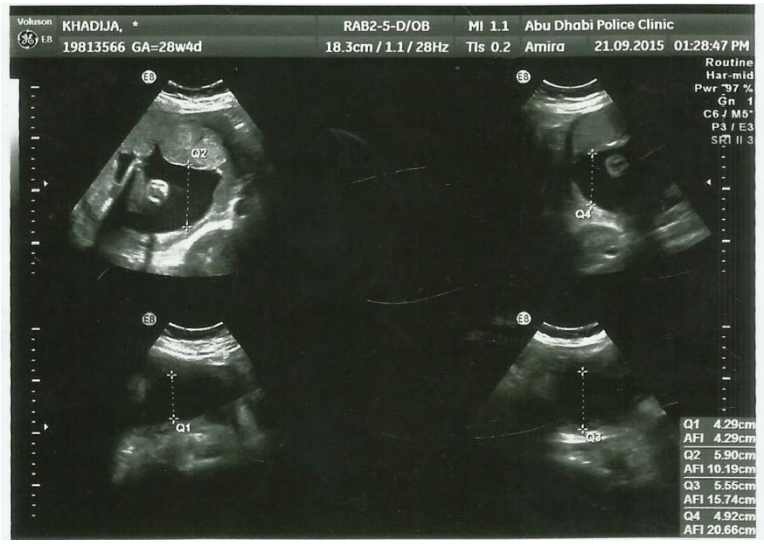
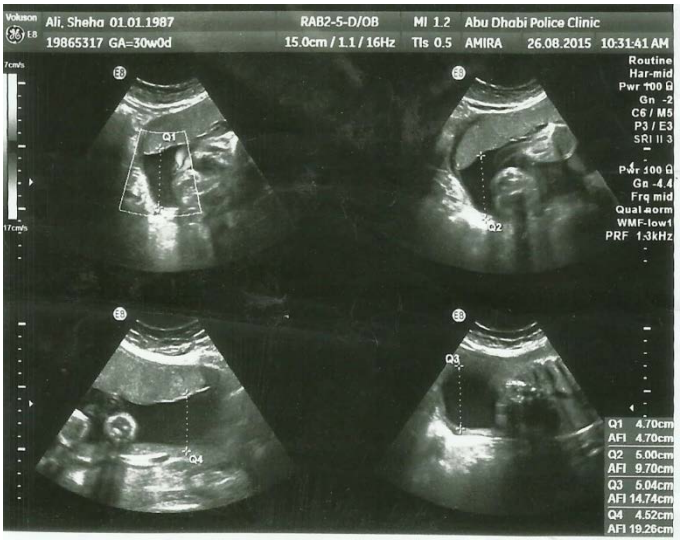
Pwr 100 @
Gn 1
C6 7 M5*
P3 / E3
SRI II 3
Q1 2.38cm
AFI 2.38cm
Q2 3.71cm
AFI 6.09cm
Q3 3.94cm
AFI 10.03cm
Q4 4.52cm
AFI 14.55cm

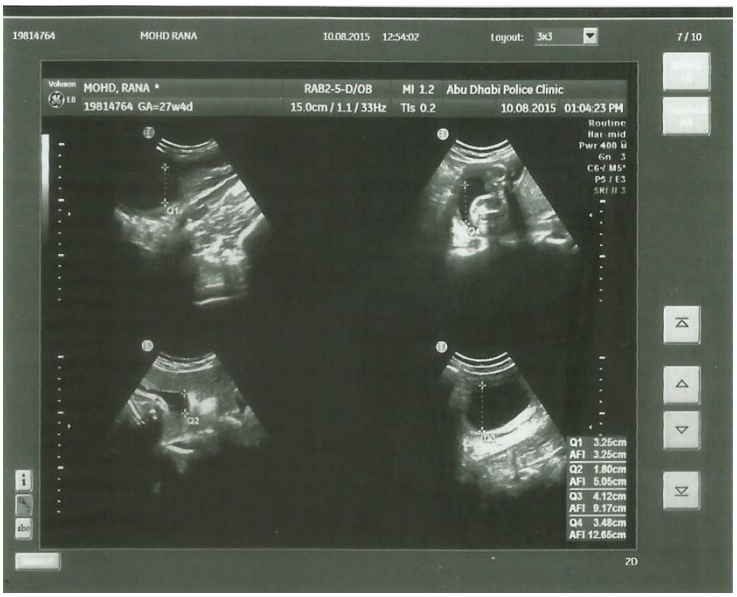

19814764
MOHD RANA
10.08.2015 12:54:02
Layout: 3x3
7 / 10
MOHD, RANA *
19814764 GA=27w4d
RAB2-5-D/OB
MI 1.2
Abu Dhabi Police Clinic
15.0cm / 1.1 / 33Hz
TIs 0.2
10.08.2015 01:04:23 PM
Routine
Har-mid
Pwr 400 @
Gn 3
C6-/ M5*
P5 / E3
SRI II 3
Q1 3.25cm
AFI 3.25cm
Q2 1.80cm
AFI 6.05cm
Q3 4.12cm
AFI 9.17cm
Q4 3.48cm
AFI 12.65cm
2D

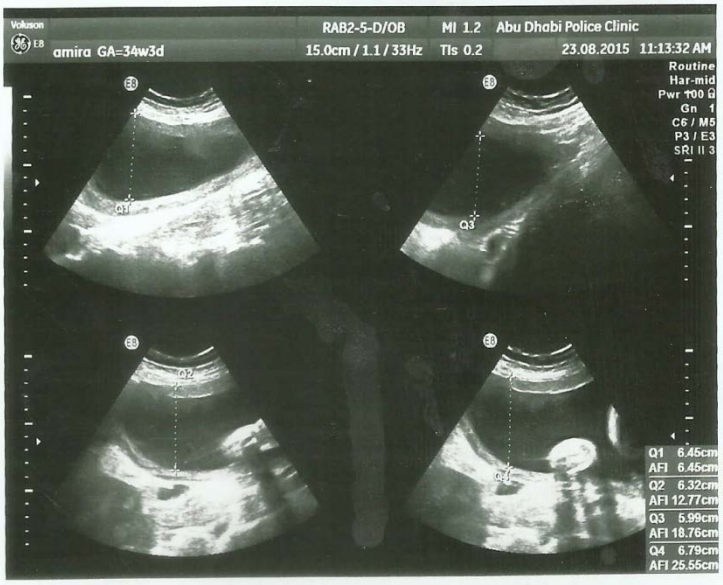

19752953 MONA MOHD 18.08.2015 11:34:26 Layout: 3x3 7 / 10
MONA MOHD, * RAB2-5-D/OB MI 1.2 Abu Dhabi Police Clinic
19752953 GA=33w0d 23.3cm / 1.1 / 23Hz TIs 0.2 18.08.2015 11:43:07 AM
Routine
Har-mid
Q1 4.70cm
AFI 4.70cm
Q2 4.53cm
AFI 9.23cm
Q3 3.84cm
AFI 13.07cm
Q4 4.34cm
AFI 17.41cm
2D

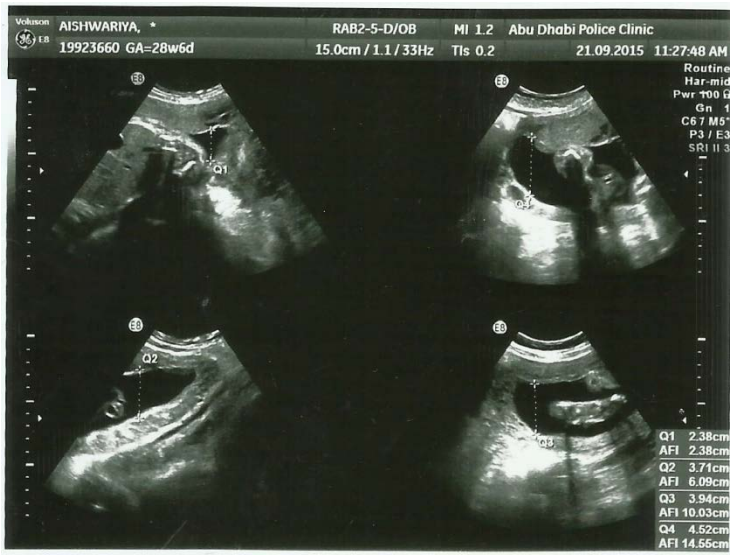

Ahmed, Fadya *
1970 GA=32w6d
RAB2-5-D/OB MI 1.2 Abu Dhabi Police Clinic
16.7cm / 1.1 / 31Hz TIs 0.2 09.09.2014 01:55:36 PM
Routine
Har-mid
Q1 6.74cm
AFI 6.74cm
Q2 7.31cm
AFI 14.05cm
Q3 6.99cm
AFI 21.04cm
Q4 4.75cm

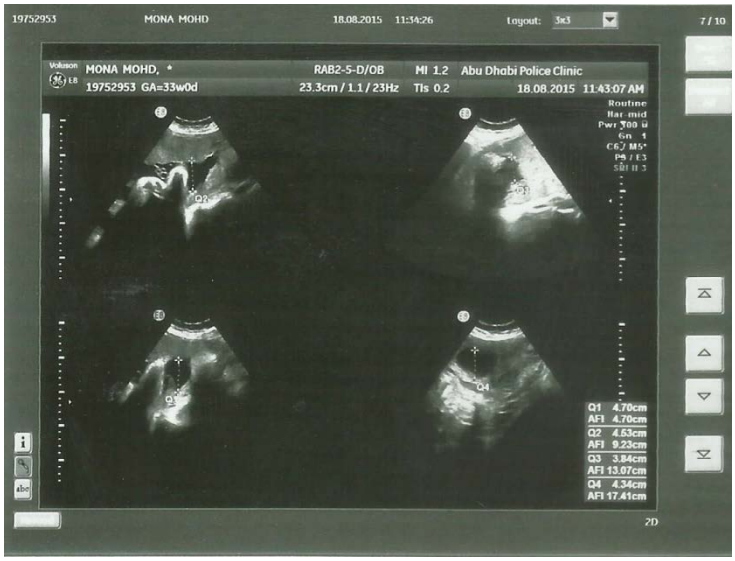

KHADIJA, *
19813566 GA=28w4d
RAB2-5-D/OB MI 1.1 Abu Dhabi Police Clinic
18.3cm / 1.1 / 28Hz TIs 0.2 Amira 21.09.2015 01:28:47 PM
Routine
Har-mid
Q1 4.29cm
AFI 4.29cm
Q2 5.90cm
AFI 10.19cm
Q3 5.55cm
AFI 15.74cm
Q4 4.92cm
AFI 20.66cm

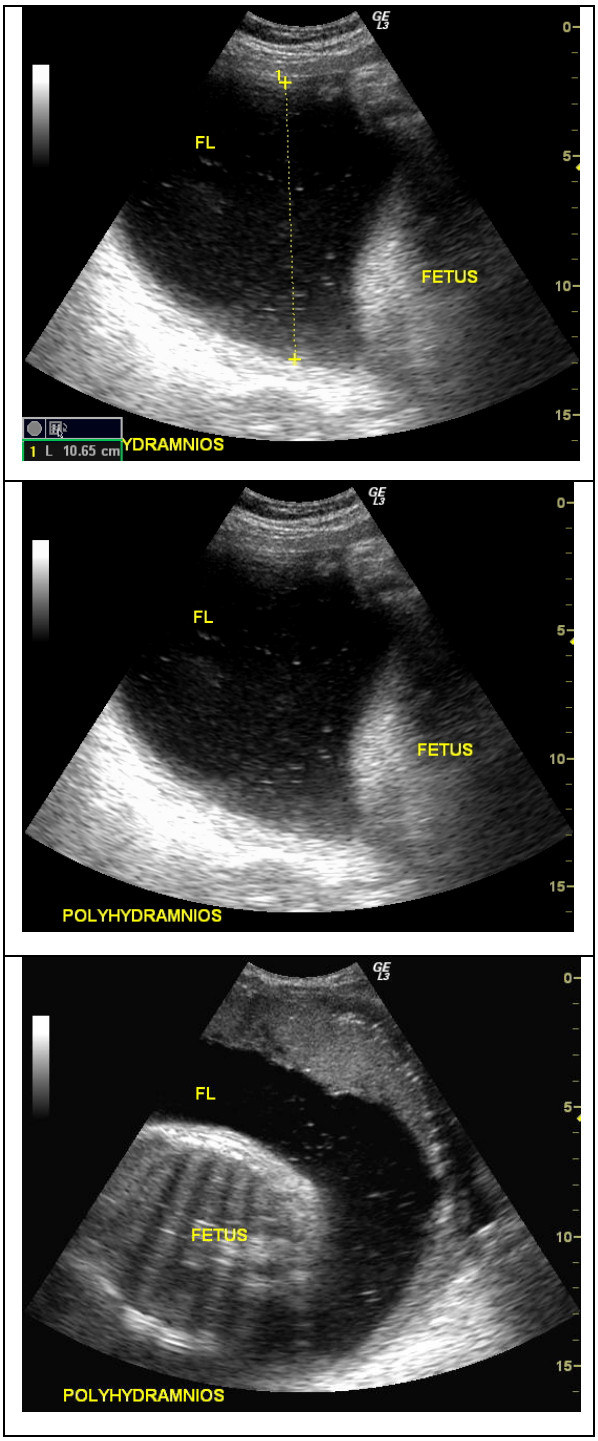

Ali, Sheha 01.01.1987
19865317 GA=30w0d
RAB2-5-D/OB MI 1.2 Abu Dhabi Police Clinic
15.0cm / 1.1 / 16Hz TIs 0.5 AMIRA 26.08.2015 10:31:41 AM
Routine
Har-mid
Frq mid
WMF-low1
PRF 1.3kHz
Q1 4.70cm
AFI 4.70cm
Q2 5.00cm
AFI 9.70cm
Q3 5.04cm
AFI 14.74cm
Q4 4.52cm
AFI 19.26cm


19814764
MOHD RANA
10.08.2015 12:54:02
Layout: 3x3
7 / 10
MOHD, RANA *
19814764 GA=27w4d
RAB2-5-D/OB
MI 1.2
Abu Dhabi Police Clinic
15.0cm / 1.1 / 33Hz
TIs 0.2
10.08.2015 01:04:23 PM
Routine
Har-mid
Pwr 400
Gn 3
C6 / M5*
P5 / E3
SRI II 3
Q1 3.26cm
AFI 3.26cm
Q2 1.80cm
AFI 5.06cm
Q3 4.12cm
AFI 9.17cm
Q4 3.48cm
AFI 12.65cm
2D


Volusion
amira GA=34w3d
RAB2-5-D/OB
MI 1.2
Abu Dhabi Police Clinic
15.0cm / 1.1 / 33Hz
TIs 0.2
23.08.2015 11:13:32 AM
Routine
Har-mid
Pwr 100
Gn 1
C6 / M5
P3 / E3
SRI II 3
Q1 6.45cm
AFI 6.45cm
Q2 6.32cm
AFI 12.77cm
Q3 5.99cm
AFI 18.76cm
Q4 6.79cm
AFI 25.55cm


Volusion
AISHWARIYA, *
19923660 GA=28w6d
RAB2-5-D/OB
MI 1.2
Abu Dhabi Police Clinic
15.0cm / 1.1 / 33Hz
TIs 0.2
21.09.2015 11:27:48 AM
Routine
Har-mid
C6 / M5*
P3 / E3
SRI II 3
Q1 2.38cm
AFI 2.38cm
Q2 3.71cm
AFI 6.09cm
Q3 3.94cm
AFI 10.03cm
Q4 4.52cm
AFI 14.55cm


19752953
MONA MOHD
18.08.2015 11:34:26
Layout: 3x3
7 / 10
MONA MOHD, *
19752953 GA=33w0d
RAB2-5-D/OB
MI 1.2
Abu Dhabi Police Clinic
23.3cm / 1.1 / 23Hz
TIs 0.2
18.08.2015 11:43:07 AM
Routine
Har-mid
Pwr 100
Gn 1
C6 / M5*
P3 / E3
SRI II 3
Q1 4.70cm
AFI 4.70cm
Q2 4.53cm
AFI 9.23cm
Q3 3.84cm
AFI 13.07cm
Q4 4.34cm
AFI 17.41cm
2D



The above ultrasound images show excess amniotic fluid (the largest single pocket measuring 11 cms. approximately). This suggests mild to moderate polyhydramnios