“TO STUDY THE MATERNAL AND PERINATAL OUTCOME IN TERM ANTENATAL MOTHERS WITH BORDERLINE OLIGOHYDRAMNIOS WHOSE FETAL CEREBROPLACENTAL RATIO >1”

Dissertation submitted to
The Tamilnadu Dr. M. G .R. Medical University,
In partial fulfillment for the award of the degree of

MS OBSTETRIC & GYNAECOLOGY
BRANCH II

INSTITUTION

DEPARTMENT OF OBSTETRIC &GYNAECOLOGY
MADRAS MEDICAL COLLEGE
CHENNAI - 600 003.

EXAMINATION - MAY 2018

THE TAMILNADU Dr. M. G .R. MEDICAL UNIVERSITY,
CHENNAI, TAMILNADU - 600032
BONAFIDE CERTIFICATE

This is to certify that **DR. ANNIE RAJIAH** has been a postgraduate student at the Department of **OBSTETRIC & GYNAECOLOGY**, **INSTITUTE OF OBSTETRIC & GYNAECOLOGY** Madras Medical College, Chennai - 03.

This Dissertation titled “**TO STUDY THE MATERNAL AND PERINATAL OUTCOME IN TERM ANTENATAL MOTHERS WITH BORDERLINE OLIGOHYDRAMNIOS WHOSE FETAL CEREBROPLACENTAL RATIO >1**” is a bonafide work done by her during the study period and is being submitted to The Tamil Nadu Dr.M.G.R. Medical University, Chennai - 32 in partial fulfilment of **MS OBSTETRIC & GYNAECOLOGY** Examination.

Prof. Dr. D. Tamil selvi, MD., DGO.,
Director,
Institute of social obstetrics,
Kasturba Gandhi Hospital,
Madras Medical College
Chennai – 600 005.

Prof. Dr. N. Hemalatha MD., (OG),
Institute of Obstetrics and Gynaecology
Govt. Women and Children Hospital
Madras Medical College
Chennai – 600 005

Dr. R. Narayana Babu MD. DCH
Dean
Madras Medical College,
Chennai- 600 003
DECLARATION

I solemnly declare that this dissertation entitled “TO STUDY THE MATERNAL AND PERINATAL OUTCOME IN TERM ANTENATAL MOTHERS WITH BORDERLINE OLIGOHYDRAMNIOS WHOSE FETAL CEREBROPLACENTAL RATIO >1” was prepared by me under the guidance and supervision of Dr. Dr. N. Hemalatha, MD, (OG), Professor, Department of Obstetrics and Gynaecology, Institute of Obstetrics and Gynaecology, Egmore, Chennai.

This dissertation is submitted to The Tamil Nadu Dr. M.G.R. Medical University, Chennai in partial fulfilment of the University regulations for the award of the degree of M.S. (Obstetrics and Gynaecology).

Place: Chennai

Date: DR. ANNIE RAJIAH
ACKNOWLEDGEMENT

I gratefully acknowledge and sincerely thank Dr. Narayana Babu MD., DCH., Dean, Madras Medical College and Research Institute, Chennai for allowing me to use the facilities and clinical materials available in the hospital.

My sincere thanks and gratitude to Dr. D. Tamil selvi, M.D., D.G.O., Director and Superintendent, Institute of Obstetrics and Gynaecology, for granting me permission to utilize the facilities of the institute for my study.

I am extremely grateful to our Professor, Dr. N. Hemalatha MD., (OG), Institute of Obstetrics and Gynaecology and Government Women and Children hospital, Egmore, Chennai for her valuable guidance, motivation, and encouragement given during the study.

I humbly thank all the Professors and Assistant Professors of IOG, Egmore and Government Kasturba Gandhi Hospital, Triplicane for all their help during the course of the study.

My sincere thanks to Mr. Ashok kumar, Statistician for helping me in analysing the results of my study.

My special thanks to my family and friends for their physical help and moral support without which nothing would have been possible.

I am immensely grateful to all the patients who took part in the study.
<table>
<thead>
<tr>
<th>S.NO</th>
<th>TITLE</th>
<th>PAGE.NO</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>INTRODUCTION</td>
<td>1</td>
</tr>
<tr>
<td>2</td>
<td>REVIEW OF LITERATURE</td>
<td>4</td>
</tr>
<tr>
<td>3</td>
<td>AIMS AND OBJECTIVES</td>
<td>47</td>
</tr>
<tr>
<td>4</td>
<td>MATERIALS AND METHODS</td>
<td>49</td>
</tr>
<tr>
<td>5</td>
<td>OBSERVATION AND ANALYSIS</td>
<td>57</td>
</tr>
<tr>
<td>6</td>
<td>DISCUSSION</td>
<td>66</td>
</tr>
<tr>
<td>7</td>
<td>SUMMARY</td>
<td>75</td>
</tr>
<tr>
<td>8</td>
<td>CONCLUSION</td>
<td>77</td>
</tr>
<tr>
<td>9</td>
<td>BIBLIOGRAPHY</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>ANNEXURES</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• PROFORMA</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• MASTER CHART</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• ETHICAL COMMITTEE CERTIFICATE OF APPROVAL</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• PATIENT INFORMATION &amp; CONSENT FORM</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• PLAGIARISM SCREENSHOT</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• PLAGIARISM CERTIFICATE</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• ABBREVIATION</td>
<td></td>
</tr>
</tbody>
</table>
INTRODUCTION
INTRODUCTION

INTRODUCTION:

Modern obstetrics has grown in leaps and bounds in the past decade to reduce the perinatal mortality and morbidity. Though the methods of forecasting have evolved continually, antenatal forecasts of fetal health remains a challenge in modern obstetrics and has been a focus of intense interest in past few decades in obstetrics.

But, One of the most worrisome aspect of modern obstetrics is the increase in the caesarean section rate [1, 2]. In recent years, the caesarean section rate has increased in different parts of the world, both in developed and developing countries. In a study conducted in the department of Obstetrics and Gynaecology, Seth G.S. Medical College and K.E.M. Hospital, a large tertiary care municipal hospital in western India, the results of which were published in The Journal of Obstetrics and Gynaecology of India[3], they have documented an increase in average annual caesarean delivery rate, from 17.15 % in 2001 to 23.47 % in 2006 to 28.93 % in 2011, this findings were consistent with the findings of Barber et al. [4], who showed an increase from 26 to 36.5 % between 2003 and 2009.
Oligohydramnios is one such situation which has a higher incidence of occurrence and also one of the comorbid condition in a term pregnant mother which leads to the dilemma on the part of the treating obstetrician as to decide upon the mode of delivery. This can be seen from the fact that in one study by Bhat et al, oligohydramnios was present in 54% of their primigravida mothers in their study. Similarly, Donald D et al, [6] noted the incidence of oligohydramnios to be around 60% in primigravida.

Further, in the same Bhat et al study they noted that nearly 40% of the oligohydramniotic mothers patients delivered through caesarean section, 71.4% of oligohydramniotic mothers required surgery to deliver the fetus was noted in patients as they had altered Doppler study.

Since the oligohydramniotic mothers experience high chances of intrapartum complication resulting in perinatal morbidity and mortality, delivering the fetus through caesarean section this cohort of mothers has been rising, nevertheless, decision between caesarean section and vaginal delivery has to be well balanced so as to prevent the unnecessary maternal morbidity, having said that we should never hesitate to do the necessary timely intervention if the perinatal well-being is at stake, Hence the need of the hour is to design methodologies based on sound scientific evidence so that these caesarean rates are brought down.
To achieve the above goal its imperative that we study the maternal and perinatal outcome in term antenatal mothers with borderline oligohydramnios whose Doppler study is quite favourable ie cerebroperfusion ratio >1.
REVIEW OF LITERATURE
REVIEW OF LITERATURE

Among the innumerable list 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 non-invasive nature. The most frequently utilised method to predict the perinatal outcome is to measure the amount of amniotic fluid by ultrasonogram.

The well-being of the intrauterine fetus largely is dictated by the level of amniotic fluid. It allows the fetus to move by acting as a cushion and prevents injury of the fetal parts, at the same time it helps in avoiding the compression of the umbilical cord, Moreover, amniotic fluid’s bacteriostatic nature stalls the occurrence of infection in the intra-amniotic environment.

At any point of time during gestation, the amount of amniotic fluid is the result of water exchange between the mother, placenta & the fetus, the amount is maintained between a relatively narrow range. Polyhydramnios and oligohydramnios are as a result of disorder of this regulatory process. 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 ultrasonogram, accurate assessment of amniotic fluid has been possible, resulting in earlier recognition of abnormal conditions and possible intervention. Proper clinical assessment of amniotic fluid volume was difficult in the past. Better identification of the at-risk fetus can be done now by using the Amniotic Fluid Index (AFI) method described by Phelan et al, by the four quadrant technique is employed during trans abdominal ultrasound. With this USG technique we are now able to clearly categorize antenatal mothers based on the liquor amnii level, which has led to numerous studies that have studied the perinatal outcome of pregnancies with AFI<5 cms by further sub-dividing oligohydramniotic mothers to borderline oligohydramniotic (AFI 5-8 cm) and oligohydramniotic (AFI < 5 cm), out of the sub-sect of Antenatal mothers with borderline oligohydramniotic mothers, many were found to have a favourable chance of delivering through vaginal delivery after a trail labour, nevertheless this vaginal mode of delivery was not feasible in all borderline oligohydramniotic mothers, so we are left with the question of who are those borderline oligohydramniotic mothers who will be benefitted out of trail labour, so that they can successfully deliver through vaginal elivery. To answer this question we had to take the assistance of yet another technology.
Yet another dramatic revolution in obstetric care has been done by the advent of Doppler scan which can be done in a single sitting using the same ultrasound equipment with the required accessories, this Doppler scan has helped us to predict the nature of care required in intrapartum period and to predict the course and mode of delivery of the fetus.

**Doppler studies**

Application of doppler studies in the assessment of the unborn fetus as a method of intensive fetal surveillance is relatively new.

Since the early 2000’s research has demonstrated that doppler studies of the fetus is probably the best tool available for fetal surveillance.

All doppler tests are based on the principle that sound which is reflected from a target which is moving will shift its frequency in proportion to the velocity of the target.

Doppler in obstetrics is typically used for the study of vascular blood flow, doppler ultrasonography is an excellent non-invasive procedure which uses the detectable changes in high frequency sound waves, this is called doppler effect which creates clear digital images in real time.
The 2 basic principle which are used are:

1) **Ultrasound principle:**

High frequency of sound waves which are aimed at the stationary target is reflected back and detected by the transducer. this is displayed as intensities of Echo on the screen.

2) **Doppler principle:**

Echoes from moving target exhibit slight differences in the time interval between signal(s) which is/are returned to the receiver, this brings changes in the sound pitch, which depends on the movement of blood in relation to the positive or negative shift, these signals are picked up and are exhibited as images on the screen in real time.

**Amniotic fluid level and perinatal outcome:**

*Amniotic fluid in normal pregnancy*

Source:

The exact source of amniotic fluid is yet to be determined. The below mentioned are the important sources of amniotic fluid.
1. Transudate which is generated from maternal plasma which passes through chorio amniotic membrane and fetal membranes into the maternal circulation in the placenta.

2. Transudate fluid from the fetal circulation from the palcenta, umbilical cord and through the fetal skin the fetal skin before the skin keratinisation is the source of amniotic fluid at 24-26 weeks of gestational age.

3. Secretion from amniotic epithelium by hydrostatic forces and osmotic forces.

4. In the later half of gestation two primary sources are fetal kidney and lung. The fetal kidneys begin to function at about 16 weeks of gestation age and the fetal kidneys become the primary source of amniotic fluid

**Development:**

Amniotic fluid is in the amniotic sac ,it is also known as CAMERON’s fluid.it is present from the formation of the gestational sac in the humans,

In the 1st trimester amniotic fluid which is the ultra-filtrate of plasma which consists of extra cellular fluid which diffuses through the chorio
amniotic membranes which covers the placenta, cord, the fetal embryonic skin and tissues which is approximately only 4 cell layered in thickness.

The fetal skin keratinisation begins to occur by 15th week of pregnancy and continues to 24th to 25th week of gestation.

After that in the 2nd and 3rd trimester of the development the fetal urine plays an important role in its production.

At the earliest at about 12 weeks of gestational age the excretion of the urine by kidneys are hypotonic in nature. As the gestational age of the fetus exceeds 18th week the fetal urine contribution starts increasing steadily throughout the pregnancy at the rate of 7-17 ml each day and keeps on increasing.

The fetal lungs which also contribute to amniotic fluid production.

The amniotic fluid is mainly absorbed by swallowing into the gastrointestinal tract and also into the fetal blood by permeation through the placenta.

The amount of amniotic fluid which is swallowed by the fetus is about 50% nearing term.
Circulation of amniotic fluid:

Amniotic cavity which is a truly metabolically active compartment and is remarkably dynamic site of amniotic fluid volume changes. Plentill (1966) demonstrated that there is a dynamic of amniotic fluid circulation using tagged sodium and deuterium oxide. At term the complete circulation time allowing full changeover of amniotic fluid circulation is around 3 hours. The approximate volume of amniotic fluid at any specific moment is represented by a balance between the structures which produce or allow passage of fluid to and fro into amniotic cavity i.e. chorion frondosum, chorio-amniotic membranes, fetal skin, fetal urinary and respiratory tract and those involved in removal of amniotic fluid i.e. amniochorionic and gastrointestinal tract interface. The additional pathways for clearance are intramembranous and transmembranous. The more important intramembranous pathway is which includes transfer of amniotic fluid and fetal blood perfusing the fetal surface of placenta, fetal skin and umbilical cord. The transmembranous pathway which involves exchange across the chorio-amniotic membranes as between the amniotic fluid and the maternal blood within the wall of uterus. At term the exchange between maternal blood and amniotic fluid is negligible whereas intramembranous flow reaches approximately 400ml/day.
Volume of amniotic fluid:

The Amniotic fluid volume at different gestational ages was determined by Weismann, Itskovitz, Eldor and Jakobi. It was found that amniotic fluid increased from approximately 1 ml at 7 weeks to 25 ml at 10 weeks, 60 ml at 12 weeks, 400 ml at 20 weeks and which peaks at around 1 litre at 35-36 weeks and beyond these weeks of pregnancy the amniotic fluid volume considerably decreases. Beyond 40 weeks the amniotic fluid volume decreases further. The amniotic fluid measured is 480 ml, 250 ml and 160 ml at 42, 43 and 44 weeks respectively. The rate of decrease of amniotic fluid is unpredictable in post term pregnancies and especially an abrupt fall can occur within 24 hrs.

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

Characteristics of amniotic fluid:

{A}Physical:

Specific Gravity — Early pregnancy — 1.006
Late Pregnancy — 1081 pH at term — 7.04 to 7.11

Osmolality 20-30 mOsm/ltr.

Colour: During early pregnancy amniotic fluid is colourless since 98-99% of amniotic fluid contains water. It gradually becomes pale straw to deep yellow colour which depends on the amount of bilirubin pigment. Bilirubin concentration decreases after mid pregnancy and after 36 wks. Amniotic fluid is colourless initially but cloudy due to mixture of vernix caseosa (clumps of undissolved desquamated fetal skin cells and some free lipid material) lanugo hair and also some epithelial cells. A large number of dissolved substances are also present in the amniotic fluid which are creatinine, urea, renin, bile pigments, simple sugars like glucose & fructose, proteins like albumin and globulin, lipids, hormones like oestrogens and progesterone, enzymes and mineral like sodium, potassium and chloride.

{B} 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% and Inorganic — 50%

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

i. Proteins and their derivatives — 0.25g%

ii. Albumin — 60%

iii. Ceruloplasmin — 1.5%

iv. Transferrin — 11.6% , transferrin acts as a barrier to infection , it binds itself to iron needed by bacteria and fungi

v. IgA- 0.1 % and IgG- 11% , both IgG, IgA and lysozymes help in defence against pathogens

vi. Alpha feto protein

vii. Amino Acids — Similar to that in maternal plasma

3. Glucose — 20 mg% along with fructose

4. Uric Acid — 4 mg%

5. Creatinine — 1.8 mg%

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

7. Hormones
8. Lipids and fatty acids have a detergent effects on bacterial membranes

9. Bilirubin indicates the degree of fetal RBC lysis and is abnormally high during serious fetal blood group incompatibility

10. Prostaglandins

11. Non-embryonic stem cells: these stem cells have ability to differentiate into different cell types like nervous tissue, organs and bone mesenchyme

**Inorganic:**

1. Electrolytes: During the first half of pregnancy sodium and chloride concentrations are similar to fetal than maternal serum. Later the amniotic fluid becomes progressively hypotonic with decreased sodium and chloride concentrations and corresponding decrease 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 that there is a positive correlation between maternal hematocrit values and amniotic fluid PaO$_2$. Pa CO$_2$ in amniotic fluid values varies from 44.0-57.6mm Hg.(Kittrich 1968).

3. Cells composition: 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. Protecting the fetus: Amniotic fluid has a cushioning effect which allows normal musculoskeletal development of fetus free from restriction of movements and distortion by adjacent structures.

b. Temperature control: It maintains an even temperature and provides thermally stable environment for the fetus.

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

d. Acts as a lubricant: It allows free movement of fetus and prevents adhesions between fetal parts and amniotic sac. Fluid in the amniotic sac within uterus prevents the umbilical cord from being compressed.
e. It has nutritive value.

f. Growth factors like epidermal growth factors (EGF and EGF like growth factors e.g. transforming growth factor. Ingestion of amniotic fluid into Gastro intestinal system 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 by the bag of membranes.

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

3. It flushes the vagina before birth of the baby. Its bactericidal and antiseptic action protects the fetus during passage via the birth canal and prevents ascending infection into uterine cavity.

4. It serves as an active biological medium in which various bioactive substances are stored. Half-life of selected compounds in amniotic fluid is much longer than those of same compounds in blood. For eg. T1/2 of PGF2 alpha and PGE2 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 excretory function. Changes in AFV is related to a wide variety of physiological and pathological changes in fetus and mother. Clinical assessment of amniotic fluid volume is usually subjective. Though most experienced clinicians are capable of making the 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 in the field to devise more convenient and highly reproducible methods for estimation of amniotic fluid volume.

Ultrasonography:

USG is an ideal non-invasive tool for accurate and can be used repeatedly for assessment of amniotic fluid volume. Ultrasonographic visualization of amniotic fluid may be subjective or semiquantitative.

- Subjective:

The technique of subjective assessment of AFV is by comparing echo free fluid areas surrounding the fetus to the space occupied by fetus and placenta, allowing sonographer to visually integrate multiple pockets of amniotic fluid into a subjective total that is compared with expected normal level at each stage of gestational growth. Halperin
et al evaluated both 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 between 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 gravid uterus to select single deepest Amniotic fluid pocket which is free of umbilical cord and fetal parts. The greatest vertical dimension of this pocket is measured at right angle to the uterine ovoid contour, thus excluding errors due to venous drainage, by using transducer perpendicular to the floor. This measurement has been referred as maximum vertical pocket (MVP). The depth of the largest pocket was measured at right angles to the depth measurement in order to exclude errors related to the umbilical cord which 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 stalwarts Rutherford, Moore and Cayle developed a semiquantitative method of sonographic assessment of amniotic fluid index. This method is accurately based on division of gravid uterus into four quadrants using external landmarks on maternal abdomen. Linea nigra divides it into right and left halves and an transverse line through the umbilicus divides the abdomen transversely into upper and lower 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 curvilinear or a sector transducer is used frequently.
- Dividing the gravid uterus into four quadrants using external landmarks on maternal abdomen. Linea nigra divides it into right and left halves and an transverse line
through the umbilicus divides the abdomen transversely into upper and lower halves.

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

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

- The process is repeated in each of the four quadrants and pocket measurements are summated 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 it was noted that Phelan et al's original description of AFI did not mention whether in the pockets of amniotic fluid, umbilical cord should be included or excluded. Rutherford et al subsequently stated that umbilical cord or a limbs may occasionally traverse a pocket of measured amniotic fluid. However when the pocket is almost completely filled with either umbilical cord or limbs, it should not be included as one of the pockets.
DEFINITION OF OLIGOHYDRAMNIOS


<table>
<thead>
<tr>
<th>Technique</th>
<th>Definition of Oligohydramnios</th>
<th>Study</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dye dilution method</td>
<td>200ml</td>
<td>Horsager, Nathan &amp; Leveno</td>
</tr>
<tr>
<td>Ultrasound</td>
<td>Single vertical pocket &lt;1cm</td>
<td>Manning, Hill &amp; Platt</td>
</tr>
<tr>
<td>Ultrasound</td>
<td>Single vertical pocket &lt;3cm</td>
<td>Halperin et al</td>
</tr>
<tr>
<td>Ultrasound</td>
<td>AFI &lt;8cm</td>
<td>Jeng et al</td>
</tr>
<tr>
<td>Ultrasound</td>
<td>AFI &lt;5\textsuperscript{th} % tile for gest age</td>
<td>Moore &amp; Cayle</td>
</tr>
<tr>
<td>Ultrasound</td>
<td>AFI &lt;5cm</td>
<td>Phelan et al</td>
</tr>
<tr>
<td>Ultrasound</td>
<td>AFI 5.1-8cm</td>
<td>Jeng et al</td>
</tr>
<tr>
<td>Ultrasound</td>
<td>AFI 5.1-8cm</td>
<td>James high risk</td>
</tr>
</tbody>
</table>
Moore and Cayle defined oligohydramnios when AFI was less than 5\textsuperscript{th} percentile which corresponds to an AFI of less than 7-8 cm. Rutherford et al used 5 cm as a threshold to define oligohydramnios, a number that is less than the first percentile. Although controversy still exists to which threshold values to use, values greater than 5 cm and less than 18-20 cm are considered by most to be normal. The borderline Oligohydramnios values is defined as AFI as 5.1 -8 according to high risk pregnancy James and jeng et al which is of interest to us.

In spite of different parameters for borderline AFI in different studies, In most reported studies, the pregnancies with borderline AFI of 5-8 cm have shown detrimental perinatal outcome in comparison with control subjects with normal amniotic fluid level (8.1-18 cm) [28]. Also the low amniotic index may increase the rate of delivery of fetus through caesarean section.

Kwon et al [29] studied perinatal outcomes of 271 pregnancies with an AFI of 5 - 8 cm compared with 3523 pregnancies with an AFI of 8 - 25 cm. They observed ,that in those with AFI of less than 8, there appeared a greater risk of small for gestational age (SGA) neonates, caesarean delivery due to fetal distress, less than 7 Apgar scores at 5 minutes, and more NICU admissions. In those gestations with a borderline AFI, if the Doppler velocimetric values were abnormal , the
chances of an adverse perinatal outcome was increased compared with the group with a normal AFI.

In the light of the above facts it was felt necessary to outline a sect of pregnancies, whose outcome could be different and more favourable within the subset of borderline AFI, hence it was decided to test the perinatal outcome in the subset of people with favourable CPR, and to test whether the perinatal outcome was similar if allowed to deliver through trail of labour.

❖ Knowledge about placenta and uteroplacental circulation is important before we set out to understand the central idea and mechanism about Cerebro Placental Ratio’s role in predicting the fetal outcome in the antenatal period.

PLACENTA - A UNIQUE ORGAN.

The conversion of the spiral arteries to uteroplacental arteries is termed a physiological change. Spiral arteries becomes dilated and tortuous. The diameter increases from 15–20 to 300–500 mm, due to the invasion of cytotrophoblast cell which leads to a complete absence of muscular and elastic tissue, no continuous endothelial lining, mural thrombi and fibrinoid deposition It reduces the impedance to flow and creates high-flow, low-resistance placental circulation and fetomaternal
exchange in the intervillous space. This optimizing modification permit the ten-fold increase in uterine blood flow which is necessary to meet the respiratory and nutritional requirements of the fetus and placenta. It occur in two stages: the first wave of trophoblastic invasion converts the decidual segments of the spiral arteries in the first trimester and the second wave converts the myometrial segments in the second trimester

**Maternal-feto circulation**:
Maternal Heart

▼

Uterine Arteries

▼

Spiral artery Invaded by trophoblast

▼

Uteroplacental circulation Fetal heart

▼

Umbilical arteries

▼

Tertiary villous vessels

▼

Fetoplacental circulation
Significance of colour Doppler and the various ratios in predicting the outcome of the term pregnancy with borderline Oligohydramnios.

The CPR represents the interaction of alterations in blood flow to the brain as manifest by increased diastolic flow as the result of cerebrovascular dilation resulting from hypoxia and increased placental resistance, resulting in decreased diastolic flow of the umbilical artery. When these alterations occur, the increased diastolic flow of the MCA is manifest by a decrease in the systolic/diastolic ratio (S/D), resistance index (RI); [(systolic peak velocity/diastolic peak velocity)/systolic peak velocity], and the pulsatility index (PI); [(systolic peak velocity/diastolic peak velocity)/ velocity time integral], whereas these measurements are increased in the umbilical artery as the result of increased resistance to blood flow as the result of placental pathology. Although the S/D ratio, RI, and PI have been reported when computing the CPR, more recently the PI is the computation of choice.

Whereas the CPR was first described in the 1980s, interest in this assessment tool has been rekindled because of recent reports associating an abnormal ratio with adverse perinatal outcome and postnatal neurological deficit.
For an accurate measurement, the fetal head should be in the transverse plane. An axial section of the brain, including the thalami and the sphenoid bone wings, should be obtained and magnified. The MCA vessels are often found with colour or power Doppler ultrasound overlying the anterior wing of the sphenoid bone near the base of the skull. The reading should be obtained close to its origin in the internal carotid artery as the systolic velocity decreases with distance from the point of origin of this vessel. An angle of insonation of <15° should be used; typically, an angle that approximates 0° can be achieved by moving the transducer on the maternal abdomen.

**Parameters used include:**

- fetal MCA pulsatility index (PI)
- fetal MCA peak systolic velocity (PSV): the highest velocity should be recorded
- fetal MCA systolic/diastolic (S/D) ratio: a normal fetal MCA S/D ratio should always be higher than the umbilical arterial S/D ratio
- cerebroplacental ratio (CPR): ratio of pulsatility index of MCA and umbilical artery.
Presence of chronic fetal hypoxia leads to redistribution of fetal circulation to heart, kidneys and brain. Hence, compensatory vasodilation of middle cerebral artery with increase in diastolic flow results in a decrease in its pulsatility index (PI) and resistive index (RI) termed as “brain sparing effect”. It is associated with low cerebral/umbilical PI ratio. Gramellini et al studied 45 normal growth and 45 growth retarded fetus and concluded that cerebral umbilical (C/U) Doppler ratio is usually constant during the last 10 weeks of gestation. In this study C/U PI ratio < 1.08 was taken as abnormal and predicted adverse perinatal outcome with 90% accuracy as compared to MCA PI or UA PI alone[7]. Bano S et al also in a recent study stressed that C/U PI ratio is a better predictor for
adverse perinatal outcome, hence the measurement of CPR was selected as the predictor of perinatal outcome in our study[8].

1. Pulsed wave doppler PW emits pulses of sound only for a fraction of time and receives the returning signals the rest of the time. Each returning echo is recognized by its timing and thus the system defines the depth of the structure. As it is gray scale, imaging of small and tortuous vessels is extremely inaccurate.

DOPPLER INDICES All three indices were found to correlate well with the actual impedance to flow. :

1. When diastolic flow increases the S/D ratio decreases.
2. When end diastolic velocity is absent (zero), the S/D ratio becomes infinite.
3. The lower the diastolic velocity in the S/D ratio the larger the systematic error.
4. In cases with absent or reverse diastolic flow velocity only the PI can provide us with a measurable entity for future reference.

UTERINE ARTERY DOPPLER Uterine artery Doppler provides flow resistance information on the maternal surface of the placenta (maternal-placental unit) and therefore reflects the adequacy of trophoblastic invasion and spiral artery conversion. In normal pregnancy
the S/D ratio or RI values significantly decrease with advancing gestation until 24 to 26 weeks.

**UTERINE ARTERY SAMPLING SITE** First-trimester uterine artery evaluation (Figure 1) 1. Transabdominal technique

Transabdominally, a midsagittal section of the uterus is obtained and the cervical canal is identified. The probe is then moved laterally until the paracervical vascular plexus is seen. Color Doppler is turned on and the uterine artery is identified as it turns cranially to make its ascent to the uterine body.

**Normal Pregnancy - Uterine artery waveform**

- Normal impedance to flow in the uterine arteries in 1º trimester
- Normal impedance to flow in the uterine arteries in early 2º trimester
- Normal impedance to flow in the uterine arteries in late 2º and 3º trimester
Predictive value of Uterine A. doppler findings :: There is an association between high resistance uterine artery Doppler at the end of first trimester (11-14 weeks) and in mid-trimester, with the subsequent development of early-onset fetal growth restriction, pre-eclampsia and abruption. This is being used by various centres as screening modality in High risk cases. Uterine artery Doppler was considered abnormal between 19 and 23 weeks’ gestation if - # Resistance index (RI) greater than the 95th centile # Early diastolic notch in either of the two uterine arteries) # When the mean PI of both uterine arteries was greater than (1.45 – 1.58)
UTERINE ARTERY DOPPLER (RCOG guidelines) #In a low risk population 2nd trimester has limited accuracy to predict a SGA. In high risk populations Doppler at 20–24 weeks of pregnancy has a moderate predictive value for a severely SGA neonate. In women with an abnormal UA Doppler at 20–24 weeks of pregnancy, subsequent normalisation of flow velocity indices is still associated with an increased risk of a SGA neonate. Women with an abnormal UA Doppler at 20–24 weeks (defined as a pulsatility index [PI] > 95th centile) and/or notching should be referred for serial ultrasound measurement of fetal size, AFI, BPP with umbilical artery Doppler commencing at 26–28 weeks of pregnancy. Women with a normal uterine artery Doppler should be offered a single scan for fetal size and umbilical artery Doppler during the 3rd trimester.

UMBILICAL ARTERY DOPPLER:

Umbilical Artery Doppler is essentially placental, rather than fetal Doppler, providing information on the fetal side of the placenta. Flow velocity measurements performed at umblical artery level represent downstream resistance, namely those at placental stem and terminal villi.

UMBILICAL ARTERY SAMPLING It is easy to sample, Best site is near its origin from the placenta. Here it gives better representation of downstream impedance (i.e Placenta)
CHARACTERISTICS OF UMBILICAL ARTERY WAVEFORM & INDICES

- The Umbilical arterial waveform usually has a “Saw tooth” type pattern with flow always in the forward direction.

- The S/D ratio decreases, from about 4.0 at 20 weeks to 2.0 at term. The S/D ratio is generally less than 3.0 after 30 weeks. •Umblical Artery Doppler may be a useful adjunct in the management of pregnancies complicated by FGR

- No role in screening of low-risk pregnancies or for complications other than growth restriction
PREDICTIVE VALUE OF UMBILICAL A. WAVEFORM AND INDICES # If impedance is increased in Umblical A > 60% of the placental vascular bed is obliterated # AEDF and REDF have an associated 40% and 70% perinatal mortality, respectively .AEDF in Umblical A and MCA PI < 5th percentile are considered "early" stage changes of IUGR. # REDF in the Umb A, along with pulsation in Umb Vein are the best predictor of severe fetal distress, so termination of pregnancy must be considered as soon as possible.

**ABNORMAL UMBILICAL A. DOPPLER WAVEFORM**

- High pulsatility index
- Very high pulsatility index

**Umbilical arteries (AEDV)**
- Very high pulsatility index.
- End diastolic velocity
- Pulsation in the umbilical vein

**Umbilical arteries(REDV)**
- Severe cases absence of reversal of end diastolic frequencies

**ABNORMAL:**

- If the S/D ratio is above the 95th percentile for gestational age.
- In extreme cases of growth restriction, end-diastolic flow may become absent or even reversed
• These are ominous findings and should prompt a complete fetal evaluation—almost half of cases are due to fetal aneuploidy or a major anomaly

• In the absence of a reversible maternal complication or a fetal anomaly, reversed end-diastolic flow suggests severe fetal circulatory compromise and usually prompts immediate delivery

UMBILICAL ARTERY DOPPLER (RCOG guidelines)

In a high-risk population, the use of umbilical artery Doppler has been shown to reduce perinatal morbidity and mortality. Umbilical artery Doppler should be the primary surveillance tool in the SGA fetus. #When umbilical artery Doppler flow indices are normal it is reasonable to repeat surveillance every 14 days. #More frequent Doppler surveillance may be appropriate in a severely SGA infant. #When umbilical artery Doppler flow indices are abnormal (pulsatility or resistance index > +2 SDs above mean for gestational age) and delivery is not indicated repeat surveillance twice weekly in fetuses with end-diastolic velocities present and daily in fetuses with absent/reversed end-diastolic frequencies.
MIDDLE CEREBRAL ARTERY DOPPLER:

The middle cerebral artery is the most studied cerebral artery because
(a) it is easy to sample
(b) it provides information on the cerebral blood flow in normal and
IUGR fetuses and
(c) it can be sampled at an angle of 0° between the ultrasound beam and
the direction of the blood flow. Therefore, for the middle

cerebral artery we are able to determine angle-independent
indices (the most used is the pulsatility index) and also the real velocity of
blood flow.

MIDDLE CEREBRAL ARTERY SAMPLING

What is the appropriate technique for obtaining fetal middle cerebral
artery Doppler waveforms?

• An axial section of the brain, including the thalami and the
  sphenoid bone wings, should be obtained and magnified.
• Color flow mapping should be used to identify the circle of Willis
  and the proximal MCA.
• The pulsed-wave Doppler gate should then be placed at the
  proximal third of the MCA, close to its origin in the internal
carotid artery10 (the systolic velocity decreases with distance
  from the point of origin of this vessel).
• The angle between the ultrasound beam and the direction of blood flow should be kept as close as possible to 0°.

• At least three and fewer than 10 consecutive waveforms should be recorded. The highest point of the waveform is considered as the PSV (cm/s).
Fetal middle cerebral arterial (MCA) Doppler assessment is an important part of assessing

a) Fetal cardiovascular distress

b) Fetal anemia (Peak Systolic Flow Velocity)

c) Fetal hypoxia (brain sparing effect)

It is a very useful adjunct to Umbilical Artery doppler assessment in IUGR fetus. A normal fetal MCA S:D ratio should always be higher than the Umbilical arterial S:D ratio. Measurement of the fetal MCA (PSFV) is a predictor of severe fetal anemia and can be used to avoid unnecessary invasive procedures in red blood cell isoimmunized pregnancies.
INTERPRETATION:

In the normal situation the fetal MCA has a high resistance flow which means there is minimal antegrade flow in fetal diastole

In pathological states this can turn into a low resistance flow mainly as a result of the fetal head sparing theory

The fetal head sparing theory is one that underpins asymmetrical intrauterine growth restriction, where the difference between normal head circumference and decreased abdominal circumference is attributed to the fetus's ability to preferentially supply the cerebral, coronary, adrenal and splenic circulations. In a situation of chronic fetal hypoxaemia, the fetus redistributes its cardiac output to maximize the oxygen supply to brain by vasodilation of the cerebral arteries thereby causing a decrease in the left ventricular afterload.

Paradoxically in some situations such as with severe cerebral oedema, the flow can revert back to a high resistance pattern when the pathology has not yet resolved - this is a very poor prognostic sign cerebroplacental ratio (CPR) >1.1 is normal and <1.1 is abnormal

Placental insufficiency, whether primary or secondary to maternal factors such as hypertension, poor nutrition, etc., is the most common cause of intrauterine growth retardation (IUGR) and perinatal mortality. It
is essential to recognize placental insufficiency early so that its hazards can be reduced, if not prevented.

Doppler USG enables a better understanding of the hemodynamic changes and has therefore become one of the most important clinical tools for fetomaternal surveillance in high-risk pregnancies. It can be credited with causing a significant decrease in perinatal mortality and morbidity.

An adequate fetal circulation is necessary for normal fetal growth. To facilitate this, remarkable changes occur in the maternal, placental and fetal vasculatures.

UA velocimetry correlates with hemodynamic changes in the fetoplacental circulation. With an increase in the number of tertiary stem villi and arterial channels, as the fetoplacental compartment develops, the impedance in the UA decreases. A diastolic component in the UA flow velocity waveform (FVW) appears during the early second trimester, i.e., at 15 weeks' gestation, and progressively increases with an increase in the gestational age. A mature UA FVW is usually achieved by 28-30 weeks. The normal UA waveform pattern shows low impedance and high diastolic flow with a low PI. During normal pregnancy, the MCA shows high resistance and low diastolic flow with an increase in the PI index. In the normal situation the fetal MCA has a high resistance flow which means there is minimal antegrade flow in fetal diastole. # In pathological states
this can turn into a low resistance flow (reduced PI) mainly as a result of the FETAL HEAD SPARING EFFECT. Paradoxically in some situations such as with severe cerebral oedema and due to acidemia, the flow can revert back to a high resistance pattern when the pathology hasn't yet resolved which is again an ominous sign and call for termination of pregnancy.

An abnormal CPR may result from 3 types of Doppler measurement patterns. The first is when the UA and MCA PI are in the upper and lower range of the distribution curve, resulting in an abnormally low CPR (Figure 2). The second is when the UA PI is normal but the MCA PI is decreased, resulting in an abnormally low CPR (Figure 3). The third pattern consists of an abnormally elevated UA PI and an abnormally decreased MCA PI, resulting in an abnormally low CPR (Figure 4).
2. Fetus with several abnormalities

3. This is an example of a fetus with A, a high but normal PI of the umbilical artery, B, low but normal PI of the middle cerebral artery, and C, an abnormal cerebroplacental ratio below the fifth centile (red). Each graph illustrates the raw data for the mean (dots) and 95th and fifth centiles (solid lines). The dotted line is the mean of
the regression line. The reference ranges are from a study by Baschat and Gembruch. CPR, abnormal cerebroplacental ratio.
4. Fetus with other abnormalities

5. This is an example of a fetus with A, a normal PI of the umbilical artery, B, abnormal low PI of the middle cerebral artery, and C, an abnormal CPR below the fifth centile (red). Each graph illustrates the raw data for the mean (dots) and 95th and fifth centiles (solid lines). The dotted line is the mean of the regression line. The reference ranges are from a study by Baschat and Gembruch.9

6. CPR, cerebroplacental ratio; SGA, small for gestational age; PI, pulsatility index.
Figure 4
7. Fetus with an elevated PI of the UA, low PI of the MCA, and an abnormal CPR

8. This is an example of a fetus with A, an elevated PI of the umbilical artery, B, low PI of the middle cerebral artery, and C, an abnormal CPR below the fifth centile (red). Each graph illustrates the raw data for the mean (dots) and 95th and fifth centiles (solid lines). The dotted line is the mean of the regression line. The reference ranges are from a study by Baschat and Gembruch.⁹

9. CPR, cerebroplacental ratio; MCA, middle cerebral artery; PI, pulsatility index; SGA, small for gestational age; UA, umbilical artery.

Hence from the above review of literature we are able to decipher the significance of using USG for measuring the amniotic fluid volume and in the same note we were able to classify the different sects of Oligohydramnios, out of that we were able to pick out the borderline Oligohydramnios as a special group which poses a dilemma in decision taking regarding the mode of delivery, in this connection we have also reviewed the importance of Doppler study and the mechanism behind it.
AIM AND OBJECTIVE
AIM & OBJECTIVES

Aim:

The aim of the present study was to determine the maternal and perinatal outcome of borderline oligohydramnios whose fetal cerebroplacental perfusion >1 and to evaluate the effectiveness of using colour Doppler ratio of CPR for deciding upon the mode of delivery of fetus

Primary Objective(s):

The primary objective is to determine the relationship between borderline oligohydramnios whose fetal cerebroplacental perfusion >1 and

1). Maternal outcome
   a) spontaneous vaginal delivery
   b) induction of labour whether mechanical or chemical;

2) Perinatal outcome

Secondary Objective(s):

To assess the feasibility and safety of using CPR of >1 as a criterion to allow borderline oligohydramnios antenatal full-term mothers to go in for vaginal delivery
• To assess whether there is any appreciable or significant difference in the fetal wellbeing when such pregnancies are allowed for trial labour and vaginal delivery.

• To assess whether such an exercise can be used to define a subset of oligohydramniotic mothers namely the borderline ones, so as to decrease the number of caesarean delivery in these subset
MATERIALS
AND
METHODS
MATERIALS & METHODS

This prospective study was conducted in IOG, Egmore, Chennai. Written informed consent was obtained from all Antenatal women who participate in the study.

Participating antenatal women will undergo ultrasonography and liquor status will recorded and those who have AFI score between 5.1 to 8, will be taken up for fetal Doppler study and if found to have CPR>1 , these AN mothers will be observed for:

1) Onset of labour
2) Mode of delivery
3) Perinatal outcome

Inclusion criteria

1) Patients with correct dates or having early USG
2) Singleton live pregnancy
3) Vertex presentation
4) Gestational age 37 to 40 weeks
5) Membranes intact
6) True labour pain
7) AFI estimated by four quadrant technique at admission
8) Admission CTG done in all cases
Exclusion Criteria:

Maternal criteria:

1. Patients with LMP not known or those not having early trimester USG to conform gestational age
2. PROM
3. Women with previous history of caesarean section
4. Polyhydramnios
5. Women with preeclampsia/gestational hypertension
6. Women with Gestational diabetes mellitus
7. Antepartum haemorrhage
8. Women with skeletal abnormalities
9. Smokers

FETAL criteria

1. IUGR
2. Congenital malformation
3. Multifetal gestation
4. IUD
Screening Procedures/ Visits

I) Determination of AFI:

This is done for Antenatal mothers who have completed 37 gestational weeks. Gestational age will be determined from last menstrual period and confirmed by measurement of the fetal crown rump length at first trimester scan.

The women will be examined with an empty bladder in dorsal position.

For AFI study four pockets of fluid are measured by ultrasound and added up and expressed in cms. And those having between 5.1 to 8 cms are categorised to have borderline oligohydramnios.

2) CPR determination:

Cerebro placental ratio is measured using both Umblical artery doppler and middle cerebral artery Doppler and those having CPR >1 is included in the study

Borderline oligohydramnios term mothers would be followed up for obstetrics outcomes
The term mothers would be divided into three groups with ultrasound for liquor (AFI) estimation and CPR greater than 1.

A. 37 completed weeks
B. 38-39 completed weeks
C. 40 weeks

In each of the above group the obstetrics outcomes would be followed as

1. Normal vaginal delivery
2. Normal vaginal delivery with induction----
   i. Mechanical- foleys
   ii. Chemical—PGE2 gel
3. Assisted vaginal delivery
4. LSCS

In each group perinatal outcomes will be studied intrapartum with continuous CTG monitoring

Postnatally Like

1. Fetal distress,
2. LBW,
3. Meconium stained,
4. RDS,
5. Low Apgar score,
6. NICU admissions and

7. Perinatal mortality.

Fetal hypoxia is one of the major causes of high perinatal morbidity and mortality rates. It may lead to various neurodevelopmental disabilities, ranging from difficulties in school to dyslexia, attention deficit hyperactivity disorder (ADHD), vision or hearing impairment, and mental disorders, including cerebral palsy. Fetal hypoxia activates a number of defense mechanisms, such as modification of fetal heart rate (FHR), increase in blood pressure and redistribution of blood to the heart, brain, and adrenal glands. Low oxygen partial pressure (pO₂) leads to cerebral vasodilation and a fall in vascular resistance, which results in a decrease in middle cerebral artery resistance index (MCA RI) values.

Doppler ultrasound tests such as C/U evaluation are commonly used nowadays, and enable one to assess blood flow disturbances in placento-umbilical and feto-cerebral circulations. The C/U evaluation is used to detect and assess the fetal response to oxygen deficiency in utero. With the progress of pregnancy, the resistance in fetal circulation decreases gradually. Nevertheless, the values of MCA RI should remain higher than umbilical artery resistance ratio (UA RI) values, which implicates that C/U, being the ratio of MCA RI to UA RI, should be higher than 1–1.1 in uncomplicated pregnancies.
Placenta-based intrauterine growth restriction (IUGR) is predominantly a vascular disorder. It starts with abnormal tertiary villous vessels and ends with characteristic foetal multi-vessel cardiovascular manifestations. These effects can be documented with Doppler ultrasound examination of a number of vessels: maternal uterine arteries and the foetal umbilical arteries for the placenta; middle cerebral artery (MCA) for preferential brain perfusion; and precordial veins for the cardiac effects of placental dysfunction. As IUGR worsens, Doppler abnormalities in these vascular territories also deteriorate, suggesting a sequential pattern of disease progression. This presumed sequence and the anticipation of foetal deterioration forms the basis for Doppler surveillance in IUGR. In normal pregnancy, the three indices; S/D; PI and RI decrease with advancing gestation in Umbilical artery. But in IUGR first there is decreased diastolic flow in the umbilical artery due to increase in the resistance that occurs in small arteries and arterioles of the tertiary villi. This raises the S/D ratio; PI and RI of umbilical artery. As the placental insufficiency worsens, the diastolic flow decreases, then become absent, and later reverses. Yoon et al demonstrated in their study that absent umbilical artery waveform is a strong and independent predictor of adverse perinatal outcome. Foetal MCA is a low resistance circulation throughout pregnancy. It is highly sensitive to foetal hypoxia which induces redistribution of cardiac output towards foetal brain (brain sparing effect) which leads to increase in
diastolic flow with decreased pulsatility index of MCA. As MCA/UA ratio incorporates data not only on placental status but also on foetal response, an abnormal MCA/UA PI Doppler ratio is strongly correlated with worse foetal prognosis. In normal pregnancies the diastolic component in the cerebral arteries is lower than in the umbilical arteries at any gestational age. Therefore, the cerebrovascular resistance remains higher than the placental resistance and the MCA/UA PI is greater than 1. The index becomes less than 1 if the flow distribution is in favour of the brain in pathological pregnancies. In our study the CPR had a high specificity and positive predictive value (86% and 86.9%) similar to Gramellini et al and Lakhar et al, Shahina Bano et al showed 100% specificity of this parameter. Changes in the venous circulation, ductus venosus, are shown to be associated with severely compromised foetus and correlate better with foetal acidosis according to Rizzo et al requiring urgent intervention, though in our study none of the cases reached to that stage.

A total of 100 gravid women in 3rd trimester of pregnancy were included in this study. Due to the extended scope of our exclusion criteria, the sample size was small. All the eligible and consenting gravid women (Written informed consent was taken from those who were willing to participate in the study) were admitted in the antenatal ward. Thorough history taking with general, obstetric and pelvic examination, routine and special investigation was done. The periodic follow up was performed
using NST, AFI, UARI, MCARI and MCA/UA ratio and repeated twice weekly till termination of pregnancy. The non stress test (NST) by using tococardiographic equipment is widely used for antenatal surveillance. NST was performed on admission and twice weekly to see whether the fetus was reacting or not. The test was considered reactive if baseline heart rate 110-160 per minute and there are two or more fetal heart rate acceleration clearly recorded during a 20 minute period, each of 15 or more beat per minute and lasting for 15 seconds or more. If no spontaneous fetal movement (FM) occurred during the initial 20 minutes, the test was continued for another 20 minutes, during this period FM is provoked by external manipulation. If there was no acceleration with spontaneous or repeated external stimuli during a 40 minute period, the test was considered non reactive. The amniotic fluid index (AFI) was measured by the four quadrant ultrasonic method. AFI
OBSERVATION
AND
ANALYSIS
OBSERVATION AND ANALYSIS

Figure 5

Age wise classification showed that almost 50% of the AN mothers were of the age group between 21 to 25 years, followed closely by those mothers of the age group between 26 to 30 years contributing to about 34% of our study population.

Table-- 2

<table>
<thead>
<tr>
<th>Age group of AN mothers</th>
<th>no of AN mothers</th>
</tr>
</thead>
<tbody>
<tr>
<td>18-20 yrs</td>
<td>10</td>
</tr>
<tr>
<td>21-25 yrs</td>
<td>46</td>
</tr>
<tr>
<td>26-30 yrs</td>
<td>34</td>
</tr>
<tr>
<td>31-35 yrs</td>
<td>10</td>
</tr>
</tbody>
</table>
Since our inclusion criteria included only full term and near full term AN mothers, our study population of AN mothers were more or less equally distributed between 37 weeks to 39 weeks and 39weeks+6days(90%), only 10% were of 40 weeks gestation.
52% of the infants had their birth weight between 2.6 kg to 3 kg, followed by infants who had birth weight between 3.1 to 3.5 kg, who constituted about 34%, 8% of them weighed between 2 to 2.5kg, at birth.
Figure 8

Table –5

<table>
<thead>
<tr>
<th>Mode of delivery</th>
<th>No. of antenatal mothers</th>
</tr>
</thead>
<tbody>
<tr>
<td>LSCS</td>
<td>18</td>
</tr>
<tr>
<td>outlet forceps</td>
<td>2</td>
</tr>
<tr>
<td>vacuum</td>
<td>14</td>
</tr>
<tr>
<td>normal vaginal delivery</td>
<td>66</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>100</strong></td>
</tr>
<tr>
<td>Perinatal outcome</td>
<td>No of affected foetus</td>
</tr>
<tr>
<td>--------------------------------------</td>
<td>-----------------------</td>
</tr>
<tr>
<td>fetal distress req LSCS</td>
<td>10</td>
</tr>
<tr>
<td>non reactive CTG</td>
<td>2</td>
</tr>
<tr>
<td>APGAR &lt;7@1MIN</td>
<td>28</td>
</tr>
<tr>
<td>MAS</td>
<td>12</td>
</tr>
<tr>
<td>RDS</td>
<td>10</td>
</tr>
<tr>
<td>TTN</td>
<td>6</td>
</tr>
<tr>
<td>IUGR</td>
<td>2</td>
</tr>
<tr>
<td>NICU OBSERVATION</td>
<td>8</td>
</tr>
<tr>
<td>NICU ADMISSION</td>
<td>4</td>
</tr>
</tbody>
</table>
Though the entire cohort of patients we recruited were borderline AFI, which is considered as one of the risk factors for perinatal mortality, and studies by Luo X et al reported that in these group of borderline oligohydraminos there was an increase in the frequency of emergency caesarean delivery compared to non-oligohydramniotic antenatal mothers, but we wanted to delineate a favourable sub-sect out of these borderline oligohydramniotic pregnancies which can be safely allowed to deliver by non-caeserean mode, At the same time we had also to make sure that doing so, should not hamper the fetal well being in any manner, hence we tabulate the perinatal outcome out of these caesarean an non-caeserean delivery to prove that there was no ifference in the perinatal outcome when we allow borderline oligohydramniotic mothers with favourable CPR to go in for delivery through the vaginal route.
<table>
<thead>
<tr>
<th></th>
<th>CAESEREAN DEL</th>
<th>NON-CAESEREAN DEL</th>
</tr>
</thead>
<tbody>
<tr>
<td>APGAR SCORE &gt;7 AT 1 MINUTE</td>
<td>10</td>
<td>62</td>
</tr>
<tr>
<td>APGAR SCORE &lt;=7 AT 1 MINUTE</td>
<td>8</td>
<td>20</td>
</tr>
<tr>
<td></td>
<td>P= 0.41</td>
<td></td>
</tr>
<tr>
<td></td>
<td>CAESEREAN DEL</td>
<td>NON-CAESEREAN DEL</td>
</tr>
<tr>
<td>-------------------</td>
<td>--------------</td>
<td>------------------</td>
</tr>
<tr>
<td>APGAR SCORE &gt;7 AT 5 MINUTE</td>
<td>16</td>
<td>76</td>
</tr>
<tr>
<td>APGAR SCORE &lt;=7 AT 1 MINUTE</td>
<td>2</td>
<td>6</td>
</tr>
<tr>
<td></td>
<td></td>
<td>P = 0.63</td>
</tr>
</tbody>
</table>
Thus from the above tables we were able to decipher that comparing the group the outcome in the form of APGAR score is not significantly different in both the groups. we can safely conclude that allowing the AN mothers (with favourable CPR score i.e >1) to go in for a trail labour and such exercise does-not compromise on the perinatal outcome., which means we can in future safely allow these special group of favourable AN mothers to deliver vaginally and thereby decrease the infection rate and the monetary loss to the mother which might have arisen due to extended hospital stay following caesarean section, as well as we can save on the government expenditure in a low resource country like ours.
DISCUSSION
DISCUSSION

Time and again modern obstetrics has tried to evolve itself for the betterment of the perinatal outcome, but still it has to shake itself out of this new growing myth that all complicated cases has to go under the knife i.e. LSCS.

If the indication for caesarean is low, then it is more of a bane than a boon to the mother- so prevention of unnecessary caesarean delivery is the need of the hour:

Childbirth by its own virtue portends potential risks for the mother and her baby, whatever be the route of delivery. Nevertheless any low risk indication if chosen to be delivered by caesarean, then it may result in undesirable aftermaths. The National Institutes of Health has quoted evidence-based reports over recent years to examine the risks and benefits of caesarean and vaginal delivery (3) (Table 1). For certain strong indications like placenta previa or uterine rupture, caesarean delivery has been firmly established as the safest mode of delivery. nevertheless, for most other pregnancies, which are low-risk, caesarean delivery may turn up to pose a much higher risk of maternal morbidity and mortality than the natural vaginal delivery (4) (Table 1).
### Table 1. Risk of Adverse Maternal and Neonatal Outcomes by Mode of Delivery

<table>
<thead>
<tr>
<th>Outcome</th>
<th>Risk</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Maternal</strong></td>
<td><strong>Vaginal Delivery</strong></td>
</tr>
<tr>
<td>Overall severe morbidity and mortality*†</td>
<td>8.6%</td>
</tr>
<tr>
<td>Maternal mortality‡</td>
<td>3.6:100,000</td>
</tr>
<tr>
<td>Amniotic fluid embolism§</td>
<td>3.3–7.7:100,000</td>
</tr>
<tr>
<td>Third-degree or fourth-degree perineal laceration‖</td>
<td>1.0–3.0%</td>
</tr>
<tr>
<td>Placental abnormalities¶</td>
<td>Increased with prior caesarean delivery versus vaginal delivery, and risk continues to increase with each subsequent caesarean delivery.</td>
</tr>
<tr>
<td>Urinary incontinence#</td>
<td>No difference between caesarean delivery and vaginal delivery at 2 years.</td>
</tr>
<tr>
<td>Postpartum depression‖</td>
<td>No difference between caesarean delivery and vaginal delivery.</td>
</tr>
<tr>
<td></td>
<td>Neonatal</td>
</tr>
<tr>
<td>---------------</td>
<td>----------</td>
</tr>
<tr>
<td>Laceration**</td>
<td>NA</td>
</tr>
<tr>
<td>Respiratory morbidity**</td>
<td>&lt; 1.0%</td>
</tr>
<tr>
<td>Shoulder dystocia</td>
<td>1.0–2.0%</td>
</tr>
</tbody>
</table>

Abbreviations: CI, confidence interval; NA, not available; NICU, neonatal intensive care unit; OR, odds ratio; RR, relative risk.


† Data from Liu S, Liston RM, Joseph KS, Heaman M, Sauve R, Kramer MS. Maternal mortality

It is difficult to isolate the morbidity caused specifically by route of delivery. For example, in one of the few randomized trials of approach to delivery, women with a breech presentation were randomized to undergo planned caesarean delivery or planned vaginal delivery, although there was crossover in both treatment arms. In this study, at 3-month follow-up, women were more likely to have urinary, but not fecal, incontinence if they had been randomized to the planned vaginal delivery group. However, this
difference was no longer significant at 2-year follow-up. Because of the size of this randomized trial, it was not powered to look at other measures of maternal morbidity.

A large population-based study from Canada found that the risk of severe maternal morbidities—defined as hemorrhage that requires hysterectomy or transfusion, uterine rupture, anesthetic complications, shock, cardiac arrest, acute renal failure, assisted ventilation, venous thromboembolism, major infection, or in-hospital wound disruption or hematoma—was increased threefold for caesarean delivery as compared with vaginal delivery (2.7% versus 0.9%, respectively). There also are concerns regarding the long-term risks associated with caesarean delivery, particularly those associated with subsequent pregnancies. The incidence of placental abnormalities, such as placenta previa, in future pregnancies increases with each subsequent caesarean delivery, from 1% with one prior caesarean delivery to almost 3% with three or more prior caesarean deliveries. In addition, an increasing number of prior caesareans is associated with the morbidity of placental previa: after three caesarean deliveries, the risk that a placenta previa will be complicated by placenta accreta is nearly 40%. This combination of complications not only significantly increases maternal morbidity but also increases the risk of adverse neonatal outcomes, such as neonatal intensive care unit admission
and perinatal death. Thus, although the initial caesarean delivery is associated with some increases in morbidity and mortality, the downstream effects are even greater because of the risks from repeat caesareans in future pregnancies.

**The validation of CPR measurements as a tool to predict perinatal outcome.**

Keeping the above perils of caesarean section in mind we designed our study so as to find out one way to scientifically reduce the LSCS section rate, by using a noninvasive technique and thus the main objective of this study was to find out a subset of term AN mothers who could be spared of LSCS, on this account we narrowed upon borderline Oligohydramnios and looked upon a cohort of an Mothers who could be safely allowed to go in for trail labour.

In this pursuit, the calculation of CPR has been of a major deciding factor in predicting the perianal outcome as per Dr. Sovik k Das, who describes that among all the antepartum surveillance tests, MCA/UA Doppler ratio had found the highest sensitivity (72.97%), specificity 95.24%), Positive Predictive Value (PPV) (90%), Negative Predictive Value (NPV) (85.71%) for prediction of adverse perinatal outcome in pregnancies
Presence of chronic fetal hypoxia leads to redistribution of fetal circulation to heart, kidneys and brain. Hence, compensatory vasodilation of middle cerebral artery with increase in diastolic flow results in a decrease in its pulsatility index (PI) and resistive index (RI) termed as “brain sparing effect”. It is associated with low cerebral/umbilical PI ratio. Gramellini et al studied 45 normal growth and 45 growth retarded fetus and concluded that cerebral umbilical (C/U) Doppler ratio is usually constant during the last 10 weeks of gestation. In this study C/U PI ratio < 1.08 was taken as abnormal and predicted adverse perinatal outcome with 90% accuracy as compared to MCA PI or UA PI alone. Bano S et al also in a recent study stressed that C/U PI ratio is a better predictor for adverse perinatal outcome, hence the measurement of CPR was selected as the predictor of perinatal outcome in our study. Hence we could fix CPR>1 as the cut off value to draw lines between favourable and unfavourable obstetric outcomes in antenatal mothers.

Age wise classification showed that almost 50% of the AN mothers were of the age group between 21 to 25 years and age group between 26 to 30 years contributed to about 34% of our study population.
As we can see from fig that this study beautifully fulfilled its objective of decreasing the LSCS section rate, which we can see from the towering number of ante natal mothers who had delivered successfully through normal vaginal delivery after trial of labour and that the no of C sections was only 18%, while non-caesarean delivery had a total tally of 82%, meaning that when we could diligently separate the favourable group of borderline AFI mothers based on good CPR score. We could safely allow for vaginal delivery and that they need-not always be taken up for C section, thereby decreasing the AN mothers morbidity as well as prevent unnecessary extended hospital stay.

Since IUGR and large for gestational age fetus are confounding factors which might by itself be a reason for deferring vaginal delivery, he results of our study showed, majority of the infants to be weighing between 2.6 to 3.5 kg, since that 86% of the babies born to mothers recruited in our study weighed between 2.6 to 3.5 kg, this confounding bias was not there to affect the results of our study.
In spite of having borderline oligohydramnios in all our mothers in their near term and since we have sorted mothers based on the colour Doppler information regarding the cerbroplacental ratio, and that we have allowed induction of labour to only those pregnancies with a CPR > 1, we were able to achieve a staggering 66% NORMAL vaginal delivery, more so the non-LSCS delivery was encouragingly 82%.

Now that the above figure depicted the decrease in the need for ceacerean section when we use CPR values > 1 as a favourable parameter to allow these borderline AN others to go in for a trail of labour, we however need to justify our outcome by assessing whether the perinatal outcome of the two groups are not significantly different, for this we used the apgar score of the infant at 1 minute an APGAR score at 5 minutes as the yard stick to quantify the fetal outcome and tabulated the results to find out whether there were any difference in the perinatal outcome between borderline AFI AN mothers delivering by caesarean vs those delivering by vaginal delivery after a trail of labour, the results were as depicted in the fig.
From the results of testing the significance of difference using vassarstats software we were able to analyse that fetal outcome of the caesarean vs non caesarean group in the form of APGAR score is not significantly different in both the groups. Thus we can safely conclude that allowing the AN mothers (with favourable CPR score i.e >1) to go in for a trail labour is a justifiable option and such exercise does-not compromise on the perinatal outcome., which means we can in future safely allow these special group of favourable AN mothers to deliver vaginally and thereby decrease the infection rate and the monetary loss to the mother which might have arisen due to extended hospital stay following caesarean section, as well as we can save on the government expenditure in a low resource country like ours.
SUMMARY
SUMMARY

Modern obstetrics though has grown exponentially to forecast the maternal outcome of an ensuing delivery, yet it has miles to go in predicting the fetal and postnatal aftermath.

In this connection we set out to study the outcome of 100 pregnancies which presented to our teritary care centre, these antenatal mothers were first confirmed for the inclusive criteria and those who fulfilled the criteria were subjected to doppler study to calculate the CPR, if CPR was found to be > 1, those antenatal mothers were allowed to go in for a trail labour.

We found that out of 100 pregnancies who had a CPR of >1,

we were able to deliver the fetus of 82% with vaginal delivery itself, various studies have predicted that 40-50 % of oligohydramniotic pregnancies delivered through the caeserean route,
whereas when we used doppler study to further subdivide oligohydramniotic pregnancies in to favourable (CPR>1) and unfavourable (CPR<1), and allowed a trail labour in these favourable group we were able to cut down the percentage of pregnancies requiring caeserean section to 28%, nearly 12-20% improvement in the rate of vaginal delivery,
CONCLUSION
CONCLUSIONS

Age wise classification showed that almost 50% of the AN mothers were of the age group between 21 to 25 years, 42% of the infants born to Oligohydramnios mothers weighed between 2.5 to 3.5 kg.

When the favourable group out of these borderline oligohydramniotic mothers were allowed to go in for a trail labour, 82% successfully delivered via the vaginal route, albeit 14% were through outlet forceps and 2% with vacuum assisted vaginal delivery, we were able to cut down the caesarean route of delivery to mere 18%, which in return resulted in a better quality of life to the mother in the post partum period, as well as we could prevent the long term operative morbidity.

Having said that we are fully aware of the limitations of this study like low number of cases, other interfering factors may coexist with oligohydramniotic pregnancies which irrespective of the presence of favourable Doppler CPR ratio, might have a stronger say in the decision making process.

Hence we suggest that a more larger study with more stringent exclusive factors so as to nullify these confounding factors is necessary before we can propose this criterion as a standard of care for future obstetric clinical practice.
BIBLIOGRAPHY


5. Fetal Cerebral Umbilical Doppler Ratio in Prediction of Adverse Perinatal Outcome in Patient with Preeclampsia Dr. Sovik K. Das, Dr. Titol Biswas Jmscr Volume 2 Issue 6 June 2014)


APPENDIX
PROFORMA
PROFORMA

TO STUDY THE MATERNAL AND PERINATAL OUTCOME IN TERM ANTENATAL MOTHERS WITH BORDERLINE OLIGOHYDRAMNIOS WHOSE FETAL CEREBRO PERFUSION RATIO >1 at IOG, Madras Medical College, Chennai.

Name

Wife of

Address

Age

I.P/O.P No

Socio economics status

Booked / Unbooked

D.O.A

LMP

EDD

Obstetric formula G P L A

Complaints (if any)

Present 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
| 
| --- |
| **2r Vaginal Examination:** |
| Pelvic grips |
| Amount of liquor |
| 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
<table>
<thead>
<tr>
<th>S.No.</th>
<th>Name</th>
<th>Age</th>
<th>Obstetrics</th>
<th>GA in Weeks</th>
<th>AFI in cms</th>
<th>Mode of delivery</th>
<th>Colour of liquor</th>
<th>Fetal outcome</th>
<th>Birth Wt in Kg</th>
<th>APGAR</th>
<th>NICU</th>
<th>Follo up</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Saranya</td>
<td>26</td>
<td>G2P1L1</td>
<td>39-40</td>
<td>6</td>
<td>Labour natural</td>
<td>clear</td>
<td>Alive</td>
<td>4.270</td>
<td>8/10 &amp; 9/10</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2.</td>
<td>Rajeswari</td>
<td>28</td>
<td>G3P2L2</td>
<td>39</td>
<td>5-6</td>
<td>Labour natural</td>
<td>clear</td>
<td>Alive</td>
<td>3.620</td>
<td>7/10 &amp; 8/10</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4.</td>
<td>Anandhi shoban babu</td>
<td>24</td>
<td>Primi</td>
<td>38</td>
<td>6</td>
<td>Labour natural</td>
<td>clear</td>
<td>Alive</td>
<td>2.805</td>
<td>8/10 &amp; 9/10</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6.</td>
<td>Priya peter</td>
<td>20</td>
<td>Primi</td>
<td>40</td>
<td>5-6</td>
<td>Vacuum delivery</td>
<td>clear</td>
<td>Alive</td>
<td>2.730</td>
<td>8/10 &amp; 9/10</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7.</td>
<td>Vanitha venkatesan</td>
<td>24</td>
<td>Primi</td>
<td>37</td>
<td>6-7</td>
<td>Labour natural</td>
<td>clear</td>
<td>Alive</td>
<td>2.300</td>
<td>8/10 &amp; 9/10</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8.</td>
<td>Kalaiavani neelakandan</td>
<td>21</td>
<td>G2P1L1</td>
<td>40</td>
<td>6-7</td>
<td>Labour natural</td>
<td>clear</td>
<td>Alive</td>
<td>3.140</td>
<td>8/10 &amp; 9/10</td>
<td></td>
<td></td>
</tr>
<tr>
<td>9.</td>
<td>Lavanya Thomas</td>
<td>23</td>
<td>G2P1L1</td>
<td>37</td>
<td>6-7</td>
<td>Labour natural</td>
<td>clear</td>
<td>Alive</td>
<td>2.915</td>
<td>8/10 &amp; 9/10</td>
<td></td>
<td></td>
</tr>
<tr>
<td>11.</td>
<td>Mahalakshmi sathish</td>
<td>22</td>
<td>Primi</td>
<td>40</td>
<td>5-6</td>
<td>Labour natural</td>
<td>clear</td>
<td>Alive</td>
<td>3.400</td>
<td>7/10 &amp; 9/10</td>
<td></td>
<td></td>
</tr>
<tr>
<td>12.</td>
<td>Bhuvaneswari ganamurthy</td>
<td>26</td>
<td>Primi</td>
<td>38</td>
<td>6-7</td>
<td>Vacuum delivery</td>
<td>clear</td>
<td>Alive</td>
<td>2.800</td>
<td>7/10 &amp; 9/10</td>
<td>TTN/RPS</td>
<td></td>
</tr>
<tr>
<td>No.</td>
<td>Name</td>
<td>Age</td>
<td>Gravida</td>
<td>Parity</td>
<td>Gestation</td>
<td>Delivery Method</td>
<td>Indication</td>
<td>Outcome</td>
<td>Apgar Score</td>
<td>10 Min</td>
<td>5 Min</td>
<td>Notes</td>
</tr>
<tr>
<td>------</td>
<td>---------------------------</td>
<td>-----</td>
<td>---------</td>
<td>--------</td>
<td>-----------</td>
<td>----------------------------------------</td>
<td>-----------------------------------------------</td>
<td>---------</td>
<td>-------------</td>
<td>---------</td>
<td>-------</td>
<td>-------</td>
</tr>
<tr>
<td>15.</td>
<td>Lavanya sriramu</td>
<td>27</td>
<td>Primi</td>
<td>38</td>
<td>6-7</td>
<td>Vacuum delivery with episiotomy</td>
<td>meconium</td>
<td>Alive</td>
<td>2.750</td>
<td>8/10 &amp; 9/10</td>
<td>MAS</td>
<td></td>
</tr>
<tr>
<td>17.</td>
<td>Nalini</td>
<td>29</td>
<td>G2P1L1</td>
<td>39W2D</td>
<td>6-7</td>
<td>Labour natural with episiotomy</td>
<td>clear</td>
<td>Alive</td>
<td>3.330</td>
<td>8/10 &amp; 9/10</td>
<td></td>
<td></td>
</tr>
<tr>
<td>18.</td>
<td>Subashree thangabalu</td>
<td>21</td>
<td>Primi</td>
<td>38</td>
<td>6-7</td>
<td>Emergency LSCS with intra caesarean Cu-T</td>
<td>Meconium</td>
<td>Alive</td>
<td>2.600</td>
<td>7/10 &amp; 8/10</td>
<td></td>
<td></td>
</tr>
<tr>
<td>19.</td>
<td>Srilekha vonodhkumar</td>
<td>22</td>
<td>Primi</td>
<td>37</td>
<td>6-7</td>
<td>Emergency LSCS with intra caesarean Cu-T</td>
<td>Meconium</td>
<td>Alive</td>
<td>3.140</td>
<td>8/10 &amp; 8/10</td>
<td>MAS*</td>
<td></td>
</tr>
<tr>
<td>20.</td>
<td>sagayamary</td>
<td>26</td>
<td>G2P1L1</td>
<td>38</td>
<td>6-7</td>
<td>Labour natural</td>
<td>clear</td>
<td>Alive</td>
<td>3.600</td>
<td>8/10 &amp; 9/10</td>
<td></td>
<td></td>
</tr>
<tr>
<td>23.</td>
<td>Sindhiya</td>
<td>31</td>
<td>G3P1L1A1</td>
<td>37</td>
<td>5-6</td>
<td>Emergency LSCS indication-failed induction</td>
<td>clear</td>
<td>Alive</td>
<td>2.966</td>
<td>8/10 &amp; 9/10</td>
<td></td>
<td></td>
</tr>
<tr>
<td>24.</td>
<td>Kanagalakshmi balachander</td>
<td>22</td>
<td>Primi</td>
<td>37</td>
<td>7</td>
<td>Labour natural with episiotomy</td>
<td>clear</td>
<td>Alive</td>
<td>2.610</td>
<td>8/10 &amp; 9/10</td>
<td></td>
<td></td>
</tr>
<tr>
<td>25.</td>
<td>Maheswari chellamuthu</td>
<td>28</td>
<td>G2P1L1</td>
<td>37</td>
<td>6-7</td>
<td>Labour natural</td>
<td>clear</td>
<td>Alive</td>
<td>2.855</td>
<td>8/10 &amp; 9/10</td>
<td></td>
<td></td>
</tr>
<tr>
<td>No.</td>
<td>Name</td>
<td>Age</td>
<td>Gravida</td>
<td>Parity</td>
<td>Gestation</td>
<td>Mode of delivery and episiotomy</td>
<td>Outcome</td>
<td>GA</td>
<td>APgars</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>-----</td>
<td>-----------------------</td>
<td>-----</td>
<td>---------</td>
<td>--------</td>
<td>-----------</td>
<td>---------------------------------</td>
<td>---------</td>
<td>----</td>
<td>--------</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>27.</td>
<td>Yadma rubin prabhu</td>
<td>26</td>
<td>Primi</td>
<td>38</td>
<td>5-6</td>
<td>Vacuum delivery with episiotomy</td>
<td>clear</td>
<td>Alive</td>
<td>3.150</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>28.</td>
<td>Shanthi karthik**</td>
<td>23</td>
<td>G2P1L1</td>
<td>38</td>
<td>6-7</td>
<td>Labour natural with episiotomy</td>
<td>clear</td>
<td>Alive</td>
<td>2.790</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>29.</td>
<td>Umamaheswari sanskar</td>
<td>27</td>
<td>Primi</td>
<td>39</td>
<td>5-6</td>
<td>Vacuum delivery with episiotomy</td>
<td>clear</td>
<td>Alive</td>
<td>3.130</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>30.</td>
<td>Swathi padmanabhun</td>
<td>18</td>
<td>Primi</td>
<td>39</td>
<td>7</td>
<td>Labour natural with episiotomy</td>
<td>clear</td>
<td>Alive</td>
<td>3.440</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>31.</td>
<td>Muthamal arunkumar</td>
<td>30</td>
<td>Primi</td>
<td>39</td>
<td>5-6</td>
<td>Labour natural with episiotomy</td>
<td>clear</td>
<td>Alive</td>
<td>2.985</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>32.</td>
<td>Ammu rajesh</td>
<td>19</td>
<td>G2A1</td>
<td>39</td>
<td>7</td>
<td>Labour natural with episiotomy</td>
<td>clear</td>
<td>Alive</td>
<td>2.750</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>33.</td>
<td>Saranya suresh</td>
<td>26</td>
<td>Primi</td>
<td>39</td>
<td>6-7</td>
<td>Labour natural</td>
<td>clear</td>
<td>Alive</td>
<td>3.015</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>34.</td>
<td>Divya suresh</td>
<td>25</td>
<td>G2P1L1</td>
<td>38</td>
<td>5-6</td>
<td>Labour natural</td>
<td>clear</td>
<td>Alive</td>
<td>2.440</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>35.</td>
<td>Prema Govindan</td>
<td>35</td>
<td>Primi</td>
<td>38</td>
<td>5-6</td>
<td>Emergency LSCS with intra caesarean Cu-T</td>
<td>Meconium</td>
<td>Alive</td>
<td>3.175</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>36.</td>
<td>Kathleen</td>
<td>24</td>
<td>Primi</td>
<td>39</td>
<td>6-7</td>
<td>Outlet forceps with episiotomy with failed manual efforts</td>
<td>clear</td>
<td>Alive</td>
<td>3.090</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>37.</td>
<td>Asma Zahra</td>
<td>34</td>
<td>G2P1L1</td>
<td>38</td>
<td>5-6</td>
<td>Labour natural</td>
<td>clear</td>
<td>Alive</td>
<td>2.880</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>39.</td>
<td>Abasi mohamed mohamed sulaiman</td>
<td>25</td>
<td>Primi</td>
<td>37</td>
<td>6-7</td>
<td>Emergency LSCS with intra caesarean Cu-T</td>
<td>Meconium</td>
<td>Alive</td>
<td>2.400</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>40.</td>
<td>Kerthana vinodh</td>
<td>20</td>
<td>Primi</td>
<td>38</td>
<td>6-7</td>
<td>Labour natural with episiotomy</td>
<td>clear</td>
<td>Alive</td>
<td>3.250</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>41.</td>
<td>Saranya sivakumar</td>
<td>28</td>
<td>Primi</td>
<td>39</td>
<td>6-7</td>
<td>Vacuum delivery with episiotomy</td>
<td>clear</td>
<td>Alive</td>
<td>3.330</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>42.</td>
<td>Pavithra Kishore</td>
<td>26</td>
<td>G2P1L1</td>
<td>38</td>
<td>5-6</td>
<td>Labour natural with episiotomy</td>
<td>clear</td>
<td>Alive</td>
<td>2.750</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Name</td>
<td>Age</td>
<td>Parity</td>
<td>Week</td>
<td>Labour Type</td>
<td>Episiotomy</td>
<td>Outcome</td>
<td>APG</td>
<td>Admission</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>---</td>
<td>-----------------------</td>
<td>-----</td>
<td>--------</td>
<td>------</td>
<td>---------------------------</td>
<td>------------</td>
<td>---------</td>
<td>-----</td>
<td>-------------------</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>43.</td>
<td>Lakshmi satish</td>
<td>28</td>
<td>G2P1L1A1</td>
<td>39W5D</td>
<td>6-7</td>
<td>clear</td>
<td>Alive</td>
<td>3.920</td>
<td>8/10 &amp; 9/10</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>44.</td>
<td>Mersy catherin</td>
<td>31</td>
<td>Prim</td>
<td>38</td>
<td>6-7</td>
<td>clear</td>
<td>Alive</td>
<td>2.880</td>
<td>8/10 &amp; 9/10</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>45.</td>
<td>Vijaya shanthi karthik</td>
<td>24</td>
<td>Prim</td>
<td>38</td>
<td>5-7</td>
<td>clear</td>
<td>Alive</td>
<td>2.635</td>
<td>8/10 &amp; 9/10</td>
<td>Neonate Admitted for observation</td>
<td></td>
<td></td>
</tr>
<tr>
<td>46.</td>
<td>Faridha</td>
<td>24</td>
<td>Prim</td>
<td>38</td>
<td>6-7</td>
<td>clear</td>
<td>Alive</td>
<td>2.940</td>
<td>8/10 &amp; 9/10</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>47.</td>
<td>Chandika karthik</td>
<td>28</td>
<td>Prim</td>
<td>38</td>
<td>6</td>
<td>clear</td>
<td>Alive</td>
<td>2.205</td>
<td>8/10 &amp; 9/10</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>48.</td>
<td>Sivagami surrender</td>
<td>20</td>
<td>Prim</td>
<td>39</td>
<td>5-6</td>
<td>clear</td>
<td>Alive</td>
<td>2.635</td>
<td>8/10 &amp; 9/10</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>49.</td>
<td>Gayathri dayanadi</td>
<td>24</td>
<td>Prim</td>
<td>37</td>
<td>5-6</td>
<td>Emergency LSCS</td>
<td>Alive</td>
<td>3.170</td>
<td>8/10 &amp; 9/10</td>
<td>TTN</td>
<td></td>
<td></td>
</tr>
<tr>
<td>50.</td>
<td>Sulochana</td>
<td>20</td>
<td>Prim</td>
<td>39</td>
<td>5-6</td>
<td>clear</td>
<td>Alive</td>
<td>2.735</td>
<td>8/10 &amp; 9/10</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>51.</td>
<td>Subbulakshmi</td>
<td>20</td>
<td>Prim</td>
<td>39</td>
<td>5-6</td>
<td>clear</td>
<td>Alive</td>
<td>2.735</td>
<td>8/10 &amp; 9/10</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>52.</td>
<td>Rajeswari</td>
<td>26</td>
<td>G2p11</td>
<td>39</td>
<td>5-6</td>
<td>LN c a</td>
<td>4.1</td>
<td>8/10,9/10</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>53.</td>
<td>Sathyra</td>
<td>28</td>
<td>G3p2l2</td>
<td>38</td>
<td>5-6</td>
<td>Ln c a</td>
<td>3.5</td>
<td>7/10,8/10</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>54.</td>
<td>Usha</td>
<td>28</td>
<td>Prim</td>
<td>37</td>
<td>5-6</td>
<td>Emergency Lscs meconium a</td>
<td>2.7</td>
<td>7,8/10</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>55.</td>
<td>Aasha</td>
<td>23</td>
<td>Prim</td>
<td>37-38</td>
<td>LN c alive</td>
<td>2.8</td>
<td>8,9///////////10</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>56.</td>
<td>Ambika</td>
<td>25</td>
<td>Prim</td>
<td>38</td>
<td>5-6</td>
<td>Lscsm m alive</td>
<td>2.8</td>
<td>8,9/10</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>57.</td>
<td>Sandya</td>
<td>20</td>
<td>Prim</td>
<td>40</td>
<td>5-6</td>
<td>Vacuum c a</td>
<td>2.8</td>
<td>8,9/10</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Name</td>
<td>Age</td>
<td>Gravida</td>
<td>Menstrual</td>
<td>Type of Delivery</td>
<td>Duration</td>
<td>Admission</td>
<td>Exit</td>
<td>Notes</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>---</td>
<td>----------------</td>
<td>-----</td>
<td>---------</td>
<td>-----------</td>
<td>------------------</td>
<td>----------</td>
<td>-----------</td>
<td>------</td>
<td>-------</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>58</td>
<td>Sabitha</td>
<td>23</td>
<td>primi</td>
<td>38</td>
<td>6-7</td>
<td>L n c a</td>
<td>alive</td>
<td>2.4</td>
<td>8/10,9/10</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>59</td>
<td>Fathima</td>
<td>24</td>
<td>G2p1II</td>
<td>39</td>
<td>6-7</td>
<td>L n c a</td>
<td>alive</td>
<td>3</td>
<td>8,9/10</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>60</td>
<td>Reeta</td>
<td>23</td>
<td>G2p1II</td>
<td>37</td>
<td>6-7</td>
<td>L n c a</td>
<td>alive</td>
<td>2.8</td>
<td>8,9/10kumari</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>61</td>
<td>Kumari</td>
<td>26</td>
<td>primi</td>
<td>37</td>
<td>5-6</td>
<td>L n c a</td>
<td>3.2</td>
<td>7,8/10</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>62</td>
<td>Shalini</td>
<td>24</td>
<td>primi</td>
<td>39</td>
<td>5-6</td>
<td>L n c a</td>
<td>3.2</td>
<td>7,9/10</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>63</td>
<td>Jasmine</td>
<td>25</td>
<td>primi</td>
<td>37-38</td>
<td>6-7</td>
<td>Vacuum delivery c a 2.75</td>
<td>7,8/10</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>64</td>
<td>Mangaiyakarasi</td>
<td>24</td>
<td>primi</td>
<td>38</td>
<td>6-7</td>
<td>Labour Naturale c a 3.12</td>
<td>8/10,9/10</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>65</td>
<td>Kalpana</td>
<td>26</td>
<td>primi</td>
<td>39</td>
<td>6-7</td>
<td>Vacuum delivery c a 3.2</td>
<td>6/10,7/10 RDS</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>66</td>
<td>Sugumari</td>
<td>25</td>
<td>g2p1L1</td>
<td>38</td>
<td>5-6</td>
<td>Labour Naturale c a 2.8</td>
<td>8/10,9/10</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>67</td>
<td>Chandralekha</td>
<td>27</td>
<td>g3p1L1a1</td>
<td>39</td>
<td>6-7</td>
<td>Labour Naturale c a 3.1</td>
<td>8/10,9/10</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>68</td>
<td>Sindhu</td>
<td>31</td>
<td>primi</td>
<td>37</td>
<td>6</td>
<td>Labour Naturale c a 2.7</td>
<td>8/10,9/10</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>69</td>
<td>Ayesha</td>
<td>24</td>
<td>primi</td>
<td>37</td>
<td>5-6</td>
<td>Labour Naturale c a 2.7</td>
<td>8/10,9/10 admitted for observation</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>70</td>
<td>Fridoss</td>
<td>23</td>
<td>primi</td>
<td>37</td>
<td>6</td>
<td>Labour Naturale c a 2.8</td>
<td>8/10,9/10</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>71</td>
<td>Stella</td>
<td>37</td>
<td>primi</td>
<td>38</td>
<td>6</td>
<td>Labour Naturale c a 2.4</td>
<td>8/10,9/10</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>72</td>
<td>Roja</td>
<td>20</td>
<td>primi</td>
<td>38</td>
<td>6</td>
<td>Labour Naturale c a 2.7</td>
<td>8/10,9/10</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>73</td>
<td>Subbulakshmi</td>
<td>23</td>
<td>primi</td>
<td>37</td>
<td>5-6</td>
<td>Emergency LSCS c a 3</td>
<td>8/10,9/10 ttn</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>74</td>
<td>Sangamithra</td>
<td>20</td>
<td>primi</td>
<td>38</td>
<td>5-6</td>
<td>Labour Naturale c a 2.7</td>
<td>8/10,9/10</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>75</td>
<td>Gayathri</td>
<td>23</td>
<td>primi</td>
<td>40</td>
<td>6</td>
<td>Labour Naturale c a 2.8</td>
<td>8/10,9/10</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>76</td>
<td>Kanniyammal</td>
<td>22</td>
<td>primi</td>
<td>37</td>
<td>6-7</td>
<td>Labour Naturale meconium a 2.7</td>
<td>5/10,6/10 mas</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>77</td>
<td>Supriya</td>
<td>30</td>
<td>primi</td>
<td>39</td>
<td>5-6</td>
<td>Labour Naturale c a 2.8</td>
<td>8/10,9/10</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>78</td>
<td>Ambujam</td>
<td>19</td>
<td>g2a1</td>
<td>38</td>
<td>5-6</td>
<td>Labour Naturale c a 2.6</td>
<td>7/10,9/10</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No.</td>
<td>Name</td>
<td>Age</td>
<td>Para</td>
<td>Pregnancy</td>
<td>Gravida</td>
<td>Week</td>
<td>Mode</td>
<td>DI</td>
<td>BP</td>
<td>Remarks</td>
<td></td>
<td></td>
</tr>
<tr>
<td>-----</td>
<td>----------------</td>
<td>-----</td>
<td>------</td>
<td>-----------</td>
<td>----------</td>
<td>------</td>
<td>------</td>
<td>-----</td>
<td>-----</td>
<td>-----------------------------</td>
<td></td>
<td></td>
</tr>
<tr>
<td>79</td>
<td>Saranya Murugan</td>
<td>27</td>
<td>38</td>
<td>primi</td>
<td>g2p1L1</td>
<td>39</td>
<td>a</td>
<td>3</td>
<td>8/10</td>
<td>Labour Naturale</td>
<td></td>
<td></td>
</tr>
<tr>
<td>80</td>
<td>Devasena</td>
<td>35</td>
<td>38</td>
<td>primi</td>
<td>g2p1L1</td>
<td>39</td>
<td>a</td>
<td>2.4</td>
<td>3.2</td>
<td>8/10,9/10</td>
<td></td>
<td></td>
</tr>
<tr>
<td>81</td>
<td>Yuvarani</td>
<td>35</td>
<td>38</td>
<td>primi</td>
<td>g2p1L1</td>
<td>37</td>
<td>a</td>
<td>2.9</td>
<td>3.2</td>
<td>8/10,9/10</td>
<td></td>
<td></td>
</tr>
<tr>
<td>82</td>
<td>Gokilavani</td>
<td>32</td>
<td>37</td>
<td>primi</td>
<td>g2p1L1</td>
<td>37</td>
<td>a</td>
<td>2.6</td>
<td>3.2</td>
<td>8/10,9/10</td>
<td></td>
<td></td>
</tr>
<tr>
<td>83</td>
<td>Jagannetha</td>
<td>27</td>
<td>38</td>
<td>primi</td>
<td>g2p1L1</td>
<td>37</td>
<td>a</td>
<td>2.4</td>
<td>3.2</td>
<td>8/10,9/10</td>
<td></td>
<td></td>
</tr>
<tr>
<td>84</td>
<td>Gomathi</td>
<td>26</td>
<td>38</td>
<td>primi</td>
<td>g2p1L1</td>
<td>37</td>
<td>a</td>
<td>2.6</td>
<td>3.2</td>
<td>8/10,9/10</td>
<td></td>
<td></td>
</tr>
<tr>
<td>85</td>
<td>Abirani</td>
<td>35</td>
<td>37</td>
<td>primi</td>
<td>g2p1L1</td>
<td>37</td>
<td>a</td>
<td>2.4</td>
<td>3.2</td>
<td>8/10,9/10</td>
<td></td>
<td></td>
</tr>
<tr>
<td>86</td>
<td>Kamara Suresh</td>
<td>26</td>
<td>38</td>
<td>primi</td>
<td>g2p1L1</td>
<td>37</td>
<td>a</td>
<td>2.6</td>
<td>3.2</td>
<td>8/10,9/10</td>
<td></td>
<td></td>
</tr>
<tr>
<td>87</td>
<td>Janani</td>
<td>25</td>
<td>37</td>
<td>primi</td>
<td>g2p1L1</td>
<td>37</td>
<td>a</td>
<td>2.4</td>
<td>3.2</td>
<td>8/10,9/10</td>
<td></td>
<td></td>
</tr>
<tr>
<td>88</td>
<td>Nandhini</td>
<td>27</td>
<td>37</td>
<td>primi</td>
<td>g2p1L1</td>
<td>37</td>
<td>a</td>
<td>2.6</td>
<td>3.2</td>
<td>8/10,9/10</td>
<td></td>
<td></td>
</tr>
<tr>
<td>89</td>
<td>Sabithini</td>
<td>27</td>
<td>37</td>
<td>primi</td>
<td>g2p1L1</td>
<td>37</td>
<td>a</td>
<td>2.4</td>
<td>3.2</td>
<td>8/10,9/10</td>
<td></td>
<td></td>
</tr>
<tr>
<td>90</td>
<td>Sivagami</td>
<td>27</td>
<td>37</td>
<td>primi</td>
<td>g2p1L1</td>
<td>37</td>
<td>a</td>
<td>2.6</td>
<td>3.2</td>
<td>8/10,9/10</td>
<td></td>
<td></td>
</tr>
<tr>
<td>91</td>
<td>Thirumagalasundari</td>
<td>22</td>
<td>37</td>
<td>primi</td>
<td>g2p1L1</td>
<td>37</td>
<td>a</td>
<td>2.4</td>
<td>3.2</td>
<td>8/10,9/10</td>
<td></td>
<td></td>
</tr>
<tr>
<td>92</td>
<td>Sandhya</td>
<td>23</td>
<td>37</td>
<td>primi</td>
<td>g2p1L1</td>
<td>37</td>
<td>a</td>
<td>2.6</td>
<td>3.2</td>
<td>8/10,9/10</td>
<td></td>
<td></td>
</tr>
<tr>
<td>93</td>
<td>Gajalakshimi</td>
<td>29</td>
<td>37</td>
<td>primi</td>
<td>g2p1L1</td>
<td>37</td>
<td>a</td>
<td>2.4</td>
<td>3.2</td>
<td>8/10,9/10</td>
<td></td>
<td></td>
</tr>
<tr>
<td>94</td>
<td>Uma</td>
<td>26</td>
<td>37</td>
<td>primi</td>
<td>g2p1L1</td>
<td>37</td>
<td>a</td>
<td>2.6</td>
<td>3.2</td>
<td>8/10,9/10</td>
<td></td>
<td></td>
</tr>
<tr>
<td>95</td>
<td>Shanthi Priya</td>
<td>30</td>
<td>37</td>
<td>primi</td>
<td>g2p1L1</td>
<td>37</td>
<td>a</td>
<td>2.4</td>
<td>3.2</td>
<td>8/10,9/10</td>
<td></td>
<td></td>
</tr>
<tr>
<td>96</td>
<td>Shanmuga Priya</td>
<td>28</td>
<td>37</td>
<td>primi</td>
<td>g2p1L1</td>
<td>37</td>
<td>a</td>
<td>2.6</td>
<td>3.2</td>
<td>8/10,9/10</td>
<td></td>
<td></td>
</tr>
<tr>
<td>97</td>
<td>Vasanthakumari</td>
<td>18</td>
<td>37</td>
<td>primi</td>
<td>g2p1L1</td>
<td>37</td>
<td>a</td>
<td>2.4</td>
<td>3.2</td>
<td>8/10,9/10</td>
<td></td>
<td></td>
</tr>
<tr>
<td>98</td>
<td>Kiruthika</td>
<td>30</td>
<td>37</td>
<td>primi</td>
<td>g2p1L1</td>
<td>37</td>
<td>a</td>
<td>2.6</td>
<td>3.2</td>
<td>8/10,9/10</td>
<td></td>
<td></td>
</tr>
<tr>
<td>99</td>
<td>Sivagami</td>
<td>27</td>
<td>37</td>
<td>primi</td>
<td>g2p1L1</td>
<td>37</td>
<td>a</td>
<td>2.4</td>
<td>3.2</td>
<td>8/10,9/10</td>
<td></td>
<td></td>
</tr>
<tr>
<td>100</td>
<td>Devidevi</td>
<td>30</td>
<td>37</td>
<td>primi</td>
<td>g2p1L1</td>
<td>37</td>
<td>a</td>
<td>2.6</td>
<td>3.2</td>
<td>8/10,9/10</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
CERTIFICATE OF APPROVAL

To
Dr. Annie Rajiah
Post Graduate in M.S. O & G
Madras Medical College
Chennai 600 003

Dear Dr. Annie Rajiah,

The Institutional Ethics Committee has considered your request and approved your study titled "TO STUDY THE MATERNAL AND PERINATAL OUTCOME IN TERM ANTENATAL MOTHERS WITH BORDERLINE OligOHYDRAMNIOIS WHOSE FETAL CEREBRO PERFUSION RATIO > 1 AT 10G " - NO.03012017 (IV).

The following members of Ethics Committee were present in the meeting held on **31.01.2017** conducted at Madras Medical College, Chennai 3

1. Dr. C. Rajendran, MD., : Chairperson
2. Dr. M. K. Muralidharan, MS., M. Ch., Dean, MMC, Ch-3 : Deputy Chairperson
3. Prof. Sudha Seshayyan, MD., Vice Principal, MMC, Ch-3 : Member Secretary
4. Prof. B. Vasanthi, MD., Prof. of Pharmacology., MMC, Ch-3 : Member
5. Prof. S. Suresh, MS, Prof. of Surgery, MMC, Ch-3 : Member
6. Prof. N. Gopalakrishnan, MD, Director, Inst. of Nephrology, MMC, Ch : Member
7. Prof. S. Mayilvahanan, MD, Director, Inst. of Int. Med, MMC, Ch-3 : Member
8. Tmt. J. Rajalakshmi, JAO, MMC, Ch-3 : Lay Person

We apporve the proposal to be conducted in its presented form.

The Institutional Ethics Committee expects to be informed about the progress of the study and SAE occurring in the course of the study; any changes in the protocol and patients information/informed consent and asks to be provided a copy of the final report.

Member Secretary – Ethics Committee
INFORMATION SHEET

• We are conducting a study on the AFI measured by ultrasonogram for AN mothers with gestational age more than 37 weeks and its association with labour and perinatal outcome.

• We are selecting antenatal women according to the need for the study. We wish that you participate in this study.

• In this study, we will measure the AFI using ultrasound for AN mothers with gestational age more than 37 weeks. Subsequently details of your labour and fetal perinatal outcome will be recorded. The test you are subjected to, shall not affect you or your baby in uterus.

• Your participation in this study will not affect your AN care or any treatment if needed.

• The privacy of the patients in the research will be maintained throughout the study.

• In the event of any publication or presentation resulting from the research, no personally identifiable information will be shared.

• Taking part in this study is voluntary. You are free to decide whether to participate in this study or withdraw at any time; your decision will not result in any loss of benefits to which you are otherwise entitled.

• The results of the study may be intimated to you at the end of the study period or during the study if anything is found abnormal which may aid in the management or treatment.

Signature of the Investigator  
Signature of the Participant
INFORMATION SHEET IN VERNACULAR LANGUAGE.

> மதமலில் நான்கு வருடங்கள் காண்கள் மேலும் மற்றும் இயற்கை வாய்ப்புகள் நம் கையில் காண்கள் அதிலிருந்து வெளியீடு முடிகள் அந்தை பற்றியும்.

> புனே சென்று 37 முறையால் பெருஞ்சை குடியரசின் முதல் இடத்தில் வந்தோம் மேலும் இல்லையால் இருந்து வெளியீட்டுடன் கூறுவதும் முடிகள் வந்தோம் பற்றியும் அந்தை பற்றியும்.

> என்று புனே சென்று 37 முறையால் பெருஞ்சை குடியரசின் முதல் இடத்தில் வந்தோம் மேலும் இல்லையால் இருந்து வெளியீட்டுடன் கூறுவதும் முடிகள் வந்தோம் பற்றியும் அந்தை பற்றியும்.

> என்று புனே சென்று 37 முறையால் பெருஞ்சை குடியரசின் முதல் இடத்தில் வந்தோம் மேலும் இல்லையால் இருந்து வெளியீட்டுடன் கூறுவதும் முடிகள் வந்தோம் பற்றியும் அந்தை பற்றியும்.

> என்று புனே சென்று 37 முறையால் பெருஞ்சை குடியரசின் முதல் இடத்தில் வந்தோம் மேலும் இல்லையால் இருந்து வெளியீட்டுடன் கூறுவதும் முடிகள் வந்தோம் பற்றியும் அந்தை பற்றியும்.

> என்று புனே சென்று 37 முறையால் பெருஞ்சை குடியரசின் முதல் இடத்தில் வந்தோம் மேலும் இல்லையால் இருந்து வெளியீட்டுடன் கூறுவதும் முடிகள் வந்தோம் பற்றியும் அந்தை பற்றியும்.
MATERNAL CONSENT FORM

Study of Maternal and Perinatal Outcome in Term Mothers with Borderline Oligohydramnios whose fetal cerebral perfusion >1 at IOG

Participant Name
Participant No.

Participant’s Signature

I have been clearly explained about the study. I am participating in the study on my own will and if any reason including any law problem I can withdraw from the study.

I state that with regard to research study or any other higher study in connection to this, I know fully well that, the researcher does not need my permission to look into my records. I will not refuse to make use of the results of this research study.

I consent to take part in the above research study I assure that I will remain faithful to the Medical Team undertaking this study.

Participant Signature

Witness Signature

Date :
Place :

Signature of Investigator

Place :
Date :
CONSENT FORM IN VERNACULAR LANGUAGE.

பண்டி வெளிப்புறமாக

பெரும்பாலான செய்திகளுக்கு தன்னினமுள்ள பொருளை மேலே வெளிப்புறமாகப் பரிமாறி வருகையினால், வேறு புதுக்காலின் தொடர்பான நோய்களை செய்யவும் வேண்டும்.

பாதுகாப்புக்கான செய்யும்:

பாதுகாப்பு தொடர்

பாதுகாப்பு வழியாக

திறன் அனைத்து குறிப்பிட்டு வெளியிடுவதற்கு அனைத்து குறிப்பிட்டு வெளியிட்டு வெளியிடுவதற்கு

தமிழ் மொழியில் எவ்வாறு உள்ளது அனைத்து குறிப்பிட்டு வெளியிடுவதற்கு அனைத்து குறிப்பிட்டு வெளியிட்டு வெளியிடுவதற்கு

தமிழ் மொழியில் எவ்வாறு உள்ளது அனைத்து குறிப்பிட்டு வெளியிடுவதற்கு

பாதுகாப்பு தளப்பு:

செயலின்

செயலின்

செயலின்

செயலின்

செயலின்

செயலின்

செயலின்

செயலின்

செயலின்
Urkund Analysis Result

Analysed Document: ANNIE RAJIAH THESIS.pdf (D317922229)
Submitted: 10/28/2017 3:31:00 AM
Submitted By: annierajthesis@gmail.com
Significance: 1 %

Sources included in the report:
SACHIN KUMAR JAISWAL RADIOLOGY ROLE OF USG IN DETECTION AND EVALUATION OF IUGR.docx (D30526758)
Sakshi Plagiarism 01.docx (D30558979)
Dr swar Thesis final.docx (D30970446)

Instances where selected sources appear:
5
PLAGIARISM CERTIFICATE

This is to certify that this dissertation work titled “TO STUDY THE MATERNAL AND PERINATAL OUTCOME IN TERM ANTENATAL MOTHERS WITH BORDERLINE OLIGOHYDRAMNIOS WHOSE FETAL CEREBROPLACENTAL RATIO>1” of the candidate DR. ANNIE RAJIAH with registration number-221616003 for the award of M.S in the branch of OBSTETRICS AND GYNAECOLOGY. I personally verified the urkund.com website for the purpose of plagiarism check. I found that the uploaded thesis file contains from introduction to conclusion pages and result shows 1% of plagiarism in the dissertation.

Signature of the GUIDE with seal
<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Admission</td>
</tr>
<tr>
<td>AFI</td>
<td>Amniotic Fluid Index</td>
</tr>
<tr>
<td>AFV</td>
<td>Amniotic Fluid Volume</td>
</tr>
<tr>
<td>AT</td>
<td>Admission Test</td>
</tr>
<tr>
<td>BPP</td>
<td>Biophysical Profile</td>
</tr>
<tr>
<td>C</td>
<td>Clear</td>
</tr>
<tr>
<td>CPD</td>
<td>Cephalopelvic Disproportion</td>
</tr>
<tr>
<td>FD</td>
<td>Fetal Distress</td>
</tr>
<tr>
<td>FHR</td>
<td>Fetal Heart Rate</td>
</tr>
<tr>
<td>FI</td>
<td>Failed Induction</td>
</tr>
<tr>
<td>FT</td>
<td>Full Term</td>
</tr>
<tr>
<td>HIE</td>
<td>Hypoxic Ischemic Encephalopathy</td>
</tr>
<tr>
<td>IUGR</td>
<td>Intrauterine Growth Retardation</td>
</tr>
<tr>
<td>LMC</td>
<td>Low Midcavity Forceps</td>
</tr>
<tr>
<td>LSCS</td>
<td>Lower Segment Caesarean Section</td>
</tr>
<tr>
<td>MAS</td>
<td>Meconium Aspiration Syndrome</td>
</tr>
<tr>
<td>NR</td>
<td>Nonreactive</td>
</tr>
<tr>
<td>NST</td>
<td>Non Stress Test</td>
</tr>
<tr>
<td>RD</td>
<td>Respiratory Distress</td>
</tr>
<tr>
<td>SPVD</td>
<td>Spontaneous Vaginal Delivery</td>
</tr>
<tr>
<td>USG</td>
<td>Ultrasonogram</td>
</tr>
<tr>
<td>VD</td>
<td>Vaginal Delivery</td>
</tr>
<tr>
<td>Acronym</td>
<td>Description</td>
</tr>
<tr>
<td>---------</td>
<td>-----------------------------------</td>
</tr>
<tr>
<td>RI</td>
<td>Resistive Index</td>
</tr>
<tr>
<td>PI</td>
<td>Pulsatilty Index</td>
</tr>
<tr>
<td>CPR</td>
<td>Cerebro Placental Ratio</td>
</tr>
<tr>
<td>RCOG</td>
<td>Royal College of Obstetrics and Gynaecology</td>
</tr>
<tr>
<td>Um A</td>
<td>Umbilical artery</td>
</tr>
<tr>
<td>UA</td>
<td>Uterine artery</td>
</tr>
</tbody>
</table>