AMNIOTIC FLUID INDEX – EFFECT ON LABOUR AND NEONATAL OUTCOME

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BONAFIDE CERTIFICATE

This is to certify that the study entitled "AMNIOTIC FLUID INDEX – EFFECT ON LABOUR AND NEONATAL OUTCOME" is the bonafide work done by Dr.N.Chithra M.D., P.G. at the Institute of Obstetrics and Gynaecology, Government Hospital for Women and Children attached to Madras Medical College, Chennai from 2005 - 2008. This dissertation is submitted to Dr. MGR Medical University, is in partial fulfillment of the University regulations for the award of M.D. Degree in Obstetrics and Gynaecology.

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INTRODUCTION

Reduction in perinatal mortality and long-term morbidity remains a challenge in modern obstetrics. Antenatal forecasts of fetal health have been focus of intense interest in past few decades in obstetrics. The methods of forecasting have evolved continually, a phenomenon that itself suggests dissatisfaction with efficacy of any given method.

Among the vast number of biochemical and biophysical techniques that have been developed in recent years to predict and to improve perinatal outcome, ultrasound has revolutionized the practice of obstetrics, its greatest advantage being its noninvasive nature. Diagnostic ultrasound since its introduction by Prof Ian Donald in 1950 has undergone rapid technological advances. With recognition of importance of amniotic fluid in predicting the fetal well being, the amniotic fluid evaluation during sonographic examination for fetal well being though once relegated to an "after thought" is now considered an integral and important part of sonographic evaluation of pregnant women. USG is an ideal tool for accurately and repeatedly assessing amniotic fluid volume.

Manning and colleagues using real time ultrasound device have evolved biophysical profile with amniotic fluid volume (AFV) as one of the five biophysical variables. Increasing knowledge of strong correlation between fetal wellbeing and AFV in high risk pregnancy has resulted in evolution of more accurate methods of AFV assessment by USG, one such method is the four quadrant technique or Amniotic Fluid Index (AFI) proposed by J.P. Phelan and colleagues. Ultrasound estimation of AFI has become critical component of antenatal fetal surveillance. Reduction in AFI have classically been considered an indication of fetal compromise.

The present study was undertaken to re-evaluate the relationship between AFI and neonatal outcome and effect on labour

HISTORY AND REVIEW OF LITERATURE

Platt and co-workers[24] reviewed the impact of antenatal fetal testing on perinatal outcome between 1971 and 1985 at Los Angeles County Hospital. They concluded that such testing was clearly beneficial because fetal death rate was significantly less in tested high-risk pregnancies compared with the rate in those not tested.

Passive unstimulated fetal activity commences as early as 7 weeks and becomes more sophisticated and coordinated by the end of pregnancy. Since 1973, when Sadovsky and Yaffy[30] described case reports of pregnancies with decreased fetal activity that preceded fetal death, various methods have been described to quantify fetal movements as a way of prognosticating fetal well being which include use of tocodynamometer, visulisation with real time ultrasound and maternal subjective perceptions. Most investigators reported excellent correlation between maternally perceived fetal movements and those documented by instruments (Rayburn 1980). Grant and co-workers[10] (1989) concluded that informal maternal perceptions were as good as formally counted and recorded fetal movements.

Ray and colleagues[26] (1972) developed oxytocin challenge test or Contraction Stress Test (CST). A brief period of hypoxic stress, which occurs during CST, is well tolerated by healthy fetus. In presence of uteroplacental pathology such hypoxic stress produces late and variable fetal heart rate decelerations, which are earliest indicators of fetal distress.

Freeman, Lee and colleagues[8] (1985) introduced Non Stress Test (NST) to describe FHR accelerations in response to fetal movements as a sign of fetal health. It is based on hypothesis that the heart rate of the fetus that is not acidotic as a result of hypoxia or neurological depression will temporarily accelerate in response to fetal movement. By the end of 1970's the NST has become the primary method of testing fetal health as it was non-invasive, easy to perform and interpret and readily accepted by the patients. NST was considered normal when more than two accelerations of more than 15 bpm above the baseline each lasting for more than 15 sec occur in 20mts observation period. The main problems with NST are the high false positive results, the possibility that a truly abnormal result reflects an advanced rather than an early stage of fetal distress. Also the interpretation of NST relies only

on one variable i.e., presence of accelerations of FHR and ignores that other important ones like loss of variability, and presence of decelerations. Hoskins and associates[11] (1991) attempted to refine interpretation of NST with variable decelerations by adding ultrasonographic estimation of amniotic fluid volume.

Vibro Acoustic Stimulation Test (VAST) was originally designed to decrease the time spent in performance of NST. Perez, Delboy and colleagues[21] (2002), concluded that VAST shortened the average time for non-stress testing from 24 to 15 minutes.

Manning and colleagues (1980) proposed the combined use of five biophysical variables as more accurate means of assessing fetal health than any one used alone. They hypothesized that consideration of five biophysical components assessed include FHR acceleration, fetal breathing, fetal movements, fetal tone and amniotic fluid volume. Normal variables were assigned a score of two each and abnormal variables a score of zero.

Manning and co-authors (1993), Salvesen and colleagues (1993) correlated biophysical profile with umbilical venous blood pH obtained at cordocentesis. They concluded that BPP was of limited value in

prediction of fetal. PH. An equivocal result a score of 6 was poor predictor of abnormal outcome. A decrease from an abnormal result (a score of 2 to 4) to a very abnormal score (i.e., 0) was progressively more accurate predictor of abnormal outcome.

The main problem with BPP is the structure of the test in which each of the five variables is assigned a score of either 2 or 0 despite the possibility that each of these variables may have different importance in assessing fetal situation. Each fetal function evaluated in BPP has different predictive value in indicating fetal hypoxia-an assumption that was evaluated by Manning in 1990. They found that abnormal NST and decreased amniotic fluid volume have higher positive predictive values than do fetal movements, fetal tone and breathing movements.

Vintzileos et al (1987) proposed a modification of biophysical profile using NST with vibro acoustic stimulation test and amniotic fluid index.The modified BPP combines the observation of an index of acute fetal hypoxia(the NST) with an index of chronic fetal problem (the AFI).Clark et al used this modified BPP and concluded that this was best method of primary antenatal fetal surveillance.

Manning et al[14] (1981) observed that qualitative amniotic fluid volume by ultrasound could be used in antepartum detection of IUGR. Philipson et al (1983) have demonstrated clinical association and predictive value of oligohydramnios in IUGR.Chamberlain et al[3] (1984) studied the relationship of marginal and decreased amniotic fluid volume evaluated by ultrasound to perinatal outcome and stated that gross and corrected perinatal mortality was significantly higher in association with decreased qualitative amniotic fluid volume.Crowley et al (1984) used ultrasound assesement of amniotic fluid volume to monitor patients with prolonged pregnancy and reported that it was an effective discriminatory test in post term pregnancy.

Phelan JP et al[22] (1987) developed the four quadrant technique(amniotic fluid index) to identify normal amniotic fluid volume at 36-42 weeks gestation.Rutherford et al (1987) have studied the four quadrant assesement of amniotic fluid volume as an adjunct to antepartum foetal heart rate monitoring and reported an inverse relationship between amniotic fluid index and NST,FHR decelaration, meconium staining,caesarean section for fetal distress and low Apgar score.Phelan et al (1987) studied AFI changed from 11 weeks through 43 weeks gestation and suggested that serial measurement of the AFI

may be an effective means of assessing fetal status throughout pregnancy.

Moore et al[20] (1990) studied prospectively amniotic fluid index in normal human pregnancy and provided normative data for the amniotic fluid index throughout pregnancy. Christopher (1992) compared various semi quantitative ultrasonographic measures of amniotic fluid volume and concluded that amniotic fluid index is slightly better than maximal amniotic fluid vertical pocket in reflecting actual amniotic fluid volume.

Alfirevic et al (1995) reported that use of amniotic fluid index as a test of fetal well being in prolonged pregnancy may lead to more obstetric intervention without yet unclear impact on the perinatal outcome.

Gramel et al[9] (1997) studied 65 patients with oligohydramnios and found higher incidence of premature delivery but no increase in the incidence of IUGR, perinatal death or birth asphyxia. Magann et al[16] (1999) and Kreiser et al (2001) also found no increase in poor perinatal outcome in cases of isolated oligohydramnios.

Chauhan et al[4] (1999)in a meta analysis of relationship between AFI and perinatal outcome concluded that there was an association between oligohydramnios and increase incidence of caesarean delivery for non reassuring FHR patterns and low Apgar Scores.

Amniotic Fluid In Normal Pregnancy

Source:

The exact origin of amniotic fluid is not yet known. The following are the important sources of amniotic fluid.

1. Transudate from maternal plasma via chorio amniotic membrane and maternal circulation in the placenta.

2. Transudate from fetal circulation in placenta, umbilical cord and across the fetal skin before it is keratinized at 24-26 weeks.

3. Secretion from amniotic epithelium.

4. In the later half of gestation two primary sources are fetal kidneys and lungs.

In first trimester amniotic fluid is ultra filtrate of plasma consisting of extra cellular fluid that diffuses through amniotic membrane covering placenta and cord and the embryonic skin, which is only 4 cell layers thick. Diffusion across this permeable barrier continues until fetal skin keratinization occurs at 24-26 weeks gestation. In the second and third trimesters fetal urine plays important role in production of amniotic fluid. The excretion of hypotonic urine by fetal kidneys starts as early as 12 weeks. At 18 weeks gestation fetal produces urine at rate of 7-17 ml. per day and increases steadily throughout pregnancy. At term it is approximately 800ml. per day. Fetal lungs also contribute to amniotic fluid volume at the range of 60-100ml. per kg fetal weight per day at term. The primary sources of removals of amniotic fluid are gastrointestinal tract (by swallowing) and absorption into fetal blood perfusing surface of placenta. At term fetus swallows as much as 50% of total amniotic fluid volume.

Circulation of amniotic fluid:

Amniotic cavity is a metabolically active compartment and is remarkably dynamic site of fluid volume changes. Plentill (1966) demonstrated the dynamic of amniotic fluid circulation using sodium and deuterium oxide. At term the circulation time allowing complete

change over of amniotic fluid is around 3 hours. The volume of amniotic fluid at any moment represents a balance between those structures producing or allowing passage of fluid into amniotic cavity i.e. chorion frondosum, membranes, skin, urinary and respiratory tract and those involved in removal of amniotic fluid i.e. gastrointestinal tract and amniochorionic interface.There are two additional pathways- intramembranous and transmembranous. The more important intramembranous pathway includes transfer between amniotic fluid and fetal blood perfusing the fetal surface of placenta, fetal skin and umbilical cord. The transmembranous pathway involves exchange across the fetal membranes between amniotic fluid and maternal blood within wall of uterus. At term the exchange between maternal blood and amniotic fluid is small and negligible where as intramembranous flow reaches nearly 400ml. per day.

Volume of amniotic fluid:

Weismann, Itskovitz, Eldor, Jakobi, calculated amniotic fliuid volume at different gestational ages. They found that amniotic fluid increased from approximately 1 ml. at 7 weeks to 25ml at 10 weeks, 60ml at 12 weeks, 400ml at 20 weeks and peaks at around one litre between 35-36 weeks. During last weeks of pregnancy the amniotic

fluid volume decreases. Beyond 40 weeks the amniotic fluid volume decreases further. The amount of amniotic fluid is 480ml, 250ml, 160ml at 42,43,44 weeks respectively. But the rate of decline of amniotic fluid is unpredictable in post term pregnancies, abrupt fall can occur within 24hrs.

Brace and Wolf found that amniotic fluid volume progressively rises from 8 weeks gestation reaching its statistical maximum (variance analysis) at 32 weeks. These authors calculated the mean changes in amniotic fluid volume on weekly basis (based on polynomial regression equation).

Characteristics of amniotic fluid:

Physical:

Specific Gravity – Early pregnancy – 1006

Late Pregnancy – 1081

P^Hat term – 7.04 to 7.11

Osmolality 20-30mOsm./ltr.

Colour: During early pregnancy amniotic fluid is colourless and gradually becomes pale straw to deep yellow colour depending on the

amount of bilirubin. Bilirubin concentration decreases after mid pregnancy and after 36 wks. Amniotic fluid becomes colourless but cloudy due to admixture of vernix caseosa (which are clumps of desquamated fetal skin cells and free lipid material) lanugo hair and epithelial cells.

Chemical composition:

In early pregnancy composition is same as maternal plasma with lowered proteins.

Composition at term:

1. Water – 98-99.5%
2. Solid 1-2%

    Organic – 50%

    Inorganic – 50%

Organic – 50% of organic constituents are proteins and their derivatives.

1. Proteins and their derivatives – 0.25g%

    Albumin – 60%

Ceruloplasmin – 1.5%

Transferrin – 11.6%

IgA- 0.1%

IgG- 11%

Alpha feto protein

Amino Acids – Similar to that in maternal plasma

2. Glucose – 20 mg%

3. Uric Acid – 4 mg%

4. Creatinine – 1.8 mg%

5. Vitamins

6. Enzymes : Alkaline Phosphatase, Acid Phosphatase, Monoamine oxidase, Lysozyme.

7. Hormones:

8. Lipids

9. Bilirubin

10. Prostaglandins

Inorganic:

1. Electrolytes: During first half of pregnancy sodium and chloride concentrations are similar to fetal than maternal serum. Later the fluid becomes progressively hypotonic with decreased sodium and chloride concentrations and a corresponding fall in osmotic pressure. These changes associated with gradual rise in uric acid and creatinine levels reflect the contribution of maturing fetal renal function to amniotic fluid. Potassium, Calcium, Magnesium, Phosphorus, Zinc, Iron and Sulphur are also present with no significant changes as pregnancy advances.

2. Gases: Johnson and Ojo reported a positive correlation between maternal hematocrit values and amniotic fluid PaO_2 in 1967. Pa CO_2 in amniotic fluid near varies from 44.0-57.6mm Hg.(Kittrich 1968).

3. Cells: Nucleated and anucleated cells derived from fetal skin, buccal and respiratory mucosa, bladder, vagina, umbilical cord, and amniotic epithelium.

Functions of amniotic fluid:

During Pregnancy

a. Amniotic fluid acts as a cushion to allow normal musculoskeletal development of fetus free from restriction or distortion by adjacent structures.

b. It maintains even temperature and provides thermally stable environment.

c. It acts as a shock absorber protecting the fetus from possible trauma.

d. It allows free movement of fetus and prevents adhesions between fetal parts and amniotic sac.

e. It has minimal nutritive value.

f. It has epidermal growth factors (EGF and EGF like growth factors e.g. transforming growth factor β). Ingestion of amniotic fluid into GIT and inhalation into lungs may promote growth and differentiation of these tissues.

During Labour:

1. It helps in dilatation of birth passage by forming a wedge of the bag of membranes.

2. It protects fetus and placenta from pressure by contracting uterus.

3. It flushes the vagina before birth of the baby and by its antiseptic and bactericidal action protects the fetus and prevents ascending infection into uterine cavity.

4. It serves as a biological medium in which various bioactive substances are temporarily stored. Half life of selected compounds in amniotic fluid is much longer than those of same compounds in blood. For eg. t ½ of $PGF_2 \alpha$ and PGE_2 in plasma is 6-8 mts whereas in amniotic fluid it is 4-6 hrs.

Methods to assess amniotic fluids:

Amniotic fluid reflects uteroplacental perfusion, fetal metabolism and renal function. Changes in AFV may be related to wide variety of physiological and pathological changes in fetus and mother. Clinical assessment of amniotic fluid volume is usually subjective, although most experienced clinicians are capable of making this subjective assessment, lack of objectivity is troublesome and cannot be relied upon in planning the management of high risk pregnancies. Hence efforts

were made by various workers to devise convenient and reproducible methods for estimation of amniotic fluid volume.

1. Ultrasonography: USG is an ideal non-invasive tool for accurate and repeated assessment of amniotic fluid volume. Ultrasonographic visualization of amniotic fluid may be subjective or semiquantative.

- Subjective: the technique of subjective assessment of AFV involves comparing echo free fluid areas surrounding the fetus with the space occupied by fetus and placenta. This allows sonographer to visually integrate multiple pockets of amniotic fluid into a subjective total that is compared with expected normal level at each stage of gestation. Halperin et al evaluated inter and intraobserver variability in subjective assessment of AFV.

- Non – Quantitative Assessment: Crowley described a simplified method of estimating AFV based on quantity of amniotic fluid seen by USG in the area of fetal limbs. Amniotic fluid was considered normal if pocket of fluid was demonstrated between the fetal limbs and anterior and posterior wall. It was considered

reduced, if the pocket was seen only between limbs, and as absent if no pocket was seen.

- Semi-Quantitative Approaches: Their technique involves scanning the uterus to select single deepest amniotic fluid pocket free of umbilical cord and fetal parts. The greatest vertical dimension of this pocket is then measured at right angle to the uterine contour, thus excluding errors related to uterine venous drainage, using transducer perpendicular to the floor. This measurement has been referred as maximum vertical pocket (MVP). The width of the largest pocket was measured at right angles to the depth measurement in order to exclude errors related to the umbilical cord which may, especially in cases of severe oligohydramnios be mistaken for amniotic fluid. The depth of a pocket was used to classify the cases into-decreased (<1cm), marginal (1-2cm), normal (2-8cm) and excess (>8cm). The choice of less than 8cm of normal amniotic fluid was arbitrary and based upon a clinical impression gained while performing biophysical profile scoring.

In 1987 Phelan et al and subsequently Rutherford, Moore and Cayle developed a semiquantitative method of sonographic assessment

of amniotic fluid index. This method is based on division of gravid uterus into four quadrants using external landmarks on maternal abdomen-transverse line through the umbilicus divides the abdomen transversely into upper and lower halves and the lineanigra divides it into right and left halves.

Technique For Measurement Of Amniotic Fluid Index

(Adapted from Moore TR, Clinical assessment of AFI, Clinical Obst and Gyn 40:2; 300, 1997)

- Patient in supine position
- A liner curvilinear or sector transducer can be used
- Dividing the uterus into four quadrants using maternal sagittal midline vertically and arbitrary transverse line approximately halfway between the symphysis pubis and the upper edge of uterine fundus.

- The transducer must be kept parallel to the maternal sagittal plane and perpendicular to the maternal coronal plane throughout.

- The deepest unobstructed and clear pocket of amniotic fluid is visualized and image frozen. The US calipers are manipulated to measure the pocket in a strictly vertical direction.

- The process is repeated in each of the four quadrants and pocket measurements are summed to get amniotic fluid index.

- If AFI is less than 8 cm the four-quadrant evaluation is performed 3 times and average values are taken.

In a 1997 review Hill noted that Phelan et al's original description of AFI did not mention whether the pockets of amniotic fluid containing umbilical cord should be included or excluded. Rutherford et al subsequently stated that umbilical cord or an extremity may traverse a pocket of measured amniotic fluid. However when the pocket is almost

entirely filled with either umbilical cord or extremities, it should not be included as one of the measured pockets.

Table A: Amniotic Fluid Index values in normal pregnancy

(Moore and Cayle Am.J.O.G. May 1990).

Week	AFI Percentile Values					N
	2.5th	5th	50th	95th	97.5th	
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	217	233	14
22	89	97	145	216	235	14
23	90	98	146	218	237	14
24	90	98	147	219	238	23
25	89	97	147	221	240	12
26	89	97	147	222	242	11
27	85	94	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	236	269	27
39	64	72	127	226	255	12
40	63	71	123	214	240	34
41	63	70	116	194	216	162
42	63	69	110	174	192	30

DEFINITION OF OLIGOHYDRAMNIOS

(From Hill LM: Oligohydramnios – Sonographic diagnosis and clinical implications clinical Obs and Gyn 40:2:314, 1997).

Technique	**Definition of Oligohydramnios**	**Study**
Dye dilution method	200ml	Horsager, Nathan & Leveno
Ultrasound	Single vertical pocket <1cm	Manning, Hill & Platt
Ultrasound	Single vertical pocket <3cm	Halperin et al
Ultrasound	AFI <5th % tile for gest age	Moore & Cayle
Ultrasound	AFI <5cm	Phelan et al
Ultrasound	AFI <8cm	Jeng et al

Moore and Cayle defined oligohydramnios when AFI was less than 5th percentile which corresponded to an AFI of less than 7-8cm. Rutherford et al used 5cm as a threshold to define oligohydramnios, a number that would be slightly less than the first percentile. Although controversy still exists a to which threshold values to use, values greater than 5 cm and less than 18-20 cm are considered by most examiners to be normal.

Clinical Significance of Amniotic Fluid in Obstetrics

1. Prenatal Diagnosis of Genetic Diseases

Cultured amniotic fluid cells can be utilized for cytogenetic studies as well as enzyme and DNA analysis. The success rate for amniotic fluid cell growth and cytogenetic studies approaches 98 to 99 percent. The fluid itself can be utilized for measuring a variety of substances such as AFP, acetylcholine esterase etc which may provide useful clues as to the presence or absence of fetal disorders. Amniotic fluid cells can be obtained by amniocentesis most often performed at 16 to 18 weeks gestation when it is likely that there are sufficient fetal cells to allow successful culture. But recent reports suggest that early amniocentesis performed before 15 weeks also had surprisingly high rate of success, which exceeded 95 percent. The cytogenetic success is also high approaching 99 to 100 percent (Penso and Frigoletto 1990). Fetal karyotyping can be done using the shed fetal cells obtained by amniocentesis. Sex of the fetus can also be determined by using amniotic fluid cells in some patients with history of x linked recessive disorders where pregnancy may have to be terminated if the fetus is male.

2. Fetal lung maturity tests:

Delivery for fetal indications is necessary when risk to the fetus from hostile intrauterine environment is greater than the risk of respiratory distress, even if the fetus is preterm. Amniotic fluid obtained by amniocentesis is utilized to determine the relative concentration of surfactant active phospholipids to confirm fetal lung maturity. Biochemical maturation of fetal lungs is assessed by concentration of phospholipid in amniotic fluid obtained by amniocentesis. The incorporation of this fact into day to day management of obstetric patients has been very important decisions regarding timing of delivery of fetus.

Several methods have been used to estimate concentration of pulmonary surfactant and thus predict respiratory distress.

a . Lecithin Sphingomyelin (L;S) Ratio:

This was the first reliable test to determine the biochemical maturation of the fetal lungs. Before 34 weeks the concentration of lecithin and sphingomyelin is similar. After 34 weeks the concentration of lecithin relative to sphingomyelin begins to rise. The incidence of

respiratory distress was 40% in those with ratio 2-1.5 and 73% in those with ratio less than 1.5.

The main drawback of L/S ratio is that it is not useful in predicting respiratory distress in cases of patients with pregnancy complications like diabetes mellitus erythroblastosis fetalis, fetal neonatal sepsis, or any event that causes serious metabolic fetal compromise.

b. Phosphotidyl Glycerol:

Surfactant action insufficient to prevent respiratory distress even though the L/S ratio is >2 is though to be due in part to lack of phosphotidyl glycerol. Phosphotidyl glycerol appears in amniotic fluid usually after 36 weeks and is marker of final biochemical maturation of fetal lungs.

c. Foam Stability test (Shakes Tests):

To reduce time, cost and effort inherent in precise measurement of L/S ratio, the foam stability or so called shake test was introduced by Clements in 1972. The test depends upon the ability of surfactant in amniotic fluid to generate stable bubbles when mixed with appropriate

quantity of ethanol. It is almost 100% accurate when it predicts maturity but is poor predictor of pulmonary immaturity.

3. Amniotic Fluid absorbance at 650nm:

The degree of absorbance of light at 650nm wavelength has been reported to correlate well with the L/S ratio in amniotic fluid. It can be used as screening test and the value between 0.01 and 0.20 should prompt further evaluation with other tests for lung maturity.

4. Erythroblastosis fetalis:

In pregnancies affected by the presence of incomplete antibodies capable of producing erythroblastosis fetalis, spectrophotometric analysis of the amniotic fluid is reliable method of evaluating the severity of fetal haemolytic process and for determining the optimal time for intra uterine transfusion or for delivery of the infant. Amniotic fluid analysis is mandatory in management of the Rh negative isoimmunised gravidae in all her pregnancies except for the sensitized pregnancy during which she can be managed depending on antibody titre. The follow up with amniocentesis is of particular importance for

those patients with histories of prior deliveries of infants with erythroblastosis.

5. Amniotic Fluid Volume

Polyhydramnios:

Polyhydramnios is a clinical condition characterized by amniotic fluid exceeding arbitrary volume of 2000ml. It affects approximately 0.4 to 1.5 percent of all pregnancies. Based on ultrasonographic findings, hydramnios may be defined as finding of amniotic fluid pocket measuring 8 cm or more in vertical diameter or an amniotic fluid index greater than 25 cm. Traditionally, hydramnios has been classified as acute when it occurs before 24 weeks of gestation and chronic when it the diagnosis is made in the third trimester.

Etiology:

A. Maternal Causes:

- Rh isoimmunisation: With use of prophylactic anti D Ig this condition has become an uncommon cause of hydramnios. About

20 yrs back, Rh isoimmunisation accounted for 11.5% of all cases of hydramnios, while more recently it is less than 1%

- Diabetes Mellitus: It is responsible for approximately 14% of all cases of hydramnios, and 15 to 66% of all diabetic pregnancies. The exact cause is not known. Fetal hyperglycemia with polyuria and increased osmolarity of the amniotic fluid caused by high glucose concentration have been proposed.

B**. Placental Causes:**

- Placental chorioangioma

- Circumvallate placenta syndrome

C. Fetal Causes:

- Multiple Pregnancies: It accounts for 4.9% of all cases of polyhydramnios. Polyhydramnios has been reported in 25% of monozygotic twins to twin transfusion syndrome.

- Fetal Anomalies: These are responsible for approximately 12.7% of all the cases of Polyhydramnios. The most common lesions are:

i. Gastrointestinal abnormalities: Include oesophageal atresia, annular pancreas, jejunal atresia, diaphragmatic hernia, duodenal atresia, omphalocele, gastroschisis and midgut volvulus.

ii. Central nervous system abnormalities: Include anencephaly, hydrocephaly, encephalocele, spina bifida, microcephaly, holoporencephaly and hydrancephaly.

iii. Genitourinary abnormalities: Partial or incomplete renal obstruction ureteropelvic obstruction.

iv. Fetal Tumours: Include cystic congenital adenomatied malformation of the lung, sacrococcygeal teratoma and malignant cervical teratoma.

v. Skeletal Malformations: Include arthrogryposis, osteo genesis imperfacta, achondroplasia, thanatophoric dearfism.

vi. Cardiac abnormalities: Include severe congenital heart disease and persistent cardiac arrhythmias.

vii. Chromosomal abnormalities: The most frequent are Downs syndrome trisomies 13 and 18.

viii. Genetic Syndromes: Include hydrolethalis syndrome, Myotonica dystrophica and Shokier syndrome.

ix. Intrauterine Infections: Rubella, Syphilis, Toxoplasmosis

x. Heamatological causes: Homozygous alpha thalassemia and fetomaternal hemorrhage.

xi. Idiopathic: In more than 65% of cases polyhydramnios does not any specific cause.

Complications

A. Maternal

Antenatal: Preeclampsia

Malpresentations

Premature rupture of membranes

Preterm Labour

Accidental Haemorrhage

Respiratory discomfort

Intrapartum: Early rupture of membranes

Cord Prolapse

Uterine Intertia

Increased Operative delivery

Retained Placenta

Postpartum haemorrhage

Postpartum: Sub Involution

B. Fetal:

Fetal complications occurs in 16 to 69% of cases. Most common causes include.

1. Congenital anomalies incompatible with life
2. Prematurity
3. Cord prolapse
4. Hydrops fetalis
5. Increased operative delivery
6. Accidental haemorrhage

Oligohydramnios:

It is a clinical condition characterized by an abnormally low volume of amniotic fluid. Based on ultrasonography findings it can be defined as AFI less than 5 cm.

Etiology:

A. **Post Term pregnancy:** The volume of amniotic fluid decreases with increasing gestational age after term. An amniotic fluid of less than 400 ml at 40 weeks or more is associated with fetal complications. The mechanism of oligohydramnios in prolonged pregnancy seems to be diminished fetal urine production. IUGR: Oligohydramnios is a common finding in severe IUGR. The most likely cause of oligohydramnios in IUGR babies is decreased fetal urinary output caused by redistribution of the blood flow with preferential shunting to the brain and decrease in renal perfusion. The incidence of IUGR in presence of oligohydramnios is 40%

B. **Fetal congenital anomalies:** Severe fetal congenital abnormalities may be associated with oligohydramnios. Most common being those which affect the urinary system especially

renal agenesis, uretheral obstruction, Prune belly Syndrome, bilateral multicystic dysplastic kidneys, etc. The non renal causes of oligohydramnios include triploidy, thanatophoric dwarfism, thyroid gland agenesis, skeletal dysplasia, congenital hear block, etc.

C. **Occasional undetected PROM and leaking amniotic fluid:** This may be confused with excessive vaginal discharge by the patient. Leaking fluid following amniocentesis can affect less than 1% of the patients undergoing these procedures.

D. **Monozygotic Twins:** Oligohydramnios affects the donor twin in cases with twin to twin ttransfusion syndrome.

E. **Drugs:** ACE inhibitors, Indomethacin, etc.

Complications

Antenatal:

- Fetal Wastage.
- Congenital postural deformities: Mechanical factors arising from chronically low volumes of amniotic fluid and

restrictions imposed by the small size and inappropriate shape of the uterine cavity may mould the growing fetus into distinct pattern of deformity including talipes, scoliosis, hip dislocation limb reduction and body wall defects.

- Pulmonary Hypoplasia

- Amniotic Bands: Focal ring constrictions of the extremities and actual loss of a digit or a limb are rare complications of oligohydramnios.

Intrapartum

1. Cord compression: Results in intrapartum fetal distress and high incidence of operative intervention.

2. Abnormal Labour: Firm contraction of the uterus over the fetus in the absence of amniotic fluid interferes with normal progress of labour.

6. Amnioifusion

In presence of oligohydramnios the incidence of cord compression and intrapartum fetal distress can be reduced by infusion with warm normal saline. In various studies it has been noted that amnioinfusion significantly lower rates of meconium passage, server variable declerations, end stage bradycardia and operative intervention for fetal distress.

AIM OF THE STUDY

1. To study amniotic fluid index in 1500 women with 37 completed weeks of gestation in normal pregnancies

2. To study the correlation between amniotic fluid index and variables like NST, mode of delivery, colour of liquor, neonatal morbidity and mortality.

MATERIALS AND METHODS

This descriptive follow-up study was conducted among 1500 women at Government Hospital for Women and Children, Egmore, Chennai from June 2006 to June 2007.

Inclusion Criteria:

1. Patients with correct dates or having early USG

2. Singleton live pregnancy

3. vertex presentation.

4. Gestational age between 37-42 weeks

5. Membranes intact.

6. True Labour pains

7. AFI estimated by four quadrant technique at admission.

8. Admission CTG done in all cases

Exclusion criteria:

1. Patients with LMP not known or those not having early trimester USG to confirm the gestational age.
2. Multiple pregnancies.
3. Non vertex presentation
4. Pregnancies less that 37 weeks
5. Premature rupture of membranes
6. False pains
7. Previous caesarean section
8. Associated maternal complications.
9. Patients with fetus having congenital malformations diagnosed by USG.
10. Intra uterine death.

All the patients had come to labourward. A careful clinical history was taken in each case relating to demographic data, previous obstetric history, last menstrual period, previous menstrual cycle and present obstetric complications if any. Only those patients with a definitely

known LMP and / or an early scan report showing gestational age were included in the study.

A thorough clinical examination including height, weight, and presence of anaemia, oedema, and blood pressure was done. By obstetric palpation, gestational age, presentation and amount of liquor noted. The fetal heart sounds were auscultated. All preliminary base line investigations like HB% blood grouping and typing, complete urine examination and random blood sugar were done.

A NST was done in all patients on admission. AFI was measured in these patients using linear array real time B scan. Examination was performed with patients in supine position. External landmarks of maternal abdomen were used to divide the gravid uterus into four quadrants. Umbilicus was used to divide it into right and left halves. The linear transducer head was placed along mother's longitudinal axis and held perpendicular to the floor for all measurements. The maximum vertical diameter of the largest fluid pocket was measured in centimeters in each of the four quadrants. Vertical was defined as perpendicular to the transducer head. Brief appearance of cord or an extremity was ignored. However when the pocket was almost entirely filled with either cord or extremity it was not included as one of the measured pockets.

The measurements obtained from each quadrant were summed up to obtain the amniotic fluid index.

Measurement of variables included are incidence of no reactive NST, caesarean delivery for fetal distress, Apgar score < 7 at 5 mts, birth weight, meconium staining of liquor, admission to NICU and neonatal deaths.

In this study patients were grouped into four categories based on AFI. As per standard definition by Moore TR, 1997 one group had oligohydramnios(AFI <5cm) and one group had polyhydramnios(AFI >25 cm). The interval of AFI 5-25cm has been divided into two groups as 5-8 and 8.1-25 cm taking into consideration the study of Jeng et al with cutoff as <8 cm as oligohydramnios and as per Williams obstetrics 22nd edition, AFI in majority of normal pregnancies ranges from 8-24 cm. In my study also there was increased neonatal morbidity and mortality in the range 5-8 cm. Thus this range has been separated to study the importance and significance.

Chisquare statistical test was applied to find out if there is any association between the AFI level and variables studied.

Odds ratio was used to assess the strength of association.The AFI level 8.1-25 has considered as reference category . All the other three levels have been considered and expressed with 95% CL (confidence limit) of odds ratio.

RESULTS AND ANALYSIS

In this study, 1500 antenatal cases of term gestation were included. The study was divided into 4 categories based on AFI and the correlation between amniotic fluid index and variables studied like NST, mode of delivery, colour of liquor, Apgar at 5 mts, birth weight ,IUGR, NICU admission of babies and neonatal death.

TABLE: 1

DISTRIBUTION OF AFI IN THE STUDY GROUP

Total No of Cases	AFI <5 cm	AFI 5 – 8 cm	AFI 8.1-25 cm	AFI >25 cm
1500	147	360	975	18

This table shows the distribution of AFI in the study group.Out of 1500 cases studied 147 had oligohydramnios, defined as AFI <5 cm, 360 had AFI in the range of 5-8 cm, 975 had AFI in the range of 8.1- 25 cm and 18 had polyhydramnios defined as AFI >25 cm.

TABLE: 2

AFI & ADMISSION TEST

AFI	<5 cm	5-8 cm	8.1-25 cm	>25 cm
Cases	147	360	975	18
Non Reactive NST	84 (57.14%)	84 (23.33%)	78 (8%)	3 (16.66%)
Reactive NST	63 (42.85%)	276 (76.66%)	897 (92%)	15 (83.33%)

$\chi 2 = 243.6$ df= 3 pvalue < 0.001

AFI(cm)	Odds ratio (OR)	95% CL	
		Lower range	Upper range
<5 :	15.9	10.659	23.853
5-8 :	3.64	2.59	5.11
>25 :	2.39	0.677	8.447(NS)

Among the patients with AFI<5, 57.14 % of them were having nonassuring fetal heart pattern, 23.33% of the patients with AFI 5-8 were having nonassuring fetal heart pattern,16.66% of the patients with AFI>25 were having nonassuring fetal heart pattern, where as only 8% of the patients were having non assuring fetal heart pattern in the patients with AFI 8.1-25 cm.

This has an OR of 15.9 which indicates 16 times chances of having non assuring fetal heart pattern when AFI<5cm.compared to AFI group of 8.1-25 cm.

The group of patients with AFI 5-8 cm had an OR 3.6 or 3.6 times higher risk of non reassuring NST, whereas in cases of with AFI >25cm the risk of non reassuring NST was clearly 2.4 times that of AFI group of 8.1-25cm (OR = 2.39)

TABLE:3

AFI & MODE OF DELIVERY

AFI		<5 cm	5-8 cm	8.1-25 cm	>25 cm
Cases		147	360	975	18
Vaginal	SPVD	12 (8.16%)	168 (46.66%)	654 (67.07%)	12 (66.66%)
	Induced	24 (16.32%)	45 (12.60%)	72 (7.38%)	
	Forceps	12 (8.16%)	15 (4.16%)	48 (4.92%)	
Total Vaginal Delivery		48 (32.65%)	228 (63.33%)	774 (79.2%)	
Total Emergency caesarean sections		99 (34%)	132 (36.66%)	201 (27.6%)	6 (33.33%)

χ^2 =1480 df = 3 pvalue:>0.001.

AFI (cm)	OR	95%CL	
		Lower	Upper
<5 :	7.942	5.442	11.591
5-8:	2.229	1.711	2.905
>25:	1.925	0.714	5.193(NS)

Among the patients with AFI <5, 34% underwent caesarean section, 36.66% underwent caesarean section in the patients with AFI level 5-8,33.33% underwent caesarean section in the group of AFI>25 cm whereas only 27.6% patients with AFI level 8.1-25 cm underwent caesarean section.

OR 7.9 indicates chances of having caesarean section is 7.9 times higher in AFI group <5 cm and OR of 2.22 indicates chances of having caesarean section is 2.2 times higher in AFI group of 5-8 cm compared to AFI group 8.1-25 cm.

Spontaneous vaginal delivery occurred in 67.07% with AFI 8-25cm, contrasting against 8.16% with AFI<5cm and 46.66% with AFI 5-8cm.Patients with AFI>25 cm had an incidence of spontaneous vaginal delivery approaching that of normal AFI group.

Similarly induced labour was also higher in the groups AFI < 5 cm (16.32%), AFI 5-8 cm (12.6%) compared to 7.38% in AFI 8.1-25cm.

Forceps delivery was 8.1% in those with AFI <5cm, 4.16% in AFI 5-8cm and 4.92% in AFI 8.1-25cm.

TABLE: 4

AFI & INDICATION FOR CAESAREAN SECTION

AFI	<5 cm	5-8 cm	8.1-25 cm	>25 cm
Cases	147	360	975	18
Caesarean Section	99	132	201	6
Fetal distress	84 (57.14%)	93 (25.83%)	126 (12.92%)	3 (16.66%)
Failed Induction	9 (6.12%)	15 (4.16%)	12 (1.23%)	
CPD	3 (2.04%)	21 (5.83%)	57 (5.84%)	3 (16.66%)
Others:like Persistent	3 (1.36%)	3 (0.83%)	6 (0.61%)	
Occipitoposiferior	3	1	2	
DTA	-	-	2	
Failure to Progress	-	2	2	

pvalue : <0.001

This table shows that fetal distress is commonly associated with low AFI groups and it is the leading indication for emergency caesarean section in these groups.

TABLE:5

AFI & COLOUR OF LIQUOR

AFI	<5 cm	5-8 cm	8.1-25 cm	>25 cm
Cases	147	360	975	18
Clear	45 (30.61%)	264 (73.33%)	903 (92.61%)	15 (83.33%)
Thin	42 (28.57%)	39 (10.83%)	39 (4%)	3 (16.66%)
Thick	60 (40.81%)	57 (15.83%)	33 (3.38%)	-

χ^2= 360.4 df=6 pvalue : <0.001

Incidence of meconium staining liquor was higher in group with AFI< 5 cm and in group with AFI 5-8 cm compared to AFI group 8.1-25 cm.

TABLE: 6

AFI & APGAR AT 5 MINUTES

AFI	<5 cm	5-8 cm	8.1-25 cm	>25 cm
Cases	147	360	975	18
<7	75 (51.02%)	90 (25%)	132 (13.53%)	6 (33.33%)
≥7	72 (48.97%)	270 (75%)	843 (`86.46%)	12 (66.66%)

χ^2=120.5 df=3 P<0.001

AFI(cm)	OR	95%CL	
		Lower	Upper
<5	6.652	4.587	9.648
5-8	2.129	1.576	2.876
>25	3.193	1.178	8.654.

Among the patients with AFI < 5, 51.02% of them had <7 Apgar at 5mts, 25% of the patients with AFI 5-8cm had <7 Apgar at 5mts, 33.33% of the patients with AFI>25 cm had <7 Apgar at 5mts whereas

only 13.53% of patients with AFI of 8.1-25 cm had babies with Apgar <7 at 5mts.

OR 6.6 indicates the chances of having babies with Apgar score <7 for patients with AFI level <5 is 6.6 times and OR of 2.1 indicates chances of having babies with Apgar score <7 for patients with AFI level 5-8 is 2 times and OR of 3.19 indicates, chances of having babies with Apgar score <7 at 5mts 3.2 times with AFI level >25 cm compared to women with AFI level 8.1-25cm.

TABLE:7

AFI & BIRTH WEIGHT

AFI	<5 cm	5-8 cm	8.1-25 cm	>25 cm
Live Birth	147	360	975	18
<2.5 kg	51 (34.6%)	42 (11.66%)	27 (2.76%)	3 (16.66%)
2.5-4kg	93 (63.26%)	315 (87.5%)	946 (97.02%)	13 (72.22%)
>4kg	3 (2.04%)	3 (0.83%)	2 (0.20%)	2 (11.11%)

χ^2= 182.735 df=3 p<0.001

AFI(cm)	OR	95%CL	
		Lower	Upper
<5	18.653	11.184	31.11
5-8	4.637	2.813	7.645
>25	7.022	1.919	25.895

Among the patients with AFI level <5, 34.6% of them had babies with birth weight <2.5kg,12% of the patients with AFI level 5-8cm had

babies with birth weight <2.5kg whereas only 3% of patients with AFI level 8.1-25 cm were having babies with birth weight <2.5kg.

OR 18.6 indicates the chances of having babies with birth weight <2.5kg is 18.653 times higher in patients with AFI<5 cm and OR 4.63 indicates chances of having babies with birth weight <2.5kg is 4.63 times higher in a patients with AFI 5-8cm and OR 7.022 indicates chances of having babies with birth weight <2.5kg is 7.022 times higher in patients with AFI>25cm compared to the patients with AFI level 8.1-25 cm.

TABLE:8

IUGR IN RELATION TO AFI

AFI	<5 cm	5-8 cm	8.1-25 cm	>25 cm
Total Cases 1500	147	360	975	18
IUGR	48 (32.65%)	39 (10.8%)	9 (2.76%)	

$\chi^2 = 230.995$ df=3 pvalue: <0.001

AFI(cm)	OR	95%CL	
		Lower	Upper
<5	52.04	24.79	109.224
5-8	13.04	6.249	27.215
>25	-	-	-

The patients with AFI <5 cm had 32.65% of IUGR babies and patients with AFI 5-8cm had 10.8% of IUGR babies whereas patients with AFI group 8.1-25 cm had only 2.76% of IUGR babies. None of the patient had IUGR babies in polyhydramnios group.

OR 52.04 indicates chances of having IUGR babies is 52.04 times in AFI<5 group and OR 13.04 indicates chances of having IUGR babies is 13.04 times higher in AFI 5-8 group compared to group with AFI 8.1-25cm.

TABLE:9

AFI & MALFORMATION DIAGNOSED POSTNATALLY

AFI	<5 cm	5-8 cm	8.1-25 cm	>25 cm
Live Birth	147	360	975	18
Malformation	3 (2.04%) 1.CTEV-1case 2.PUJ obstruction-2 cases	-	4 (0.41%) 1.Polydactyly 2.Duodenal atresia 3.Ambiguous genitalia 4.Spinabifida	6 (33.33%) 1.Hydrops-1 case 2.Duodenal atresia-1 case 3.Spinabifida-2 cases 4.Meningomyelocele-2cases

$\chi^2 = 228.71$ df=3 pvalue:<0.001

Among the patients with AFI>25 cm, 33.33% had babies with congenital malformations, 2.04% of patients with AFI<5 cm had congenital malformations whereas only 0.41% of patients with AFI 8.1-25 cm had babies with congenital malformations diagnosed postnatally, which gives a 'p' value of 0.001 which is significant.

TABLE:10

AFI & NICU ADMISSION

AFI	<5 cm	5-8 cm	8.1-25 cm	>25 cm
Live Birth	147	360	975	18
NICU Admission	75 (51.02%)	78 (21.66%)	93 (9.53%)	8 (44.44%)

χ^2=174.55 df=3 pvalue:<0.001

AFI(cm)	OR	95% CL	
		Lower	Upper
<5	9.879	1.705	14.556
5-8	2.623	1.887	3.647
>25	7.587	2.923	19.695

Rate of admission of babies to NICU was greater in those with decreased & increased AFI compared to normal.

OR 9.8 indicates chance of having NICU admission is 10 times higher in AFI<5 group, OR 2.6 indicates, NICU admission is 3 times higher in AFI 5-8 group, OR 7.5 indicates NICU admission is 7.5 times higher in AFI>25 cm group compared to AFI group of 8.1-25cm.

TABLE:11

AFI & NEONATAL DEATH

AFI	<5 cm	5-8 cm	8.1-25 cm	>25 cm
Live Birth	147	360	975	18
Neonatal Death	7 (4.76%)	8 (2.2%)	12 (1.23%)	6 (33%)

χ^2 =89.831 df=13 pvalue<0.001

AFI(cm)	OR	95% CL	
		Lower	Upper
<5	4.012	1.554	10.36
5-8	1.82	0.739	4.49(NS)
>25	40.125	12.98	124.63

Neonatal death was 4.76% in group with AFI<5 cm,2.2% in group with AFI 5-8cm, 33% in group with AFI >25 cm and only 1.23% in group with AFI 8.1-25cm.

OR of 4.012 indicates chance of having neonatal death is nearly 4 times higher in AFI group <5 cm, OR 1.82 indicates, chance of having neonatal death is nearly 2 times higher in AFI group 5-8cm.

OR of 40.125 indicates, chance of having neonatal death is only 40 times higher in AFI group>25cm.

DISCUSSION

Quantitative amniotic fluid volume determination by AFI is now a routine part of fetal biological profile score testing. The relationship between oligohydramnios and poor perinatal outcome has been previously documented. This descriptive follow-up study was undertaken to review the relation between AFI and neonatal outcome and effect of AFI on labour in 1500 antenatal patients with term gestation. Of 1500 cases 147 had AFI<5cm,360 had AFI within the range of 5-8cm,975 had AFI in the range of 8.1-25cm and 18 had polyhydramnios with AFI>25cm.

In our study when the AFI was less than 5cm,the nonreassuring fetal heart pattern was seen in57.14%. 23.33% of patients had nonreassuring fetal heart pattern in group with AFI 5-8cm. 8% of patients had nonreassuring fetal heart pattern in the AFI group 8.1-25 cm and 16.66 of patients had nonreassuring fetal heart pattern in the AFI group >25 and ‘p’ value is <0.001 which is statistically significant.

In our study when the AFI was < 5cm the caesarean section rate was 34% and the instrumental delivery was 8.16%.The incidence of

induced and instrumental delivery (16.32% and 18.16%respectively) was significantly higher in the group with AFI < 5 cm compared to the group with AFI 8-25 cm (7.38% and 4.92%) .Less patients with oligohydramnios were allowed SPVD (8.16%) compared to 56.87% with normal AFI 8.1-25cm and 66.66% in the group of AFI > 25 cm ('p' value is < 0.001)

In our study, the incidence of SPVD was only 46.66% in the AFI group 5-8cm compared to 67.07% with AFI group 8-25cm.Among the cases taken up for caesarean section, fetal distress was the commonest indication.57.14% of patients with AFI >5, 25.83% of patients with AFI 5-8cm were taken up for caesarean section for fetal distress compared to only 12.92% in those with AFI 8-25 cm.

With respect the association between meconium staining and AFI it was concluded in our study that 38.68% of the patients with AFI of 0-5 cm,there was meconium staining of the amniotic fluid. The study done by Chauhan et al ,1999 showed that in borderline AFI, 12% of the patients had meconium staining liquor with 95% CL of 0.64-5.89 which was statistically not significant, whereas in our study the 'p' value is <0.001 and χ^2 value was 360.4. With respect to the association between AFI and Apgar at 5mts it was concluded in our study, Apgar at 5mts

was poorer in patients with AFI<5 (51.02%) unlike 14.843% with AFI>5cm

In our study the group with AFI 5-8 cm had 25% babies with Apgar <5 compared to 13.33% with AFI group 8.1-25 cm and 33.33% in the AFI group >25cm.

Taking into consideration of birth weight and IUGR in association with AFI, we can conclude from our study that there is higher incidence of IUGR and low birth weight babies when the AFI < 5 cm.The incidence of low birth weight babies and IUGR was significantly much greater in the group AFI 5-8 cm compared to the group with AFI 8.1-25 cm..'p' value is <0.001 making it statistically significant. The study done by Chauhan et al showed the mean birth weight of 3.3kg with variation of 500grams and 'p' value is < 0.001. Mean birth weight of babies in our study was 3.1kg.

We have also studied the occurrence of congenital malformations which were not diagnosed antenatally and their association with AFI. Incidence was maximum in polyhydramnios (33.33%) 'p' value is < 0.001 which is statistically significant.

Studying the association between the AFI and neonatal morbidity and mortality we find highest morbidity in the AFI group < 5 cm followed by group AFI > 25 cm. Neonatal deaths were maximum in the AFI group > 25(33%) and this was largely due to congenital malformations.

SUMMARY

1. This study entitled, 'Amniotic fluid index-Effect on Labour and Neonatal Outcome' was done at Government Hospital for Women and Children, Egmore, Chennai between June 2006 to June2007.

2. This study was done with the aims and objectives of screening of antenatal patients at term for oligohydramnios or polyhydramnios and subjecting them to ultrasound examination to determine the amniotic fluid index by four-quadrant method and to study the effect of AFI on labour and neonatal outcome.

3. This was a descriptive follow-up study. 1500 antenatal patients were included in this study. They were categorized into 4 groups as AFI < 5 cm, AFI 5-8 cm, AFI 8.1- 25 cm and AFI >25 cm.

4. All the studies done in this subject were extensively studied and analyzed and they were incorporated in the review of literature.

5. Measurement of outcomes included were incidence of non reactive NST, caesarean delivery for fetal distress, meconium staining, Apgar score <7 at 5 mts, birth weight < 2.5kg,IUGR, admission to NICU and neonatal death.

6. The various parameters, which were noted in our patients, were incorporated into proforma which is enclosed and which formed the basis of detailed discussion.

7. Incidence of caesarean section for fetal distress is highest in AFI <5 cm followed by AFI group 5-8 cm.

8. Neonatal morbidity and mortality is highest in AFI <5 cm followed by AFI group 5-8 cm.

9. Incidence of congenital malformations, which were diagnosed postnatally, was maximum in polyhydramnios group (AFI > 25cm).

CONCLUSIONS

1. This study suggests that AFI is a good predictor of neonatal morbidity and mortality as has been classically reported.The findings of this study are consistent with previous retrospective studies by Garmel et al who showed that there was significant increase in risk of caesarean delivery, fetal distress and low birth weight with oligohydramnios.

2. The AFI for detecting intrapartum oligohydramnios is a valuable screening test for subsequent fetal distress requiring caesareasn delivery.

3. There was an increased risk of nonreassuring fetal heart rate pattern during labour for oligohydramnios patients.

4. Significantly higher incidence of IUGR was found in women with low AFI as compared to women with normal AFI

5. Our data are consistent with reports of other investigations and suggest that the AFI of 5-8 cm should be an indication of twice weekly antepartum testing.

6. A border line AFI of 5-8 cm may be early marker of declining placental function and progressing fetal compromise and AFI measurements may provide an early dependent marker independent of weight and gestational age.

7. The possibility of fetal distress is much higher in the AFI group < 5 cm and 5-8 cm hence vigilance and early decision is important in these groups. Pregnancies with oligohydramnios and compromised fetuses are more likely to be terminated earlier than pregnancies with normal AFI and healthy appearing fetus. Any sign of deteriorating fetal condition may prompt immediate delivery. This selective censoring (or confounding by indication) may some extent have biased the time dependant outcomes (e.g. perinatal outcomes) towards better results in cases in oligohydramnios.

8. Neonatal morbidity and mortality is highest in AFI < 5 cm but there is significant neonatal morbidity and mortality in the AFI group of 5-8 cm and hence this group cannot be considered as normal even though the definition by Moore TR 1997 states that normal AFI is 5-25cm

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PROFORMA

The study of neonatal morbidity,mortality and labour in relation to amniotic fluid index in 1500 cases of normal pregnancies.

Name

Wife of

Address

Age

I.P/O.P No

Socio economic status

Booked / Unbooked

D.O.A.

LMP

EDD

Obstetric formula G P L A

Complaints (if any)

Present Obstetric History

Past obstetric History

Menstrual History : Age at menarche

Duration of cycle

Regular/irregular

Past Medical History: H/o TB, DM, HT, HD, Epilepsy,

Bronchial Asthma

Past surgical History:

Family History:

Personal History: Diet, Nutrition, Sleep, Bowels & Micturition

H/o cigarette smoking, Alcohol

General examination:

Height: Weight:

Nutritional Status

Pallor

Pedal Oedema

Breast

Thyroid

Spine

Gait

Vitals: Temperature: P.R

B.P R.R.

Systemic Examination: CVS: RS: CNS:

Local Examination: Fundal grip

Umblical grip

Pelvic grips

Amount of liquor

Per Vaginal Examination: Leaking membranes

Bishops Score

Pelvis

Investigations: Hb%

Urine examinations

Blood Group & Type

Random Blood Sugar

HIV & VDRL

Admission CTG

Early USG in first trimester

Ultrasonography: Presentation

Gestational Age

Amniotic fluid index

Rt upper Lt Upper

Rt lower Lt lower

Placental position and grading

Details Of Delivery:

Duration of First Stage

Second Stage

Third stage

Mode of delivery: Vaginal: Spontaneous / Induced

Forceps: Indication

LSCS: Indication

Colour of Liquor: Clear / meconium

Baby Details: Live / Still Birth

Term/Preterm

Date and Time of birth

Birth wt HC

Gestational age

Sex

Apgar Score at 1 mt

5 mt

Any congenital anomalies

Admission to NICU: Yes / No

No. of days in NICU

Oxygen / Ventilator support

I.V. Antibiotics Yes / No

CXR Yes / No

Condition at the time of discharge

NEONATAL OUTCOME:

Healthy / neonatal Death

ABBREVIATION

A	-	Admission
AFI	-	Amniotic Fluid Index
AFV	-	Amniotic Fluid Volume
AT	-	Admission Test
BPP	-	Biophysical Profile
C	-	Clear
CPD	-	Cephalopelvic Disproportion
FD	-	Fetal Distress
FHR	-	Fetal Heart Rate
FI	-	Failed Induction
FT	-	Full Term
HIE	-	Hypoxic Ischemic Encephalopathy
IUGR	-	Intrauterine Growth Retardation
LMC	-	Low Midcavity Forceps
LSCS	-	Lower Segment Caesarean Section
MAS	-	Meconium Aspiration Syndrome
NR	-	Nonreactive
NST	-	Non Stress Test
RD	-	Respiratory Distress
SPVD	-	Spontaneous Vaginal Delivery
USG	-	Ultrasonogram
VD	-	Vaginal Delivery