"PLACENTAL THICKNESS - A SONOLOGICAL PARAMETER FOR ESTIMATION OF GESTATIONAL AGE"

Dissertation submitted in partial fulfilment of the

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OBSTETRICS AND GYNAECOLOGY

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TIRUNELVELI MEDICAL COLLEGE HOSPITAL

THE TAMIL NADU DR.M.G.R. MEDICAL UNIVERSITY

CHENNAI,

TAMIL NADU.

CERTIFICATE

This is to certify that the Dissertation entitled **"PLACENTAL THICKNESS - A SONOLOGICAL PARAMETER FOR ESTIMATION OF GESTATIONAL AGE"** submitted by **Dr.GOLDY. S. J. MBBS.,** to The Tamilnadu Dr. M.G.R. Medical University, Chennai, in partial fulfilment for the award of M.S (Obstetrics and Gynaecology) is a bonafide work carried out by her under my guidance and supervision during the academic year 2012-2015. This dissertation partially or fully has not been submitted for any other degree or diploma of this university or other

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DECLARATION

I**, Dr. GOLDY S. J. MBBS.,** solemnly declare that the Dissertation titled **"PLACENTAL THICKNESS - A SONOLOGICAL PARAMETER FOR ESTIMATION OF GESTATIONAL AGE"** has been prepared by me under the expert guidance and supervision of **Prof. DR.SHEBA ROSATTE VICTOR, MD OG** Professor, Department of Obstetrics and Gynaecology, Tirunelveli Medical College Hospital, Tirunelveli.

This dissertation is submitted to the Tamilnadu Dr. M.G.R. Medical University, Chennai, in partial fulfilment of the regulations for the award of MS Degree Branch VI (OBSTETRICS & GYNAECOLOGY).

It was not submitted to the award of any degree/diploma to any University either in part or in full previously.

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CLINICAL METHODS

G 1 : A DATING CALENDER

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CONTENTS

ABBREVIATION

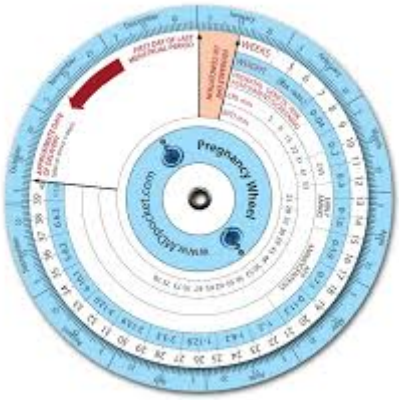
- LMP - Last Menstrual period
- EDD - Expected Date of Delivery
- GA - Gestational Age
- GS - Gestational Sac
- CRL - Crown Rump Length
- BPD - Biparietal Diameter
- FL - Femur Length
- HC - Head circumference
- AC - Abdominal circumference
- PT - Placental thickness
- SGA – Small for getational age
- LGA -Large for gestational age

INTRODUCTION [1]

A precise determination of the gestational age and expected date of delivery is the first step in the management of all pregnancies, be it high risk or low risk. Accurate dating is essential in doing and interpreting laboratory tests, planning and performing foetal therapy, and for optimising outcomes in certain tough clinical situations like foetal growth restriction, gestational diabetes, Rhesus isoimmunisation and pregnancy induced hypertension. No method on earth is a substitute to the neonatal assessment of gestational age which is in no way useful to the obstetrician which can be compared to the posthumous award to a martyr. Identification of correct dates early during the antepartum period can help the future newborn enormously. The need for an error free dating cannot be overemphasised.

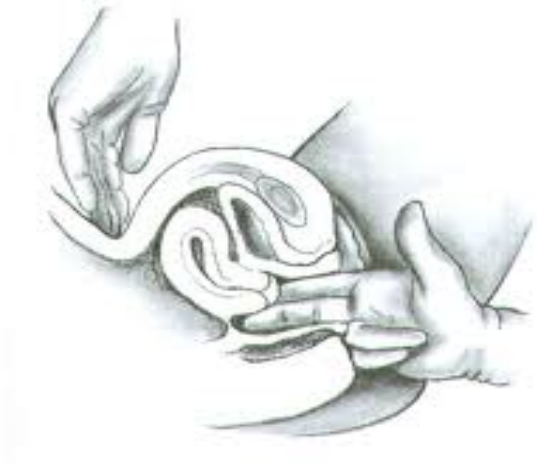
CLINICAL METHODS

FIG 1 : A DATING CALENDER



The characteristics of the LMP, the findings of the first per vaginal examination, the date of urine pregnancy test and date on which the heart sound is first heard are utilised in clinical dating. The patient's menstrual dating is appropriate if the prior periods were normal in amount, duration and regularity and if the patient was not on oral contraceptives in the past 3 months. 30 % of all pregnancies do not meet the above criteria of excellent dates making LMP estimation of gestational age unreliable .Kramer et al states that LMP GA is particularly unreliable in preterm and post term pregnancies. Matsumoto[2] et al reported that early (< day 11) or late ovulation (> day 21) occurs in approximately 20% of the population making LMP even more unreliable . According to a study at the Mc Gill university, the LMP gestational age was particularly erroneous in preterm and post term pregnancies.

FIG 2 : BIMANUAL PELVIC EXAMINATION



Fallacies in pelvic examination are observer variation, maternal obesity, position of the uterus, amount of amniotic fluid, multiple gestation, presence of uterine fibroids and foetal growth discrepancies.

The date on which the first foetal heart sound is audible with Doppler ultrasound (10 weeks) or with a stethoscope (20 weeks) is also helpful in ascertaining gestational age which is accepted only when it corresponds with other clinical parameters.

FIG 3 : URINE PREGNANCY TEST CARD

Urine pregnancy test diagnoses a pregnancy by 4-5 post menstrual weeks. It can be used for dating when other parameters are unreliable. The approximate period of gestation is 266 days from conception and 280 days from the LMP in a 28 days cycle.

The rule of Naegele

Add 7 days to the first day of LMP and count back 3 months Mc Donald's rule.

Gestational age (weeks) = Fundal height (cm) × 8/7.

Fundal height calculations are unreliable in maternal obesity, malpresentations of the foetus, multiple pregnancy, abnormal liquor quantity, uterine position, observer variation, foetal growth restriction. While measuring fundal height, doctors tend to underestimate the gestational age and have a preference for even numbers.

QUICKENING

Adding 20 weeks to a primigravida and 22 weeks to a multigravida from the date of quickening gives a probable expected date of delivery.

ABDOMINAL CIRCUMFERENCE

Abdominal girth (inches) measured at 30 wks is 30 inches and at 40 wks is 40 inches and so on. Hence abdominal girth can be used as an indirect method of estimating gestational age.

SYMPHYSIOFUNDAL HEIGHT[3]

Symphysiofundal height in cm coincides with the gestational age in weeks between 20 to 34 weeks of gestation. A difference of symphysio fundal height of 3-4 cm can be due to foetal growth restriction. Only 40% of SGA infants are identified by this method.

SONOLOGY IN DATING

Ultrasound is considered to be the third hand of an obstetrician. Sir Ian Donald was the first to introduce ultrasound in medical diagnosis. Ultrasound adds quantum to the clinical diagnosis. As of now, the first dating ultrasound is the most reliable method of assessment of gestational age. Implantation commences on day 19 of cycle and is completed on day 23. The conceptus at this stage is 0.1 mm in length and cannot be seen by currently available ultrasound equipment.

FIRST TRIMESTER [4]

Gestational sac	-	5 weeks
Gestational sac + yolk sac	-	5.5 weeks
Gestational sac + yolk sac + embryo	-	6 weeks

Crown Rump length

The distance between the top of the head to bottom of the rump is measured in a neutral position with no flexion or extension. It is used to assess gestational age from 5 weeks 3 days to 13 weeks 6 days of pregnancy .This is the most accurate parameter for assessing gestational age in a pregnancy.

SECOND TRIMESTER

- Biparietal diameter
- Femur length
- Abdominal circumference
- Head circumference

Of these none of them is reliable in third trimester

- First trimester - ± 3 days
- Second trimester - ± 1 - 2 wks
- Third trimester - ± 2 - 3 wks

So other sonological parameters like humerus length, clavicle length , trans - cerebellar diameter, foot length, placental thickness, cephalic index, occipitio-frontal distance , diameter of distal femoral epiphysis and biocular distance are also available in prediction of gestational age.

Hence this study was done to analyse whether placental thickness can be used as a new parameter to assess gestational age. The most important parameter[5] to determine the neonatal wellbeing is birth weight.

Since the estimated weight can be used as an indirect estimator of the future birth weight, the estimated foetal weight could be

considered an indirect indicator of placental wellbeing. This study was also done to find out if there was any relation to placental thickness and foetal weight.

AIM OF THE STUDY

Evaluating placental thickness, measured at the insertion of the umbilical cord, as a parameter for estimating gestational age of the foetus.

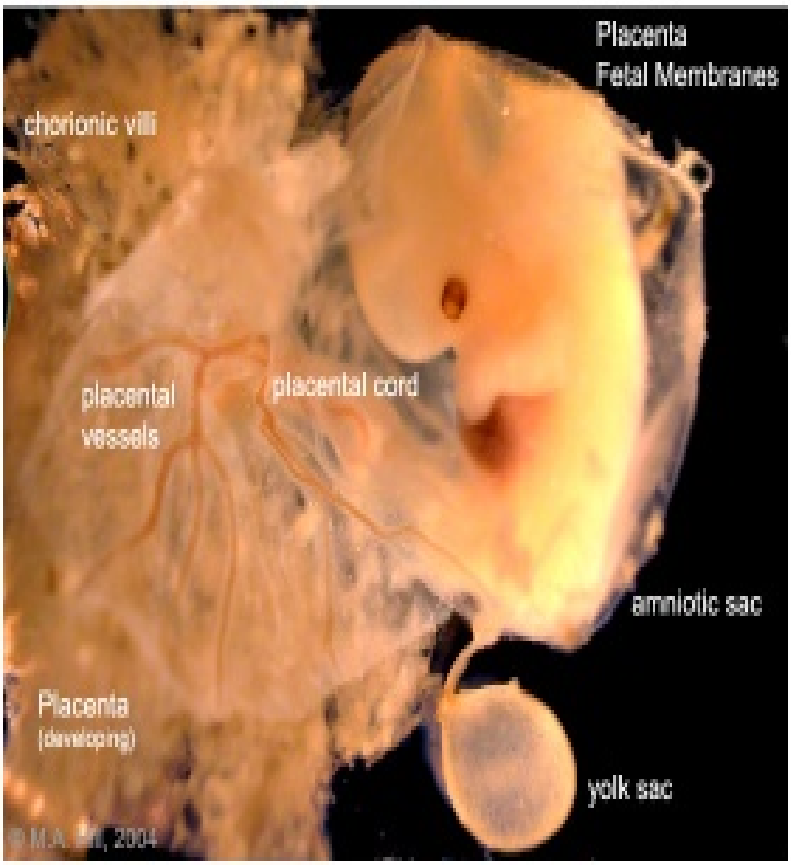
OBJECTIVES OF THE STUDY

1. To understand the correlation between placental thickness and gestational age.
2. To understand the variation in placental thickness in relation to maternal age, parity and liquor status of the foetus.
3. To analyse the differences in placental thickness with advancing gestational age in relation to placental location.
4. To understand whether placental thickness could be used as a parameter in estimating foetal age.
5. To correlate placental thickness with other sonological dating parameters like BPD, HC, FL, AC.

REVIEW OF LITERATURE

PLACENTA - EMBRYOLOGY

FIG 4 : A FOETUS IN A WOMB



Ovulation occurs 14 days following the last menstrual period and fertilization occurs 2 days later in the ampullary region of the fallopian tube . By 20 days from the LMP , the zygote has formed the blastocyst, a cystic cavity filled with fluid with an inner cell mass and the outer trophoblastic layer. The inner cell mass will ultimately result to form the embryo, yolk sac and the allantois.

The trophoplasts will eventually develop into the placenta, amnion and the chorion. The blastocyst begins to implant in the uterine endometrial cavity approximately one week after ovulation which is almost completed by day 23 from the LMP. During the implantation the trophoblasts start eroding the maternal capillary system and now the maternal blood is very close to the new conceptus. The inter - communicating lacunar network thus established later on becomes the inter villous space of the placenta.

The endometrium also undergoes decidual reaction to support and exert a control over the trophoblastic invasion. The trophoblasts also give rise to fond like villi called chorionic villi.

During the early stages of placental development, the placenta envelops the embryo, as a shell of trophoblast begins to invade the uterine stroma [6]. The yolk sac placenta which is in the coelomic cavity is connected to the embryonic cavity via vitelline stalk and its vessels. This is a transient structure which is replaced by the chorioallantoic placenta.

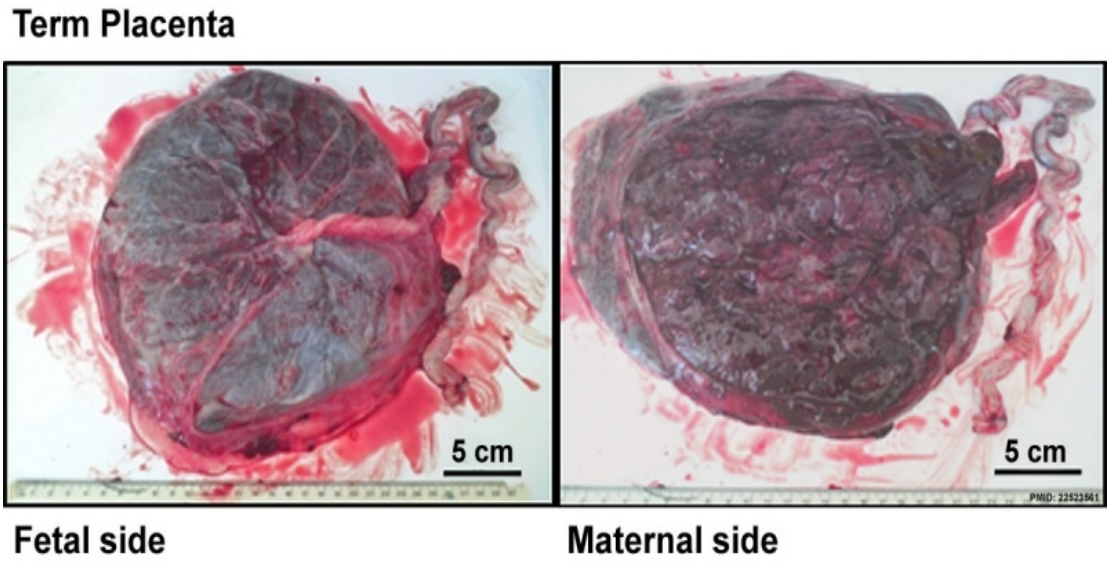
The allantoic stroma and embryonic blood vessels grow into the chorionic plate to become the chorioallantoic placenta. Foetal blood vessels grow into the developing villi to become the chorionic villi tree. The chorioallantoic placenta surrounds the embryo. By 9 to 12

weeks, two thirds of it regress to form the smooth chorion laevae and remaining one third which persists is attached to the umbilical cord to become the true placenta (chorionfrondosum) [7] . By 12 weeks placenta attains a grey granular appearance. Placenta is supplied by the spiral arteries. From 12 weeks to term, the placenta grows at a variable rate to cope up with the growth of the foetal size. At term the placenta is 3-4 cm thick and 15 – 25 cm in diameter[8]. The word placenta is derived from the greek word [9] 'plakuos' meaning a flat cake, which exactly defines its appearance.

PLACENTA - ANATOMY

Due to continuous foetal growth and uterine expansion, placenta also enlarges. The increase in surface area is parallel to the uterine expansion. The placenta occupies 15 - 30 % of the internal surface of the uterus. The maternal aspect of the placenta is formed by the basal plate. The foetal aspect is formed by the chorionic plate and the amniotic membrane. In between these two is the intervillous space containing the stem villi filled with maternal blood. The amniotic membrane is a thin membrane loosely attached to the chorionic plate which is an ectodermal derivative [10]. It has no role in the development of the placenta.

FIG 5 : A TERM PLACENTA



CHORIONIC PLATE

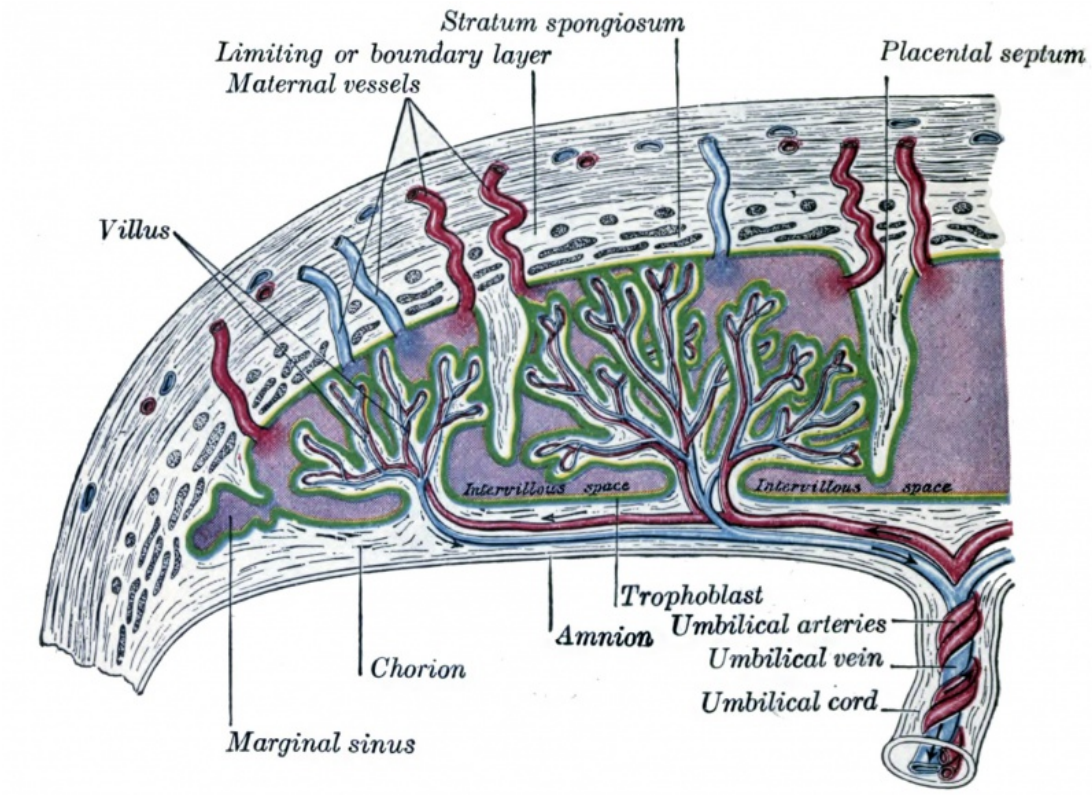
From within outwards it contains the mesenchyme containing the umbilical vessels, cytotrophoblast and the syncytiotrophoblast. The stem villi arise from this plate and form the inner boundary of the choriodecidual space.

BASAL PLATE

From outside inwards it contains the following structures

1. Part of the spongy and compact area of the decidua basalis
2. Nitabuch layer
3. Cytotrophoblast
4. Syncytiotrophoblast

FIG 6 : ULTRASTRUCTURE OF A PLACENTA



The basal plate is penetrated by the spiral branches of the uterine vessels through which the maternal blood flows into villous space. At certain sites of the basal plate, the decidual septa consisting of trophoblastic elements project into the intervillous space without reaching the chorionic plate. The area between these septa are the cotyledons of about 15 - 20 as measured from the maternal side.

INTERVILLOUS SPACE

The internal side is lined by the chorionic plate and the external side is lined by the basal plate limited on the periphery by the fusion of the two plates. It is internally lined by the synctiotrophoblast and is filled with slow flowing maternal blood. The numerous branching villi which arise from the stem villi constitute the major content of the intervillous space.

STEM VILLI

Stem villi arise from the chorionic plate and grow into the basal plate branching[11] into primary, secondary, tertiary villi. About 60 stem villi persist in the placenta. Therefore each cotyledon develops from a stem villi and is supplied by a primary branch of umbilical vessels. Each cotyledon is further divided into 1-5 lobules. The total number of cotyledons is the same throughout the gestation. But the individual cotyledons continue their growth to plateau towards term. The villi are the functional unit of the placenta. The villi exchange surface area is 4-14 m^2 which is exposed to maternal blood. The foetal capillaries within the villi are 50 km long. So while some of the villi are anchoring the placenta to the umbilical cord, much more are floating in the intervillous space and are called nutritive villi. Blood vessels within the branching villi do not anastomose with each other.

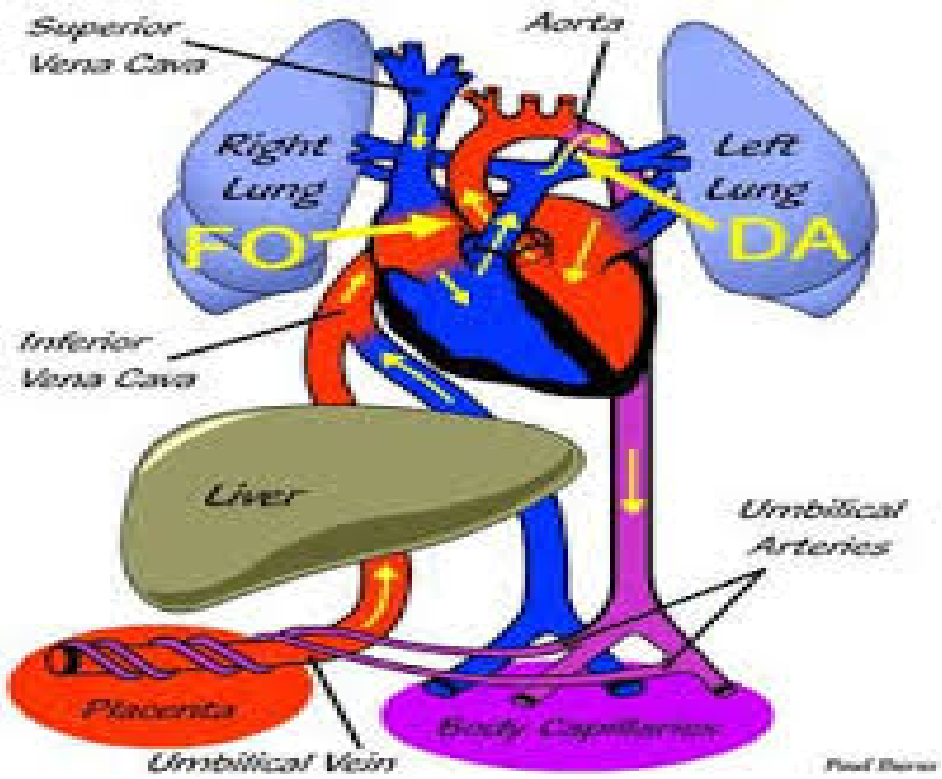
TERTIARY VILLI

In the early placenta the following structures are outside inwards, syncytiotrophoblast, cytotrophoblast, basement membrane, stroma containing foetal capillaries, primitive mesenchyme cells, connective tissue, phagocytic hofbaeur cells.

In the term placenta, the syncytiotrophoblast thins out at areas overlying the foetal capillaries and thickens at areas overlying the endoplasmic reticulum. The former is the area of exchange and the latter is the area of synthesis. The cytotrophoblast becomes sparse and the basement membrane becomes thicker. The stroma contains dilated vessels with few hofbaeur cells containing IgG surface receptors.

FOETAL CIRCULATION

FIG 7 : THE CIRCULATION OF A FOETUS



2 umbilical arteries and 1 umbilical vein constitute the foetoplacental circulation. The deoxygenated blood from the foetus is transported by the umbilical arteries to the intervillous space where exchange occurs with the richly oxygenated maternal blood. The blood returns to the foetus through the umbilical vein which empties into the portal sinus. The majority of blood flows through the ductus venosus into the inferior venacava. The remaining blood flows through the portal and hepatic veins thereby reaching the inferior

venacava. The foetal umbilical blood flow continues to increase throughout pregnancy which is regulated by the arterial pressure and systemic vascular resistance. The terminal villi which develop on the 21st day of pregnancy appears to be a significant contributor of placental vascular resistance. The utero placental flow increases from 50 cc/ min at 10 wks to 500 cc / min at term.

HEMODYNAMICS OF PLACENTAL CIRCULATION

80 - 100 spiral arteries [12] pierce the decidual plate and enter the intervillous spaces. The spiral artery has a narrow lumen, hence the inter villous pressure is high. This high pressure forces the blood into the intervillous spaces and supplies the entire villous tree with oxygenated blood. With a decline in pressure, the blood flows back from the chorionic plate to the decidua entering the endometrial veins thus reaching the maternal system.

The total blood in all the intervillous spaces of the placenta is about 150 ml. The entire volume of blood is replaced 3 - 4 times per minute.

PLACENTAL EXCHANGE

Placental exchange does not occur in all villi. Exchange occurs only where the foetal vessels are in intimate contact with the

syncytial membrane. The syncytium contains a brush border containing numerous microvilli which increase the surface area and the exchange is enhanced.

PLACENTAL MEMBRANE consists of

- Endothelial lining of the foetal vessels
- Connective tissue in villous core
- Cytotrophoblast
- Syncytium

The placental membrane which is thick initially (0.025 mm thick) begins to thin out from the fourth month of gestation and becomes 0.002 mm later on. In the later part of the pregnancy, the foetal vessels are very intimate to the syncytium thus facilitating greater exchange.

Human placenta is haemochorial[13] because the maternal blood in the intervillous system is separated from the foetal system by a membrane of the chorionic derivative. It could be summarised that the human placental complex [14] is the product of the co - operative effort of the extraembryonic tissues of the embryo and the uterine tissue.

PLACENTA - A MULTIFACETED ORGAN[15]

Placenta is a multifaceted organ which is responsible for modulating and modifying the maternal environment resulting in normal foetal development.

1. **NUTRITION -** The nutrients like carbohydrates, aminoacids, free fatty acids and vitamins are transported across the placenta.
2. **RESPIRATION -** The exchange of carbon di-oxide, carbon monoxide and oxygen is by simple diffusion. The maternal circulation supplies the placental system with 20 - 30 ml of oxygen per minute.
3. **BARRIER FUNCTION -** A barrier against pathogens and maternal immune system.
4. **THERMAL BALANCE** - The umbilical blood flow is responsible for heat transfer.
5. **ENDOCRINE[16] -** Secretion of steroid hormones, glycoprotein hormones, cytokines which are essential for homeostasis. The placenta mainly secretes progesterone which is responsible for maintaining the pregnancy. The placenta also secretes oestrogen in large quantities, mainly oestriol which is responsible for the growth of the uterus and the breast. The placenta also is responsible for

maintaining the corpus luteum by secreting Beta HCG in the first 2 months of pregnancy. The placenta also produces Human Somatomammotrophin which stimulates breast development and creates the increased priority of the foetus for maternal blood glucose.

6. **IMMUNOLOGICAL**[17]**-** In the acceptance of the foetal allograft. Immunological competence develops by the end of first trimester by which time the foetus makes almost all components of the complement. The antibodies transferred are mainly IgG antibodies from the mother which provides the foetus with passive immunity against many infectious agents.
7. **EXCRETORY**[18] - Foetal waste products such as urea, uric acid and creatinine reach the maternal blood by simple diffusion.

THE ADVENT OF THE SONOGRAM

The sonogram proves to be an essential instrument of obstetrics. A meticulously performed sonogram yields the informations like

- Intrinsic foetal anatomy
- Foetal growth
- Well being of the foetus
- Environment of the foetus

The ultrasound waves used in ultrasound has a sound intensity of 100 mv /cm^2, frequency of 5 MHz with an exposure time a little lower than 30 min. If the sonogram is utilised with above standards, there are no adverse effects either to the foetus or the mother.

Thermal injury and cavitation are the major biohazards of an ultrasound. Cavitation is due to the presence of gas which is pre-existing in the tissue. Thermal injury could be avoided by not staying on one particular point over a long time. This is particularly avoided in a foetal bone. Special care is taken to avoid pulsed Doppler ultrasound [19] for sensitive tissues like eye, head, brain and spine.

A temperature elevation[20] more than 4˚c for 5 min may be hazardous to the embryo. Few studies tell that a sonogram velocity of

more than 100 mv /cm^2 causes macro - nodular degeneration, mutations, sister chromatid exchange and increased protein and DNA synthesis. Hence sonologists should adopt the ALARA [21] principle (As Low As Reasonably Achievable) to avoid bio-hazards.

FIRST TRIMESTER

The definitive placenta is identified sonologically at 8 weeks. But a trans vaginal ultrasound can identify the placenta around 5 weeks from LMP. The deciduas basalis and the chorion frondosum form a thickening in the gestational sac which is visible by sonogram. The placental volume increases linearly with the increase in foetal weight and correlates with the increase in maternal serum hormones. The cord is inserted in the central portion of the disc and the regressing chorion laevae is seen on the opposite uterine wall. The coelomic cavity is obliterated by the developing amniotic cavity. The amnion fuses with the chorion at 12 weeks. The chorionic cavity completely occupies the uterine cavity at this stage such that internal os is completely sealed by the chorioamniotic membranes.

SECOND TRIMESTER

Now the placenta assumes a mature uniform, homogeneous granular echostructure. In the second trimester the site of attachment of the placenta is clearly defined and measures about 12 × 2.5 cm and

the thickness is less than 4 cm. After 20 weeks intraplacental sonolucencies appear in the placenta due to placental lakes and intervillous thrombi which are insignificant.

The final normal position and shape of the placenta is due to the degeneration of villi in all areas except the areas with good vascularity. As a result villi in the lower uterine segment atrophy and the villi develop within the uterine fundus. This process is termed as the trophotropism[22].

THIRD TRIMESTER

The placenta becomes heterogeneous as the pregnancy gradually advances.

PLACENTAL AGEING[23]

As the villi continue to branch, the terminal ramifications become numerous and smaller and the cytotrophoblasts decrease in volume and number. In the placentas of early pregnancy, loose intercellular matrix separates the branching connective tissue cells. As the placenta ages, the stroma becomes closely packed with cells.

ACCELERATED PLACENTAL MATURATION

Abnormally small villi and abnormally thin trophoblastic layer covering the villi result in accelerated maturation. There may be areas of

accelerated maturation combined with areas of normal maturation. The gestational age should be ascertained for sure before labelling a placenta to have accelerated maturation.

UNIFORMLY ACCELERATED MATURATION

Low maternal pre pregnant weight was associated with uniformly accelerated maturation. It is also seen in descendents of the black race. There is an association of still birth in this condition.

UNEVENLY ACCELERATED MATURATION

Uneven occlusion and stenosis of the spiral arteries resulting in uneven blood flow to the intervillous space of the placenta results in unevenly accelerated maturation. The uneven blood flow when persists for weeks and months results in normal maturation of the normally perfused area and accelerated maturation of thestenosed areas. Placental infarcts are commonly associated with this condition. The risk factors are eclampsia, pre-eclampsia, chronic hypertension, foetal growth restriction. Primigravida, increased pre-pregnant weight, decreased weight gain in pregnancy and white race are the other risk factors. There is an increase in still birth and neonatal death in this condition.

DELAYED MATURATION OF THE PLACENTA

Delayed maturation of the placenta is an infrequent finding. Major foetal malformations, maternal diabetes and erythroblastosis foetalis result in delayed maturation. There is an association of increased risk of still birth, neonatal death and mental retardation.

FOCAL / CYSTIC HYPOECHOIC LESIONS

These lesions are ubiquitous in a placenta beyond 25 weeks. Intervillous thrombosis, pervillous fibrin, decidual septal cyst, placental infarct and subchorionic fibrin deposition are associated with these lesions. Placental infarct is defined as an area of ischemic villous necrosis. It is due to the occlusion of one or more spiral arteries in the uterine wall. These occlusions are common with disorders that cause unevenly decreased uterine flow. Pre eclampsia, eclampsia and chronic hypertension are associated with this. One or two infarcts or even big infarcts at the margin of the placenta may not result in adverse outcome in a term pregnancy. The frequency of stillbirths, neonatal deaths and IUGR increases with the increase in the number and the size of infarcts, preterm deliveries, the presence of disorders like lupus, eclampsia, preeclampsia and chronic hypertension. Maternal floor infarcts also known as the massive basal plate fibrin deposition. Fibrin from the maternal blood is deposited in the basal plate in the inter-villous space.

0.1-0.5% of patient have this lesion.This lesion might interfere with the perfusion of the inter villous space and might result in serious outcomes like foetal death or foetal growth restriction. On ultrasound a discrete location near the basal plate is characteristic.

ANOMALIES OF THE PLACENTA[24]

- Lobed placenta
- Bidiscoidal
- Diffuse
- Succenturiate
- Fenestrated
- Cirumvallate

VARIATIONS IN UMBILICAL CORD INSERTION[25]

- Marginal
- Furcate
- Velamentous

PLACENTAL POSITION

A normal placenta is located on one placental surface and extends to the adjacent surface minimally.

ANTERIOR PLACENTA :

The placenta is located predominantly in the anterior wall and extends to the lateral wall or fundus minimally.

POSTERIOR PLACENTA :

The placenta is located mainly in the posterior wall and extends to the lateral wall or fundus minimally.

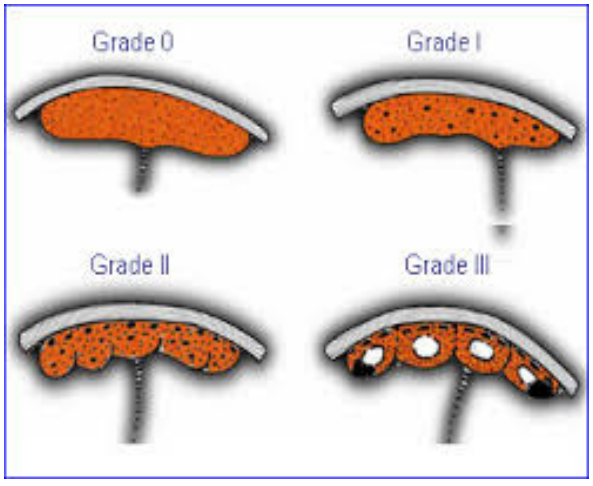
FUNDAL PLACENTA:

The placenta is located predominantly in the fundus and extends to anterior and posterior surface minimally.

LATERAL PLACENTA:

The placenta is located in the lateral wall and extends equally to the anterior and posterior walls.

FIG 8 : GRADING OF A PLACENTA



Grannum[26] et al has graded placenta based on calcifications and indentations.

Grade 0 - Late first trimester to early second trimester.

Smooth echo pattern of the placental parenchyma; no calcifications in basal plate, chorionic plate; no indentations in chorionic plate.

Grade 1 : 18 to 29 weeks:

Small diffuse calcifications of 2 - 4 mm distributed randomly in the placenta; subtle indentations in the chorionic plate.

Grade 2 : 30 weeks till 38 weeks

Dot dash calcifications along the basal plate parallel to the long axis of the basal plate; larger indentations of the chorionic plate not reaching basal plate.

Grade 3 : 39 weeks to term

Irregular calcifications with significant shadowing; marked indentations in the chorionic plate up to the basal plate resulting in cotyledons.

Though the placental grading cannot replace amniocentesis in assessing foetal maturity, it can be used as a predictive marker of neonatal outcome.

Most reproductive biologists believe that many adverse pregnancy outcomes like foetal growth restriction, still birth, preeclampsia are due to abnormal trophoblastic invasion and placental implantation which are largely completed by the end of first trimester.

Barker [27]et al states that placental development is related to long-term health consequences of the newborn and even into adulthood. Birth weight and placental insufficiency are important risk factors for the later development of metabolic syndrome. Thame[28]et al states that placental abnormalities precede abnormalities in foetal growth.

PATTERN OF GROWTH OF A NORMAL PLACENTA

The placenta grows by multiplication and ramification of the chorionic villi .The quantum of growth could be assessed by measuring the placental thickness or by volumetric assay[29]. But the problem with volumetric assay is that it is too tedious to be done on a regular basis.

The placenta grows throughout the pregnancy, the initial growth superseding the foetal growth [30]and later on plateaus as the foetus reaches term. Hence the growth rate of the placenta is directly proportional to the foetal growth rate[31] in early gestation. Later on, the ratio of foetal weight to placental weight [32] increases.

PATTERN OF CELLULAR GROWTH

The RNA and proteins continue to rise till term whereas the DNA increases rapidly initially to a rapid decline at term. Initially hyperplasia of cells predominates while later on only cellular hypertrophy occurs[33].

ABNORMAL PLACENTAL GROWTH

There are great variations in placental size. The variation may be due to a genetic aetiology. Scientists have observed that the genes involved in foetal growth and placental growth are different. Jauniax[34] et al states that there exists a correlation between placental volume and perinatal outcome.

SMALL PLACENTA

Small placenta does have clinical significance. It can be associated with low maternal plasma volume expansion with compromised utero placental circulation. Women with such a small placenta may be harbouring a growth restricted foetus (may be due to preeclampsia and chronic hypertension). Small placenta can be associated with still birth, mental retardation at 7 yrs of age and foetal malformations.

Hence a postulate that the small placenta was functionally inadequate to supply nutrients to the foetus should be entertained. Thin placenta less than 2.5 cm thickness is seen in association with foetal

growth restriction, small for dates, preterm, foetal malformations, foetal trisomy especially trisomy 18 , maternal and foetal high haemoglobin[35], digynictriploidy, low parity, maternal pregestational diabetes, chronic intrauterine infections, gestational hypertension and placenta membranaceae.

LARGE PLACENTA

A thick placenta>4 cm has been associated with maternal diabetes mellitus, hydropsfoetalis (both immune and nonimmune), intrauterine infections, foetal macrosomia and Beckwith -Weidmann syndrome. At times it can occur as a normal variation. At times, an isoechoic abruption can mimic a thick placenta. Large placenta are commonly seen in severe maternal and foetal anaemia, congenital syphilis, villous oedema, large intravillous thrombi, subchorionic haemorrhage.

Rarely congenital foetal nephrosis, toxoplasmosis, idiopathic foetal hydrops and placental chorioangioma result in a thick placenta. Villous oedema in a preterm placenta makes it thick. The villus oedema when diffuse creates a hypoxic environment to the foetus resulting in poor APGAR score at birth, difficult resuscitation, prolonged hospitalisation, respiratory distress, greater neonatal morbidity and mortality and long term neurological sequelae. The aetiology of villous oedema is nothing but an altered osmotic pressure versus hydrostatic pressure gradient.

Villous hyperplasia occurs in maternal anaemia , foetal anaemia and gestational diabetes resulting in thicker placenta .Dombrowski[36] et al reports a higher incidence of abruption , NICU admissions , congenital anomalies in a thick placenta .

The cornerstone of foetal imaging in foetal hydrops is ultrasound. The cardinal signs are skin oedema >5 mm, polyhydramnios, fluid in serosal cavity and a thick placenta. 30-75 % of hydrops foetalis are associated with polyhydramnios and thick placenta >6 cm .Tongsong[37] et al states that increasing placental thickness at mid pregnancy could be used to predict Hb Bart disease .Placental thickness varying from 4-17 mm is an early sign of the disease. On histopathology[38] the placenta showed ground glass appearance, absence of chorionic plate and buckling of chorionic plate.

A major pitfall is that the small area of placental attachment to the maternal surface appears thickened. This artefact is usually avoided by scanning the whole 360˚of the placenta.

ULTRASOUND IN DATING

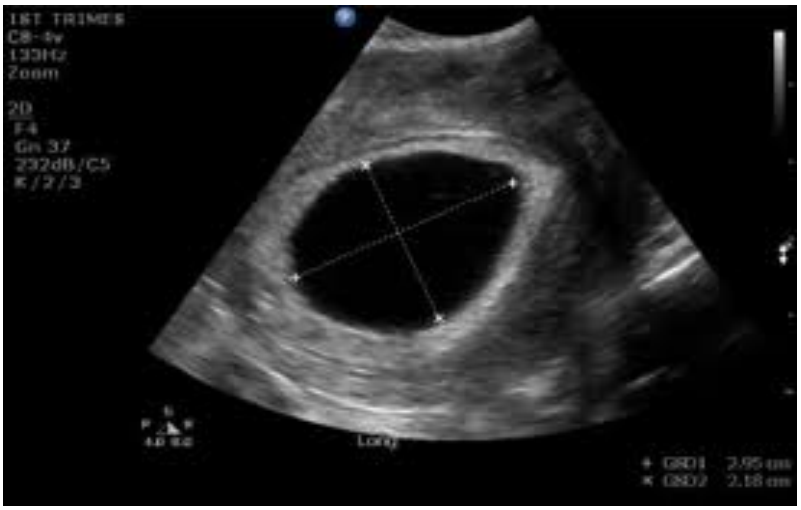
The role of ultrasound in Obstetrics is immense. It has evolved from the 2 D sonogram to the foetal doppler, doppler of maternal circulation to the 3 D sonogram of intrinsic foetal anatomy. A

meticulously performed ultrasound provides enormous details of foetal anatomy, foetal environment, foetal growth and foetal wellbeing with no obvious biological hazards. Assessment of gestational age by LMP is erroneous by 20 - 40 % due to the following reasons like irregular menstrual cycles, ovulation, implantation bleeding.

Pelvic examination is also unreliable contributing to greater morbidity like ARDS, prematurity, prolonged pregnancy. Hence the role of ultrasound in dating is undebatable.

1) GESTATIONAL SAC

FIG 9 : SONOLOGICALVIEW OF A GESTATIONAL SAC



G.sac is measured from the fifth to eleventh week of gestation. It is first seen in the uterus at fifth menstrual week and its diameter increases

at the rate of 5 - 11 mm per week and reaches a size of 5 - 6 cm at 10 weeks.

Mean sac diameter (mm) + 30 = Gestational age in days

Gest sac volume = 0.55 × 0.33 × D_1 × D_2 × D_3

Where D_1, D_2, D_3 represent the transverse, anteroposterior and longitudinal diameters of the sac.

Mean gestational sac diameter can also be calculated as a mean of three inner wall margins to inner wall margins in three horizontal diameters in three planes perpendicular to each other. It is a good marker prior to the appearance of the embryo within the sac with a margin of ± 5 days.

Nyberg et al (1985) concluded that between 5 - 11 weeks of gestation , gestational age in days can be calculated by adding 30 to the MSD (mm).

Nyberg et al reported that between 5 - 11 weeks, the MSD increased at a rate of 1.13 mm / day .Two cross- sectional study also reported a growth rate of 0.96 mm / day and 1 mm / day. A small longitudinal study showed a growth rate of 1.2 mm / day.

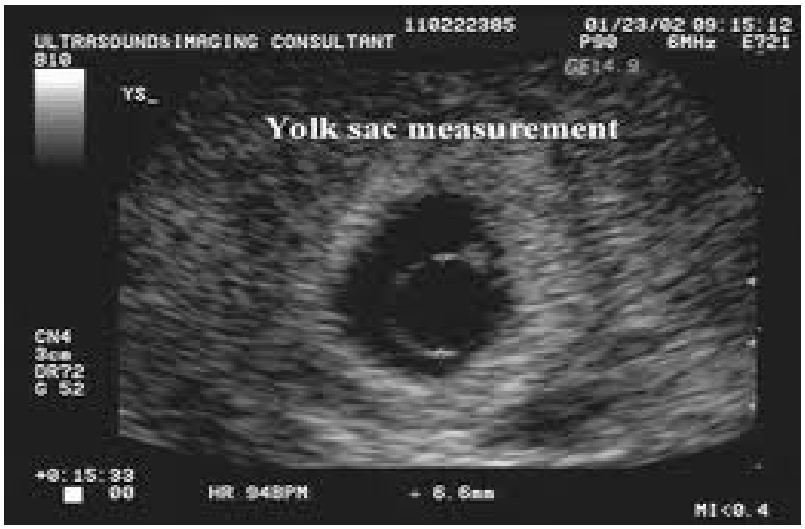
De crispigny et al (1988) concluded that at 4 weeks 3 days, the MSD is 2 - 3 mm and MSD is 5 mm at 5 weeks.

When the yolk sac becomes 20 mm in diameter the yolk sac is visible. At 5.5 weeks the yolk sac has no embryo / cardiac activity. At 6 weeks the cardiac activity becomes demonstrable, but the CRL is too small.

As the pregnancy advances, MSD becomes progressively unreliable. Once the embryo is visualised, CRL becomes the method of choice between 6 - 12 weeks.

2) YOLK SAC DIAMETER

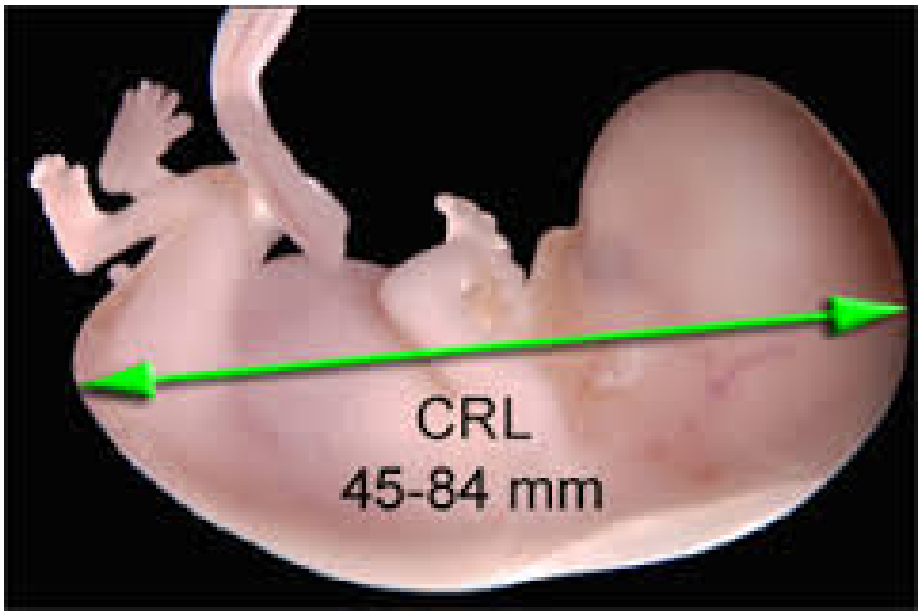
FIG 10: SONOLOGY OF A YOLK SAC



Some scientists have utilised yolk sac to calculate gestational age, but its reliability is debatable.

3) CROWN RUMP LENGTH

FIG 11 : CRL IN A SONOGRAM



Robinson (1973) introduced the concept of measuring the gestational age by a sonographic measurement, the CRL.

Hadlock and Frank predicted that between 6-14 weeks of gestation, the 95 % confidence limit of predicting CRL was 15 days.

In 1976, Drumm et al reported the validity of CRL in gestational age calculation and he confirmed the hypothesis by Basal Body Temperature calculation. In the year 1977, Drumm et al reported that

CRL was superior to BPD in gestational age calculations in the prediction of the spontaneous onset of labour.

In 1979, Adam et al also confirmed the accuracy of the technique. Selbing and Pederson used static image scanners to confirm the validity of the technique. Hence CRL is now regarded as the standard of imaging in dating.

Mac Gregor et al said that traditional CRL charts underestimate gestational age in patients who conceived after infertility treatment and in patients who knew their date of conception. He also challenged the uniform accuracy of ± 5 days in dating. He speculated that the accuracy in dating decreases as the pregnancy advances in the first trimester.

In conclusion, the most accurate gestational age assessment is obtained at 31 - 40 mm equivalent to 10 - 11 weeks. Beyond 11weeks, the subtle changes in foetal flexion alter the linearly measured CRL. Moreover increasing foetal movements also hamper accurate CRL measurements. Before 10 weeks, CRL is too small and the yolk sac which measures 3-5 mm located adjacent to the embryo could lead to the erroneous interpretation of the foetal head and the addition of the yolk sac over estimates the CRL. Only when the greatest longitudinal

measurement measures 18 - 22 mm , it is considered to be a true CRL.

After 35 - 40 mm , the increasing flexion of the embryo and the easily visualised BPD results in a switch over from CRL to BPD.

It can be summarised that CRL when utilised between 6 to12 weeks can predict gestational age with an accuracy of ± 3days. Gestational age calculations using CRL is almost equivalent to ovulation studies and embryo transfer studies.

4) BIPARIETAL DIAMETER

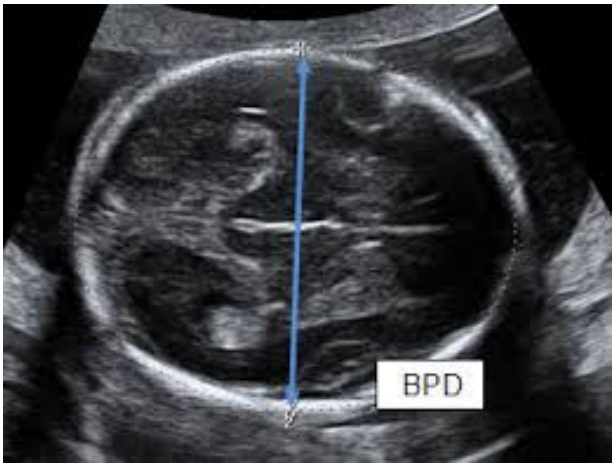


FIG 12 : BPD IN A SONOGRAM

In 1959, Ian Donald introduced BPD measurement by pulsed Doppler. Willocks et al (1974) postulated that BPD correlated with birth weight of the baby. In 1978, Willocks showed that BPD increased at the rate of 0.16 cm per week in the last 10 weeks of pregnancy but a decelerated increase or plateau is seen in pregnancies complicated by placental insufficiency and preeclampsia. Campbell (1969) proved that serial BPD measurements are invaluable in assessing foetal growth.

In 1974, Sabhagha et al proved that the third trimester BPD measurement predicted prematurity.

Subsequently, Sabhagha et al developed the GASA (Growth Adjusted Sonographic Age) by which gestational age can be calculated using BPD with an error of ± 3 weeks. By this time the practise of considering BPD as a single parameter in determining gestational age came into vogue. BPD shows a variability of ± 1 week less than 20 weeks and a variability of ±2 to ± 3 is seen beyond 20 weeks.

Foetal cranial diameters are the best in predicting gestational age from 14 weeks onwards. It is measured at the level of thalami and cavum septum pellucidum in an axial plane. It is measured transversely

at the widest area between the outer margin of the cranium to the inner margin of the cranium across the brain parenchyma.

BPD is greatly influenced by the shape of the head. It misleads gestational age assessment in brachycephalic and dolichocephalic heads. If the cephalic index is not between 70 - 85%, BPD is invalid as a biometric measurement.

Cephalic index is the ratio of the BPD to the occipitofrontal diameter. Occipitofrontal diameter is the anteroposterior diameter of cranium along the BPD plane measured from outer osseous to the outer osseous surface. Biparietal diameter is particularly invalid in circumstances like engaged head, moulded head in active labour, microcephaly, hydrocephalus, foetal growth restriction, moving foetus, occipitoposterior position, polyhydramnios, breech and transverse position.

BPD increase per week

13 - 20 weeks	-	3 to 4 mm
21 - 28 weeks	-	3 mm
29 - 32 weeks	-	2.3 mm
32 - term	-	2 mm

Although the reliability of BPD is debatable, it is comparable with a reliable last menstrual period in prediction of gestational age. Since the role of BPD as a single parameter is questionable, sonologists utilise multiple parameters like HC, AC, FL in estimating gestational age.

5) HEAD CIRCUMFERENCE

HC is more predictable than BPD at term whereas it is less predictable in gestational age assessment less than 26 weeks. HC = (BPD + Occipitofrontal diameter) ×1.62

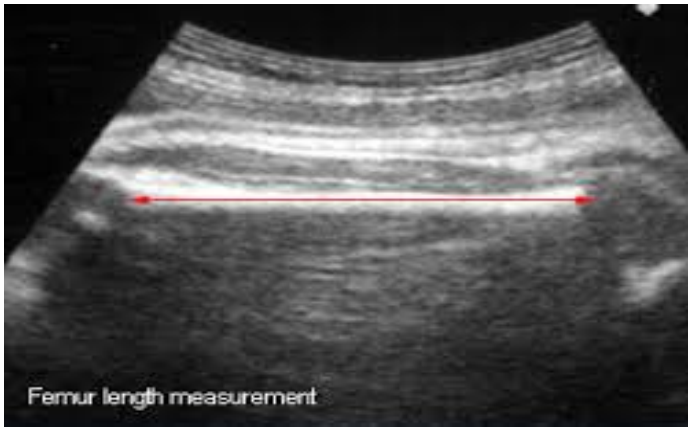
6) ABDOMINAL CIRCUMFERENCE

Campbell and Willkins (1975) reported the ultrasound measurement of the abdominal circumference. Higginbotham et al predicted the utilisation of Abdominal Circumference in estimating foetal weight. Campbell and Thorns (1977) said that abdominal circumference is invaluable in predicting foetal growth and foetal growth restriction.

Hadlock et al in 1982 said that AC is inferior to BPD in gestational age assessment. This is measured in a transverse section of the abdomen at the level of umbilical part of the foetal brain. Except during 36 - 42 weeks, its role as a single parameter in gestational age is obsolete.

7) FEMUR LENGTH

FIG 13 : SONOLOGY OF FL



Queenan et al was the first to measure the femur length (1980) and the other long bones. He showed that there is a linear increase in FL between 18 - 22 weeks. O'Brien et al and Hadlock et al reported similar findings. Yeh la et al (1982) showed that FL is superior to BPD in gestational age measurement.

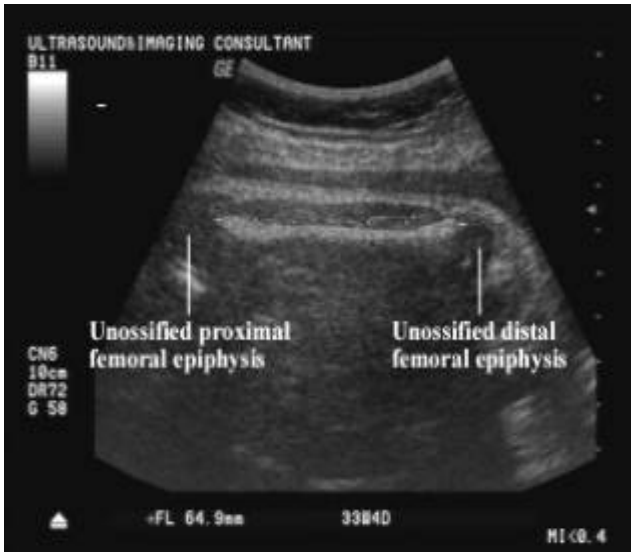
This is measured as the total length of the bone excluding the cartilaginous part at the proximal end. The bone is visualised perpendicular to the ultrasound beam. At term it ranges between 7.4 to cm.

Femur length measurement is particularly unreliable in conditions that affect the skeletal system like osteogenesis imperfecta.

Underestimation of FL can occur due to oblique imaging. Overestimation can occur if cartilaginous epiphysis is included in measurement.

8) DISTAL FEMORAL EPIPHYSIS

FIG 14 : DISTAL FEMORAL EPIPHYSIS



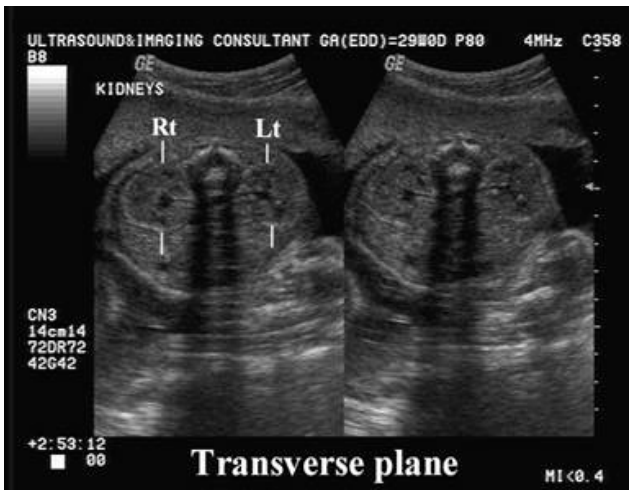
This is measured along its longest axis and measured in a plane so that it also causes acoustic shadowing.

35 weeks	-	1 mm
36 weeks	-	2 mm
37 weeks	-	3 mm
38 weeks and 3 days	-	4 mm
40 weeks	-	5 mm

The disadvantage is that it can be used only during the later weeks of pregnancy.

9) FOETAL KIDNEYS

FIG 15 : SONOLOGY OF FOETAL KIDNEYS

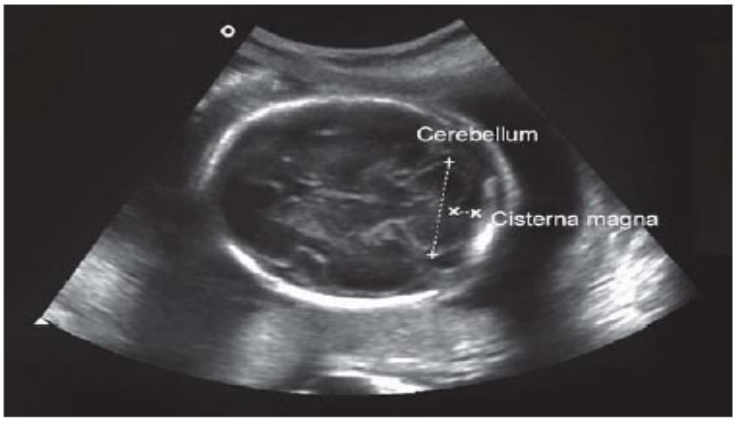


After 17 weeks, 90 % of the foetal kidneys are imaged. 2 weeks later the kidneys are easily visible owing to the increased echogenicity of the perinephric fat.

MENSTRUAL AGE (weeks) = Kidney Length (mm) = 2 × AP Diameter in mm.

10) TRANSVERSE CEREBELLAR DIAMETER

FIG 16 : ULTRASOUND OF TRANSVERSE CEREBELLAR DIAMETER



This is the widest measurement of the cerebellum in an axial section of the brain such that it often shows the nuchal skin. Serial measurements in later trimesters add value to the other biometric parameters in gestational age assessment. It is the last parameter to be affected in foetal growth disorders.

Because no individual measurement is accurate in predicting gestational age, the utilisation of the multiple growth parameters was introduced. Hadlock postulated that multiple parameters should be used to calculate the composite gestational age due to the following reasons :

1) The magnitude of error in age prediction is greater when using one parameter in estimating gestational age.
2) Normal foetuses show measurements that are above or below the mean value for each measurement at a particular gestational age.
3) The process of plane selection for measuring HC, AC, FL necessitates a detailed review of the important anatomic structures that might help to identify any anatomical abnormality of that foetal part.

The limitations of the multiple growth parameters are :

1. Foetal dating by multiple growth parameters exaggerate the age estimation in symmetrically large foetus and underestimate the gestational age in symmetrically small foetus.
2. The major problem in a composite dating is that when a single parameter is abnormal due to some pathology in the foetus the result may be biased. Few examples of such abnormalities are head circumference in a hydrocephalus, femur length in a dwarf, abdominal circumference in pathological foetal growth restriction and ascites in macrosomia. Due to all these fallacies in the present system of dating, the search for a single effective parameter continues.

11) PLACENTAL VOLUME, PLACENTAL AREA

Few studies are available. But none of them have been utilised for dating.

12) POSTNATAL GESTATIONAL AGE EVALUATION

Fair et al introduced this concept in 1966. He was the first to familiarise the concept of gestational age assessment in the neonate in addition to neonatal weight. Following his footsteps, many authors described various scoring systems, but it was the Dudowitz scoring system (1970) which was widely used. In 1979, Ballard et al developed a modified system which incorporated the good features of many scoring systems. Because the Ballard's scoring system was simple, less time consuming and precise with an error of 2 - 3 days, this is widely used till 1991. After 1991, a revised, modified version of the Ballard's scoring was developed to include the extremely premature infants who were not included in the previous scoring system. Wariyar et al in 1997 concluded that the even the best of the neonatal assessment like the Ballard's scoring has an error of 50% as compared to the antenatal assessment. He also reported that the neonatal assessment overestimates the gestational age of the baby. A final conclusion was derived which highlighted that sonographic age assessment is much better than the neonatal assessment.

13) PLACENTAL THICKNESS

Placental dysfunction is the aetiology of a variety of commonly encountered obstetric problems as reported by Schwartz et al. The in utero environment and its intimate inter play with the neonatal outcome have a great role in the adult health as reported by Salafia et al 2005. Most reproductive biologists believe that foetal growth restriction , still birth and pre eclampsia are the aftermath of subnormal trophoblastic invasion and placental implantation which is almost predestined at the end of first trimester . Recent studies by Kim et al also states that altered early placental invasion also results in spontaneous preterm birth. Barker's hypothesis states that placental dysfunction and low birth weight are the precursors of the adult onset metabolic syndrome. Since the placenta has a close link with both the mother and the placenta, placental thickness measurement could serve a mirror of the foetal and maternal health. Placental thickness measurement at the level of umbilical cord insertion is quite simple. Few authors postulate the role of placental thickness as an additional parameter in gestational age assessment and placental thickness nomograms have been published.

RELATED ARTICLES

The various measures of the placenta like placental volume, placental thickness and placental area have been described by various authors.

1. Hoddick (1985)[39] et al eluded that placental thickness in mm corresponds to the gestational age in weeks. He also concluded that in a normal pregnancy, the placental thickness was never beyond 4 cm at any stage of gestation.
2. Nyberg and Finberg[40] also stated that placental thickness (mm) parallels gestational thickness (weeks).
3. Mittal (2002) and Hooja[41]also noted an increasing trend in

   placental thickness with advancing gestation .
4. Anupama Jain (2001)[42] et al also reported similar findings. The postulate was that the placental thickness (mm) coincides exactly with gestation between 28 to 33 weeks of gestation.
5. The eratonsong (2004) et al established a placental thickness nomogram for the first half of pregnancy (8 - 20 weeks).
6. The linear relationship between the placental thickness and gestational age was also proved.

7. Tanawattancharoen[43] et al reported that placental thickness varies little between 18 - 41 weeks.
8. Jauniax et al and Hellman[44] also reported a correlation between placental size and gestational age.
9. Gosh[45] et al utilised the placental thickness measurement to identify pregnancies afflicted with homozygous alpha 1 thalassemia.
10. Bleker[46] et al(1997) have shown that there is a linear increase in surface area of placenta.
11. Habib[47] et al FA (2002) analysed placental thickness and diameter at 36 weeks of gestation in his study on 70 singleton pregnancies and reported that a placental diameter cut-off of 18 cm and placental thickness of 20 mm could predict low birth weight. He also concluded that placental thickness could predict the occurrence of FGR.
12. Mohammed Haneef[48] et al (2005) analysed 100 singleton pregnancies beyond 12 weeks and said that placental thickness increased from 18 mm at 12 weeks to 39 mm at 40 weeks.
13. Durnwald et al [49] (Dec 2004) studied 167 singleton pregnancies and the increasing trend of placental thickness with advancing gestational age and the differential thickness with the implantation site. He concluded that the posterior

and fundal placenta were thicker than the anterior placenta in the second and third trimesters .

14. Elchalal U (2002)[50] et al established that sonologically thick placenta is associated with foetal anomalies, SGA, LGA and increased perinatal morbidity.
15. Grannum et al reported that there is a linear increase in the growth of the placenta till 33 weeks of gestation after which the placenta.
16. Ohagwu et al (2009) analysed 666 nigerian mothers and reported an increase in placental thickness with advancing gestation. The mean placental thickness of 45.09 ± 6.37 mm was recorded as the maximum at 39 week of gestation.
17. Berkowitz et al reported that there was a gradual decrease in the size of the placenta from 32 weeks of gestation.
18. Tul and Eva K.Pressman also reported that the placental thickness increased with gestational age.
19. Hoogland et al (1980) measured the area of the placenta of an early pregnancy and correlated it with infant birth weight.
20. Ilaffner et al (1998) concluded that placental volume alone is inadequate to identify a small for gestational age foetus.

MATERIALS AND METHODS

SOURCE OF THE STUDY :

The study include 450 antenatal women attending antenatal OP in the Department of Obstetrics and Gynaecology, Tirunelveli Medical College Hospital between the study period of 1st May 2013 to 1 st May 2014. The dissertation is a study on the placental thickness and analyses the same.

INCLUSION CRITERIA

Normal antenatal women in all gestational ages between 14 - 40 weeks were included in the study with

- A known LMP
- Singleton uncomplicated pregnancy

EXCLUSION CRITERIA

1) Pregnancies complicated with PIH, diabetes, twins, hydrops, foetal growth restriction and congenital anomalies.
2) Placenta with morphological variations like bilobed placenta, succenturiate placenta, circumvallate placenta and placenta membranaceae are excluded.
3) Placenta with variable cord insertions like marginal or battledore placenta, velamentous placenta is excluded.

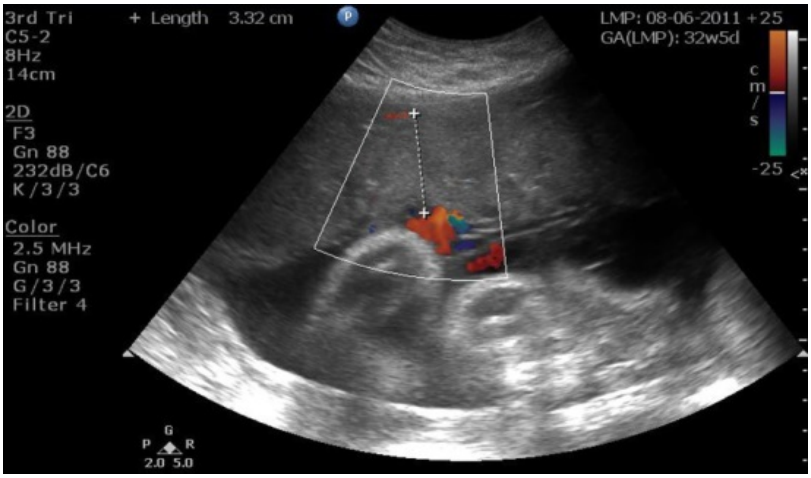
4) Placenta with poor visualisation of cord insertion is excluded.
5) Placenta with poor ultrasonographic visualisation were excluded
6) Poor visualisation may be due to maternal obesity, posterior shadowing by foetal parts in late third trimesters.
7) Pregnancies complicated by vaginal bleeding both in the early and late pregnancy.
8) Pregnancies complicated by anaemia, cardiac disorders, uterine anomalies.

TIMING OF THE STUDY:

The study was performed between 13 - 40 weeks of gestation. The study was performed in the department ultrasound room.

TECHNIQUE OF MEASURING PLACENTAL THICKNESS

FIG 17 : MEASURING PLACENTAL THICKNESS



All the antenatal women were subjected to sonogram using the Larson and Turbo Sequina model with a convex probe with a frequency of 2-5 M Hz.

The placenta was scanned with a moderately distended bladder in supine position. The transducer is placed on the abdomen after applying coupling agent perpendicular to both chorionic and basal plate as a tangential measurement would distort the placental thickness. The placental thickness in mm is measured at the cord insertion site. All these measurements were done by a single examiner to rule out inter observer bias. All the patients were explained before the examination. Consent was obtained as per PNDT act. While measurement of the placental thickness care was taken to avoid the myometrium and the retro placental complex.

CORD INSERTION SITE :

The site is usually central but slightly eccentric insertion is acceptable. Placental thickness is calculated from the echogenic chorionic plate and the placental myometrial interface. The myometrium and subplacental veins are excluded from the measurement. All measurements were taken in a relaxed uterus since a uterine contraction would cause spurious thickening of the placenta.

The thickness increases due to increase in intervillous space due to maternal blood. Placental length and surface also increase due to increase inintervillous space. Placental thickness also depends on foetal blood, maternal blood and placental size.

PLACENTAL MYOMETRIAL INTERFACE :

Correct identification of the placental myometrial interface is required for accurate measurement of the placental thickness. Focal myometrial thickening due myoma or contractions may spuriously suggest placental thickening but attention to the placental myometrial echogenicity difference should see to that the placenta drapes over the regions of myometrial thickening.

CALCULATION OF GESTATIONAL AGE

The gestational age was calculated using Hadlock tables using regression equations using multiple combinations of variables like HC, AC, FL, BPD (computer software package).

RESULTS AND ANALYSIS

The study subjects namely the pregnant women were described the categorical variable in term of percentages and the continuous variables had been described in terms of averages. The relationship between variables were analysed and interpreted by Students t test for two groups

of variables and ANOVA for more than two groups of variables. The associations between the attributes were identified by χ^2 (Chi-square). Regression equations were developed to estimate the gestational ages and other parameters through placental thickness as an estimator. The statistical package IBM SPSS statistics- 20 was used for above statistical purposes. The p- values <0.05.

(P<0.05) were considered as statistically significant in tow tailed.

RESULTS & ANALYSIS

Description of the study subjects:

The study subjects were described according to their age and parity.

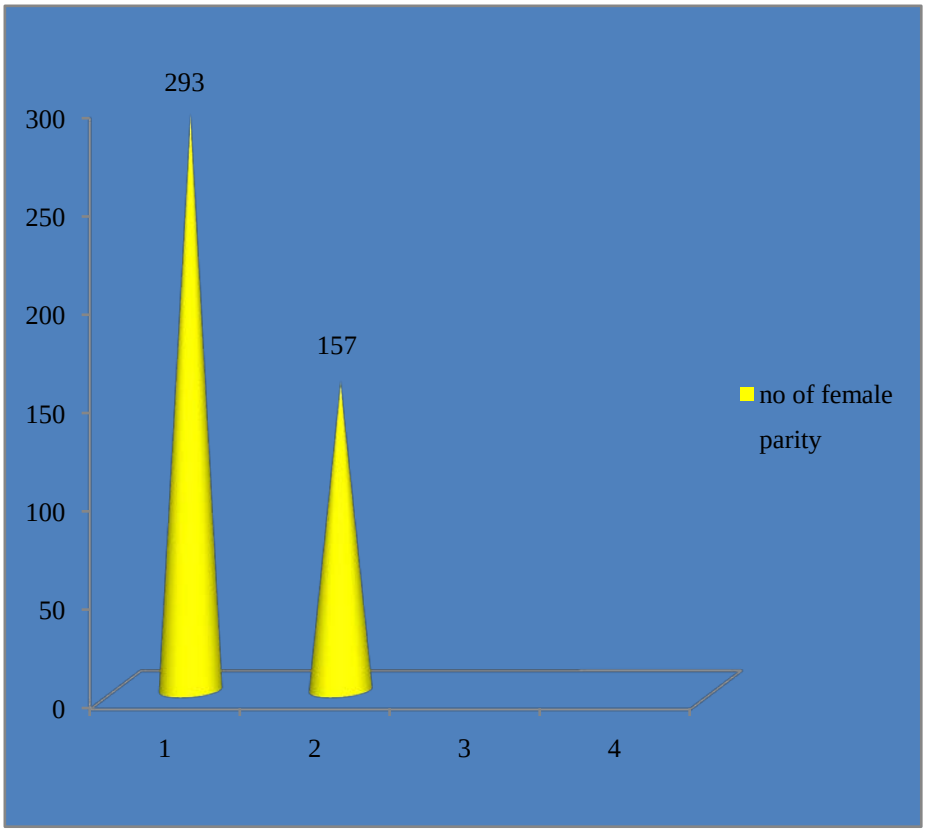
Table-1: Age wise percentage distribution of parity:

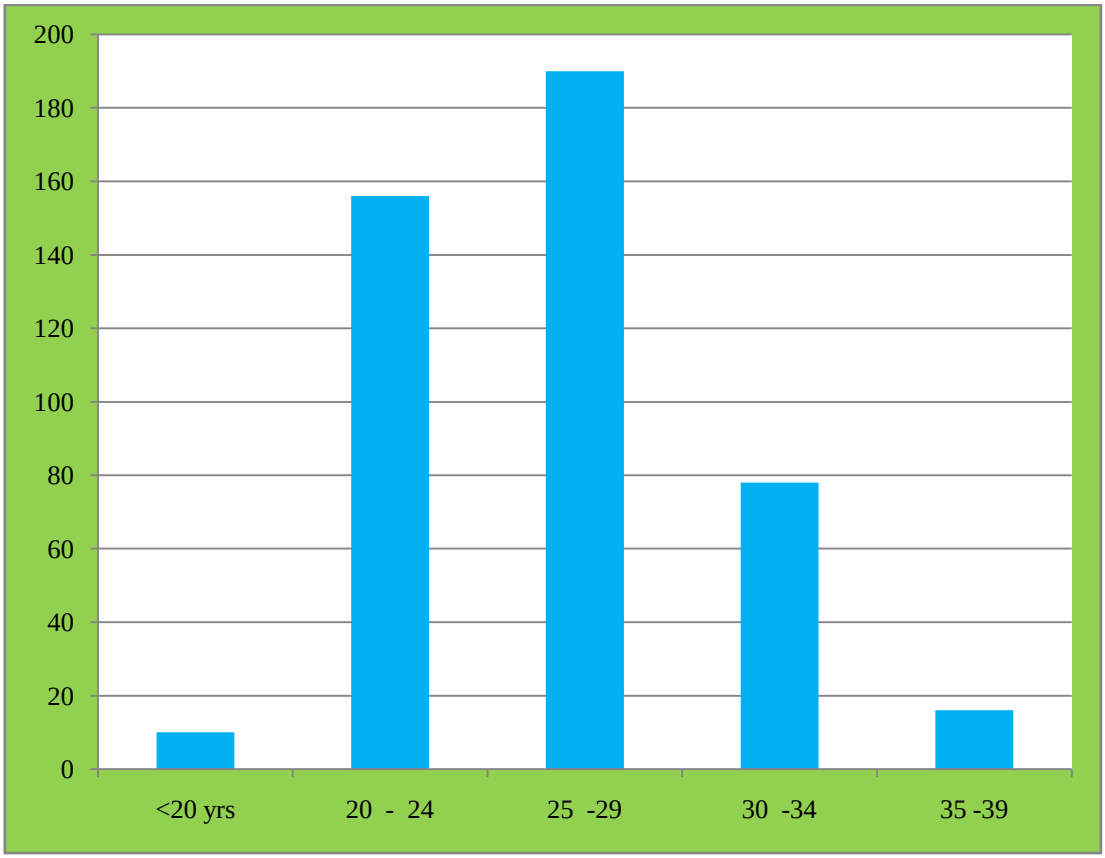
Age group	Primi		Multi		Total	
	No	%	No	%	No	%
<20	6	2.0	4	2.5	10	2.2
20-24	103	35.2	53	33.8	156	34.7
25-29	125	42.7	65	41.4	190	42.2
30-34	52	17.7	26	16.6	78	17.3
35-39	7	2.4	9	5.7	16	3.6
Total	293	100.0	157	100.0	450	100.0

The table-1 describes percentage distribution of the age and parity of mothers. Among the 450 mothers 293 (65.1%) were primipara. The multi para mothers were 157 (34.9%). Among the 450 mothers 10 (2.2) were teen age. The 20-24 age bracket mothers were 156 (34.7%). Majority of 190 (42.2) mothers were in 25-29 ages. The 30-34 age group mothers were 78 (17.3%). The 35-39 age group mothers were 16(3.6%).The study group primi includes the mothers with a prior history of abortion with no live children.

Fig 18 : GRAPHICAL REPRESENTATION OF PARITY

1 – PRIMI , 2 – MULTI, Y AXIS - NO OF FEMALES





X AXIS - AGE OF MOTHERS

Y AXIS - NO OF MOTHERS

FIG 19 : GRAPHICAL REPRESENTATION OF AGE GROUP

Table-2: Comparison of age between parity of mothers.

Parity	Number	Age		Difference b/w means	t	Df	Significance
		Mean	SD				
Primi	293	26.1	3.9	0.3	0.809	498	P=0.419
Multi	157	26.4	4.3				
Total	450	26.2	4.1				

The above table-2 compares the mean ages between the parity groups. The mean ages of Primi and Multi were 26.1±3.9 years, and 26.4±4.3 years respectively. The difference between them was not statistically significant (P>0.05). The mean age of total mothers was 26.2±4.1 years.

Table-3: Comparison of BPD between parity:

Parity	Number	BPD		Difference b/w means	t	Df	Significance
		Mean	SD				
Primi	293	67.5	19.6	0.6	0.306	448	P=0.760
Multi	157	68.1	19.0				
Total	450	67.7	19.4				

The above table-3 compares the mean BPDs between the parity groups. The mean BPD of Primi and Multi were 67.5±19.0 mm and 68.1±19.0mm respectively. The difference between them was not statistically significant (P>0.05). The mean BPD of total mothers was 67.7±19.4 mm.

Table-4: Comparison of FL between parity:

Parity	Number	FL		Difference b/w means	t	df	Significance
		Mean	SD				
Primi	293	51.1	17.9	1.0	0.562	448	P=0.575
Multi	157	52.1	17.5				
Total	450	51.4	17.7				

The above table-4 compares the mean FLs between the parity groups. The mean FL of Primi and Multi were 51.1±17.9 mm and 52.2±17.5mm respectively. The difference between them was not statistically significant (P>0.05). The mean FL of total mothers was 51.4±17.7 mm.

Table-5: Comparison of AC between parity:

Parity	Number	AC		Difference b/w means	t	Df	Significance
		Mean	SD				
Primi	293	236.5	78.9	2.9	0.371	448	P=0.711
Multi	157	239.4	77.5				
Total	450	237.5	78.3				

The above table-5compares the mean ACs between the parity groups. The mean AC of primi and Multi were 236.5±78.9 mm and 239.4±77.5mm respectively.The difference between them was not statistically significant (P>0.05). The mean AC of total mothers was 237.5±78.3 mm.

Table-6: Comparison of HC between parity

Parity	Number	HC		Difference b/w means	t	Df	Significance
		Mean	SD				
Primi	293	250.1	69.7	2.3	0.333	448	P=0.739
Multi	157	252.4	68.2				
Total	450	250.9	69.1				

The above table-6 compares the mean HCs between the parity groups. The mean HC of Primi and Multi were 250.1±69.7 mm and 252.4±68.2mm respectively. The difference between them was not statistically significant (P>0.05). The mean HC of total mothers was 250.9±69.1mm.

Relationship between estimates with estimator:

The estimates such as age, parity, gestational ages, estimated weight of fetus, placental position and AFI were related with the estimator placental thickness.

Table-7: Relation between age of mother with placental thickness:

Sl. No	Age group (years)	Number	Pla. Thickness		ANOVA F	Significance	Comparison of significance
			Mean	SD			
1	<20	10	28.0	7.4	0.301	P=0.877	Nil
2	20-24	156	29.1	7.3			
3	25-29	190	28.4	7.5			
4	30-34	78	29.1	8.0			
5	35-39	16	28.1	7.6			
	Total	450	28.7	7.5			

Table-7 states the relation between age and placental thickness. But there was no statistically significant relationship between them(P>0.05).

Table-8: Relation between parity of mother with placental thickness:

Sl. No	Parity	Number	Pla. Thickness		Difference b/w means	t	df	Significance
			Mean	SD				
1	Primi	293	28.6	7.5	0.4	0.492	448	P=0.623
2	Multi	157	29.0	7.5				
	Total	450	28.7	7.5				

Table-8 states the relation between parity and placental thickness. But there was no statistically significant relationship between them (P>0.05).

Table-9: Relation between LMP GA of fetus with BPD:

Sl. No	LMP GA Trimester	n	BPD		ANOVA 'F'	Significance	Comparison of significance
			Mean	SD			
1	Early II	7	20.8	1.3	912.844	P<0.001	1&2= S* 1&3= S* 2&3= S*
2	II	188	49.3	9.4			
3	III	255	82.5	8.1			
	Total	450	67.7	19.4			

Table-9 states the relation between LMP GA of fetus with BPD. The trimester increases the BPD was also increasing. The increase of BPD was statistically very highly significant (P<0.001). In this study, Early second trimester denotes 12 - 14 weeks.

Table-10: Relation between LMP GA of fetus with FL:

Sl. No	LMP GA Trimester	n	FL		ANOVA 'F'	Significance	Comparison of significance
			Mean	SD			
1	EARLY II	7	9.2	1.7	905.709	P<0.001	1&2= S* 1&3= S* 2&3= S*
2	II	188	34.5	8.5			
3	III	255	65.0	7.5			
	Total	450	51.4	17.7			

Table-10 states the relation between LMP GA of fetus with FL. The trimester increases the FL was also increasing. The increase of FL was statistically very highly significant (P<0.001).

Table-11: Relation between LMP GA of fetus with AC:

Sl. No	LMP GA Trimester	n	AC		ANOVA 'F'	Significance	Comparison of significance
			Mean	SD			
1	EARLY II	7	65.0	6.4	878.222	P<0.001	1&2= S* 1&3= S* 2&3= S*
2	II	188	162.3	34.3			
3	III	255	297.7	36.5			
	Total	450	237.5	78.3			

Table-11 states the relation between LMP GA of fetus with AC. The trimester increases the AC was also increasing. The increase of AC was statistically very highly significant (P<0.001).

Table-12: Relation between LMP GA of fetus with HC:

Sl. No	LMP GA Trimester	n	HC		ANOVA 'F'	Significance	Comparison of significance
			Mean	SD			
1	EARLY II	7	81.0	4.9	925.907	P<0.001	1&2= S* 1&3= S* 2&3= S*
2	II	188	185.3	34.8			
3	III	255	303.9	27.4			
	Total	450	250.9	69.1			

Table-12 states the relation between LMP GA of fetus with HC. The trimester increases the HC was also increasing. The increase of HC was statistically very highly significant (P<0.001).

Table-13: Relation between LMP GA of fetus with placental thickness

Sl. No	LMP GA Trimester	n	Pla. Thickness		ANOVA 'F'	Significance	Comparison of significance
			Mean	SD			
1	EARLY II	7	13.0	1.3	607.699	P<0.001	1&2= S* 1&3= S* 2&3= S*
2	II	188	21.8	3.4			
3	III	255	34.3	4.5			
	Total	450	28.7	7.5			

*Significant.

Table-13 states the relations between the LMP gestational ages of fetus with placental thickness. The mean thicknesses of early second, II and III trimesters were 13.0±1.3 mm, 21.8±3.4 mm and 34.8±4.5 mm respectively. The differences between the trimesters were statistically very highly significant (P<0.001).

Table-14: Relation between USG GA of fetus with placental thickness

Sl. No	USG GA Trimester	n	Pla. Thickness		ANOVA 'F'	Significance	Comparison of significance
			Mean	SD			
1	EARLY II	12	13.6	1.4	748.945	P<0.001	1&2= S* 1&3= S* 2&3= S*
2	II	195	22.3	3.4			
3	III	243	37.7	3.9			
	Total	450	28.7	7.5			

*Significant.

Table-14 states the relations between the USG gestational ages of fetus with placental thickness. The mean thicknesses of early second, II and III trimesters were 13.6 ± 1.4 mm, 22.3 ± 3.4 mm and 37.7 ± 3.9 mm respectively. The differences between the trimesters were statistically very highly significant (P<0.001).

Table-15: Relation between estimated weights of fetus with placental thickness

Sl. No	Estimated weight	N	Pla. Thickness		ANOVA F	Significance	Comparison of significance
			Mean	SD			
1	<500	128	19.8	2.8	582.766	P<0.001	Sl No 1to 7 All are significant
2	500-1000	79	25.0	2.8			
3	1000-1500	39	29.5	1.9			
4	1500-2000	45	32.0	2.2			
5	2000-2500	68	34.9	1.6			
6	2500-3000	65	37.4	2.6			
7	3000-3500	26	39.8	2.6			
	Total	450	28.7	7.5			

The table-15 shows the relationship between estimated mean fetal weights with placental thickness. The relationship between the mean placental thicknesses and the estimated weight of foetus were statistically very highly significant (P<0.001).

Table-16: Relation between AFI with placental thickness:

Sl. No	AFI (cm)	Number	Pla. Thickness		ANOVA F	Significance	Comparison of significance
			Mean	SD			
1	5-10	51	34.7	4.0	13.294	P<0.001	1&2=S*
2	10-15	343	27.9	7.6			1&3=S*
3	15-20	51	28.5	7.3			1&4=NS**
4	20-25	5	30.0	6.7			2&3=NS**
	Total	450	28.7	7.5			2&4=NS** 3&4=NS**

*Significant, **Not significant.

The table-16 states the relation between AFI with placental thickness. The mean placental thickness of 5-10 cm of AFI was statistically significant (P<0.001) with 10-15 and 15-20 cm of AFI. The other categories mean placental thickness did not differ significantly between them (P>0.05).

Table-17: Relation between Placental position with placental thickness

Sl. No	Placental position	N	Pla. Thickness		ANOVA F	Significance	Comparison of significance
			Mean	SD			
1	Anterior	175	28.7	4.0	17.221	P<0.001	1&2=NS** 1&3=NS** 1&4=S* 2&3=NS** 2&4=S* 3&4=S*
2	Fundal	153	30.7	7.6			
3	Lateral	39	31.3	7.3			
4	Posterior	83	24.1	6.7			
	Total	450	28.7	7.5			

*Significant, **Not significant.

The table-17 states the relation between Placental position with placental thickness. The mean placental thickness of Anterior was not statistically significant (P>0.05) with fundal and lateral. The other categories mean placental thickness did not differ significantly between them (P>0.05).The mean placental thickness of posterior was statistically significant with anterior, fundal and lateral (P<0.05).The mean placental

thicknesses between fundal and lateral position was not statistically significant (P>0.05).

Table-18: Association between Parity and Placental thickness:

Parity	Placental thickness					χ^2	df	Significance
	10-20	20-30	30-40	40-50	Total			
Primi	28	119	145	11	223	2.475	3	P=480
Multi	15	64	67	11	157			
Total	43	183	202	22	450			

The table 18 states the association between the parity and placental thickness. The result revealed that the association was not statistically significant (P>0.05).

Table-19: Association between Placental position and Placental thickness

Position	Placental thickness					χ^2	df	Significance
	10-20	20-30	30-40	40-50	Total			
Anterior	15	69	84	7	175	56.769	96	P<0.001
Fundal	9	52	79	13	153			
Lateral	1	12	26	0	39			
Posterior	18	50	13	2	83			
Total	43	183	202	22	450			

The table 19 states the association between the Placental position and placental thickness. The result revealed that the association was statistically significant (P<0.001).

Table- 20. LMP weeks with PLACENTAL THICKNESS and Estimated Foetal Weight

LMP GA Weeks	PLACENTAL THICKNESS			Estimated Foetal Weight	
	N	Mean	Std. Devi.	Mean	Std. Devi.
14.00	6	13.0	1.4	70. 7	9.8
15.00	5	14.6	1.3	89.2	7.4
16.00	6	15.3	1.4	101.8	21.3
17.00	1	15.0	.	108.0	.
17.50	1	17.0	.	143.0	.
18.00	3	19.3	2.1	150.3	28.9
18.50	1	18.0	.	162.0	.
19.00	15	19.7	2.1	248.0	49.3
19.50	1	21.0	.	299.0	.
20.00	19	20.3	1.4	309.3	58.8
20.50	7	21.0	1.3	359.1	79.8
21.00	7	19.9	1.1	326.3	31.6
21.50	3	21.3	0.6	390.0	32.0
22.00	22	21.2	1.5	393.5	94.0
22.50	5	21.8	1.3	412.4	40.6
23.00	25	22.3	1. 1	468.6	63.9
23.50	5	22.8	1.8	520.2	51.5
24.00	27	23.3	1. 6	579.9	75.6
24.50	2	32.0	9. 9	568.5	92.6
25.00	10	24.4	1. 6	679.5	69.0
25.50	1	27.0	.	654.0	.

26.00	10	26.0	4.3	767.0	111.2
27.00	10	25.9	2.2	820.6	145.3
27.50	2	25.5	0.7	902.5	17.7
28.00	15	27.0	1.5	1001.7	91.2
29.00	9	28. 9	0.9	1066.7	187.1
29.50	2	29.0	0.0	1151.0	73.5
30.00	8	29.2	2.2	1194.4	101.3
30.50	2	29.5	0.7	1302.0	155.6
31.00	10	29.7	2. 3	1434.4	95.3
31.50	6	31.3	1.0	1525.5	134.2
32.00	19	32.5	1.4	1659.3	125.2
32.50	1	31.0	.	1692.0	.
33.00	11	32.5	1.4	1894.1	165.0
33.50	3	32. 7	1.2	1956.0	127.4
34.00	22	32.9	3.3	2014.4	143.2
34.50	2	35.5	3.5	2086.5	118.1
35.00	33	34.4	3.3	2254.8	397.9
35.50	8	35.2	0.5	2331.5	144.9
36.00	44	35.8	1.6	2556.2	150.9
36.50	5	39.2	3.1	2756.8	63.8
37.00	18	37.8	1.9	2805.3	161.1
37.50	5	40.2	5.2	2849.6	45.9
38.00	23	39.3	2.9	3028.0	184.8
38.50	4	40.5	3.1	3247.0	130.2
39.00	2	43.0	0.0	3238.5	28.9
39.50	2	39.0	0.0	3493.5	6.4
40.00	1	39.0	.	3492.0	.

Total	450	28.7	7.5	1421.9	1008.4

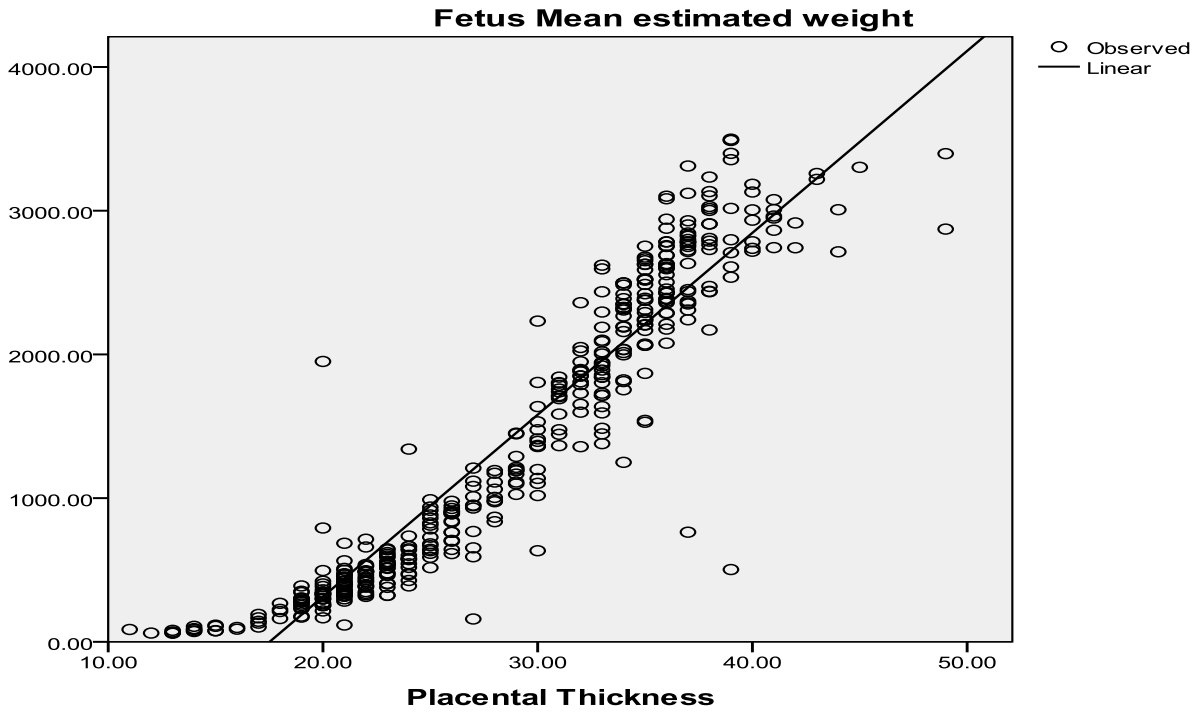
Table-21: Regression equations between estimators with estimating parameter:

Sl. No	Estimator parameter X	Estimating Parameters Y	R	R^2	Regression equations Y on X
1	Placental	GA LMP	0.951	0.905	Y = 3.776+0.951 X
2	Placental	GA USG	0.959	0.919	Y = 1.801+0.959 X
3	Placental	Est. Mean Weight	0.943	0.888	Y = 126.6 X- 2216.745
4	Placental	AFI	0.163	0.026	Y = 13.794 – 0.56 X
5	Placental	BPD	0.948	0.899	Y= 2.444x- 2.592
6	Placental	FL	0.951	0.904	Y = 2.246x- 13.138
7	Placental	AC	0.957	0.916	Y = 9.977x- 49.335
8	Placental	HC	0.948	0.899	Y = 8.726x + 0.022

The above table-21 states estimations of GA LMP, GA USG, Estimated Mean Weight, AFI, BPD,FL,AC and HC of fetus by the estimator Placental Thickness. The correlation coefficients of GA LMP, GA USG, Estimated Mean Weight BPD, FL, AC and HC were statistically very highly significant ($P<0.001$). The AFI negatively correlated ($r= -0.163$) with placental thickness. The percentages of estimates were determined by the estimator namely placental thickness.

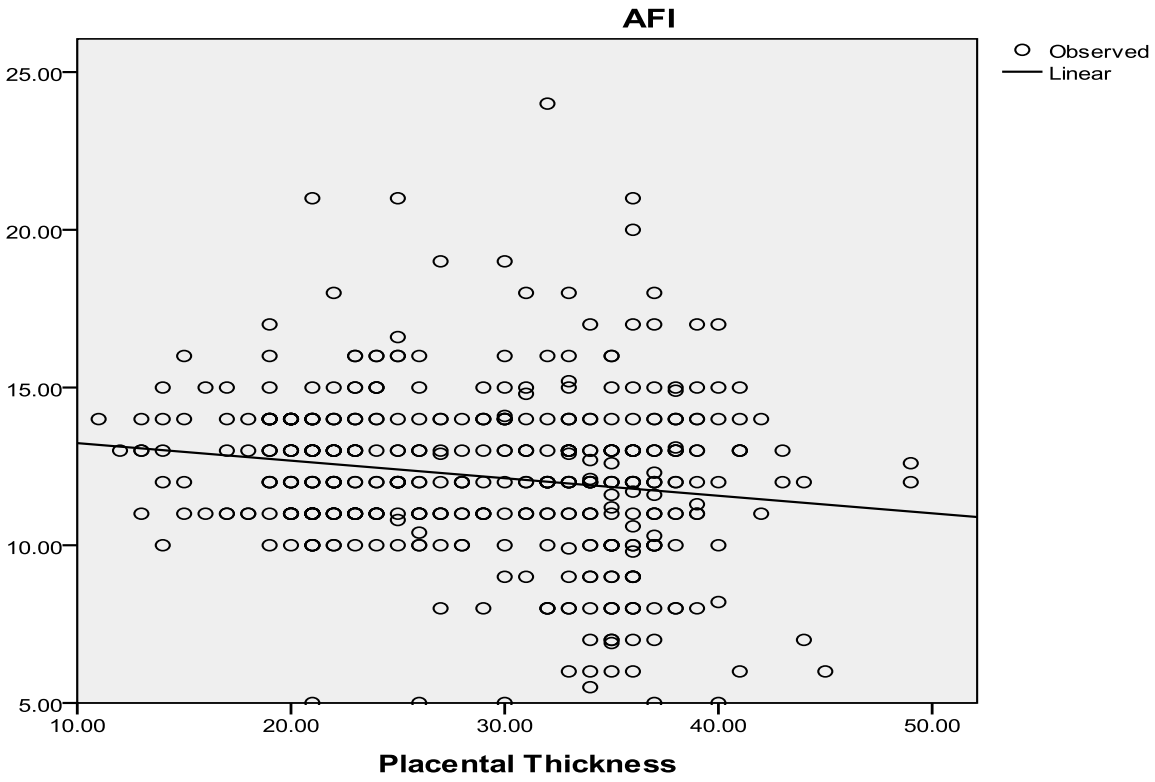
1. The placental thickness determines GA LMP = 90.5% (% R^2)
2. The placental thickness determines GA USG = 91.9% (% R^2)
3. The placental determines Est. Mean Weight = 88.8% (% R^2)
4. The placental thickness determines AFI = 02.6% (% R^2)
5. The placental thickness determines BPD = 89.9% (% R^2)
6. The placental thickness determines FL = 90.4% (% R^2)
7. The placental thickness determines AC = 91.6% (% R^2)
8. The placental thickness determines HC = 89.9% (% R^2)

Fig 20-: Regression equation for fetus means estimated weight (Y) on Placental Thickness (X)



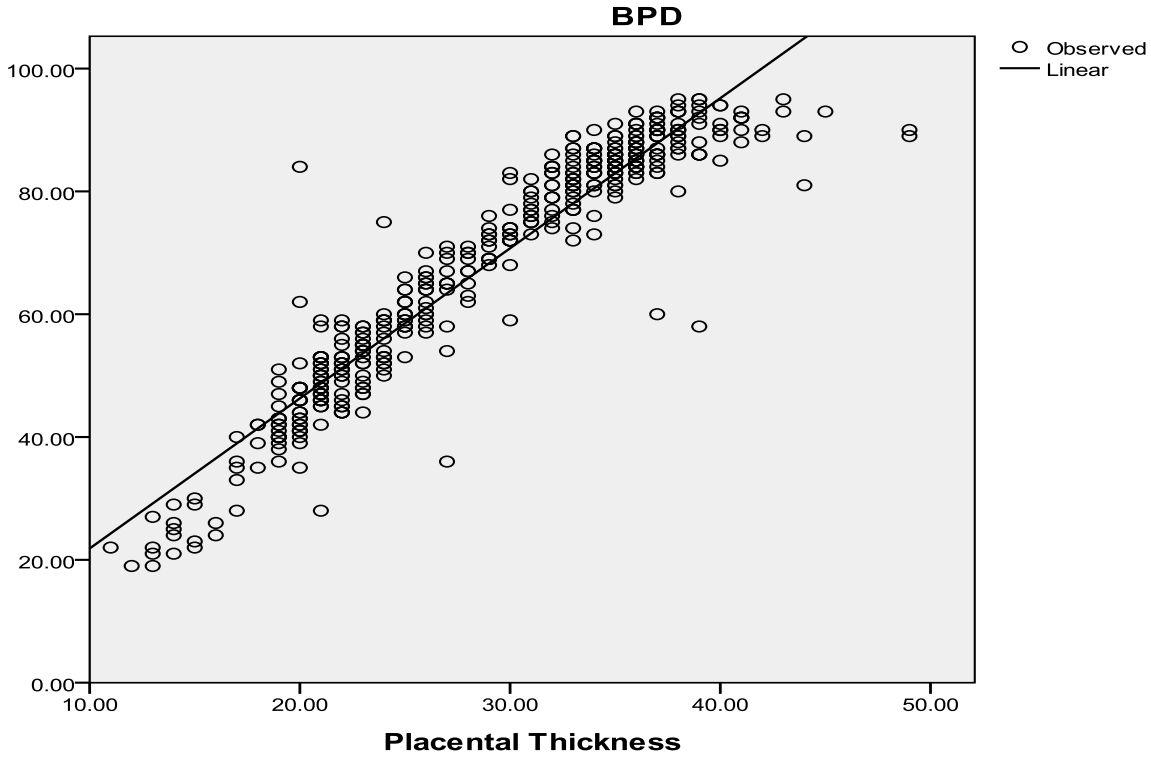
Y = 126.6 X- 2216.745

Fig-21: Regression equation for AFI (Y) on Placental Thickness (X)



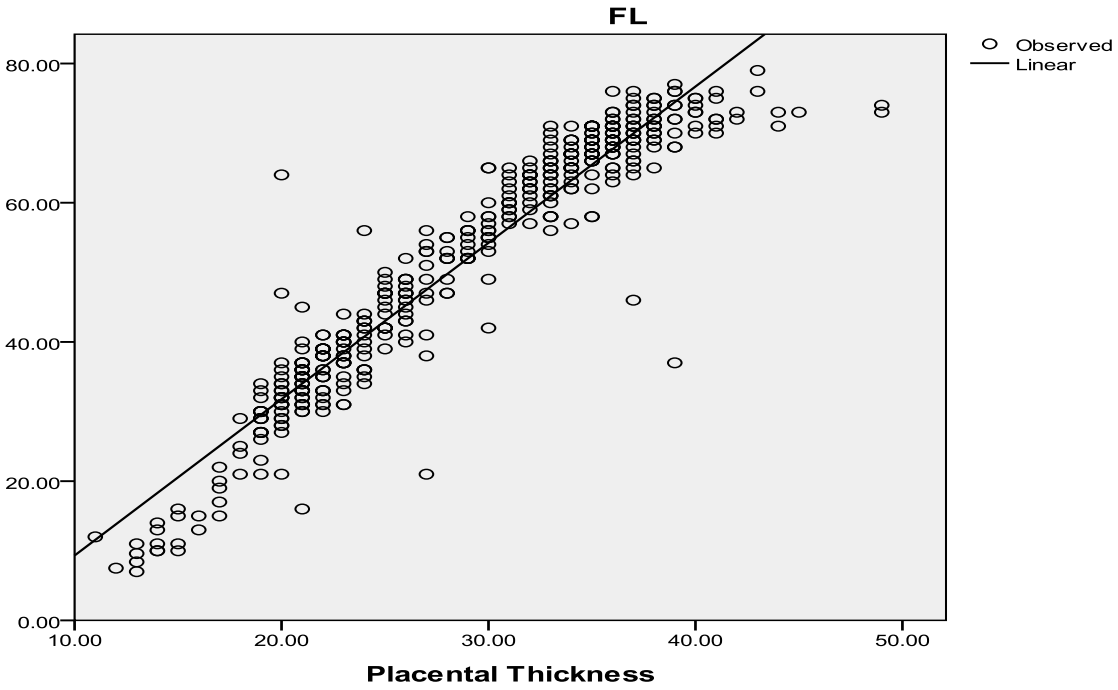
$$Y = 13.794 - 0.56\ X$$

FIG-22. Regression equation for BPD (Y) on Placental Thickness(X):



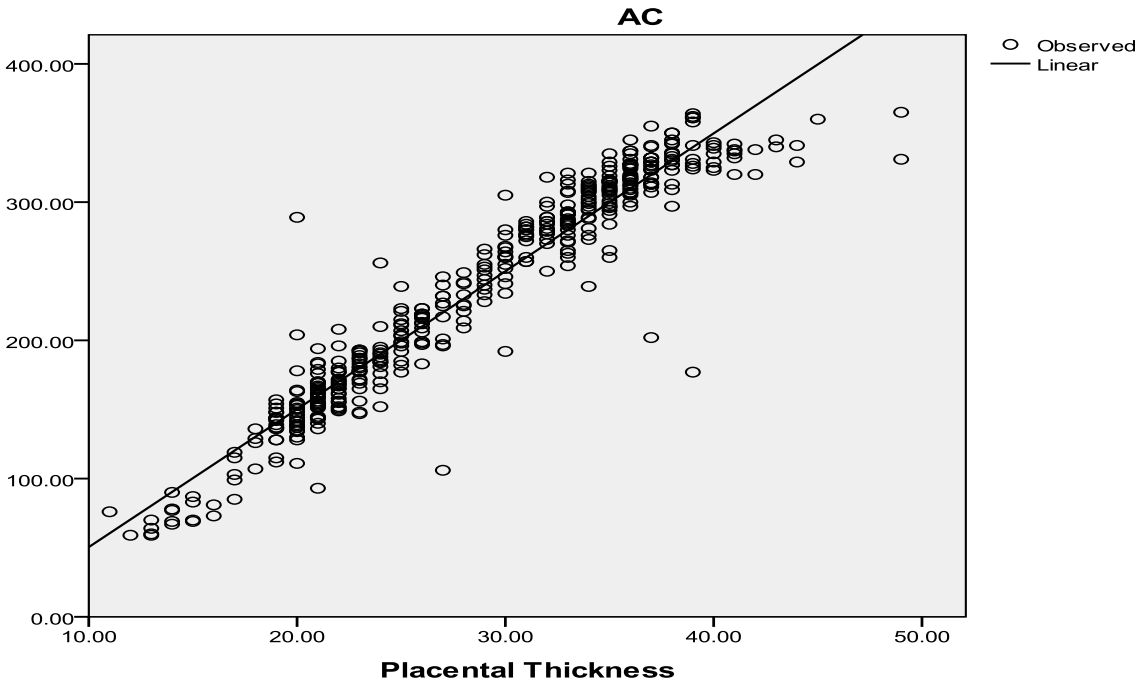
Y=2.444x-2.592

FIG23-. Regression equation for FL (Y) on Placental Thickness(x):



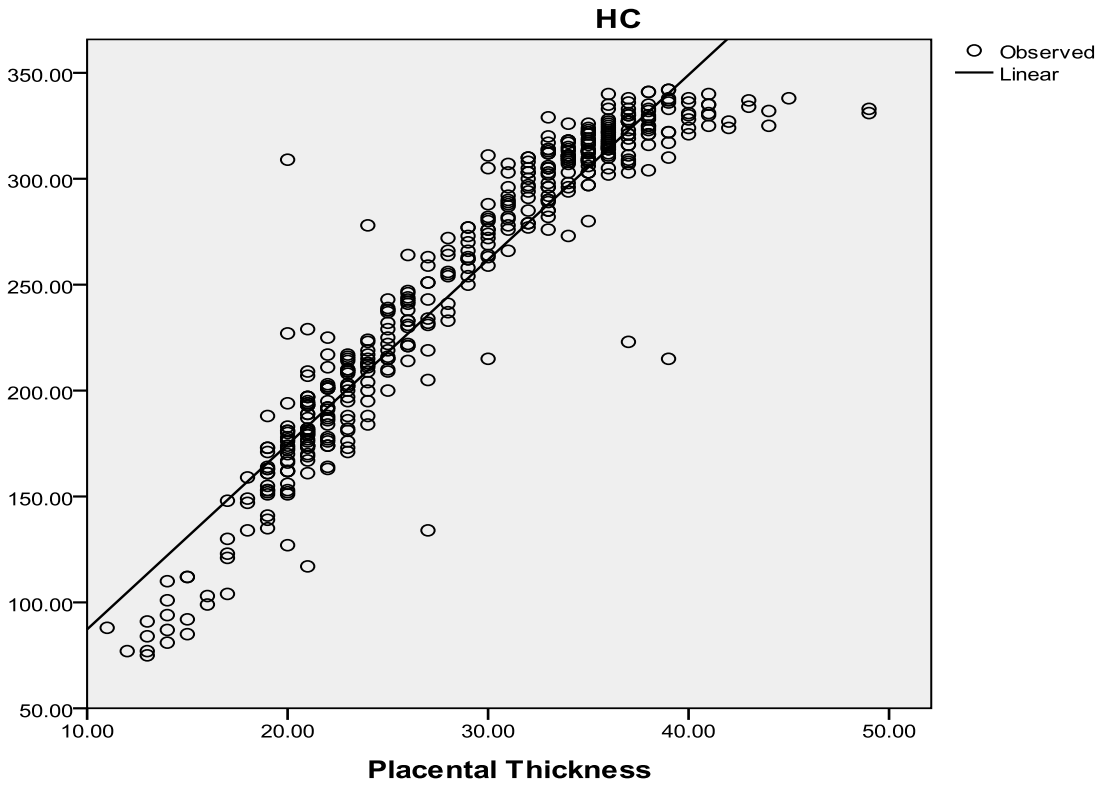
Y=2.246x-13.13

Regression equation for AC (Y) on Placental Thickness(X):



Y=9.977 x-49.335

FIG 24-: Regression equation for HC (Y) on Placental Thickness(X)



Y=8.726x+0.022

Placental thickness:

The GA LMP and GA USG were compared with reference to Placental thickness.

Table-22: Comparison between GA LMP and GA USG with Placental thickness

Placental Thickness	n	GA LMP		GA USG		Difference b/w means	t	Significance
		Mean	SD	Mean	SD			
10-20	43	18.0	3.8	16.5	2.5	1.5	2.108	P=0.038
20-30	183	24.1	3.1	23.2	3.1	0.9	2.691	P=0.007
30-40	202	34.6	2.4	34.2	2.7	0.4	1.476	P=0.141
40-50	22	37.7	0.8	37.5	0.8	0.2	0.878	P=0.385
Total	450	28.9	6.9	28.2	7.2	0.7	1.437	P=0.151

The above table -22 states the comparison between the GA LMP and GA USG with reference to the different levels of placental thickness. In 10-20 mm of thickness the mean gestational ages of GA LMP and GA USG were 18.0±3.8 weeks and 16.5±2.5 mm respectively. The difference

between them was statistically significant (P<0.05). Similarly in 20-30 mm the difference between them was statistically significant (P<0.05).

But, in 30-40 mm and 40-50 mm the differences between the mean weeks of GA LMP and GA USG were not statistically significant (P>0.05). The mean weeks of GA LMP and GA USG were also not statistically significant (P>0.05).

DISCUSSION

Accurate assessment of gestational age is essential for an obstetrician because it has got a great role in the clinical management in a number of ways.

1. Scheduling diagnostic procedures in early pregnancy- Chorionic Villous Sampling (10 - 12 weeks), Amniocentesis (15 - 18 weeks).
2. Anticipating a normal vaginal delivery with a spontaneous onset or planning an Elective Caesarean in a term pregnancy.
3. Assessing foetal growth since the range of growth parameters vary with advancing gestational age.
4. Optimising foetal outcome in high risk pregnancies like foetal growth restriction, gestational hypertension, gestational diabetes mellitus, preterm labour, preterm premature rupture of membranes, Rh Incompatibility, multiple pregnancy and in maternal chronic diseases complicating pregnancies.
5. To schedule the first trimester nuchal translucency screening, the comprehensive foetal anatomical survey and the triple screening.

6. To identify a particular anomaly with due importance to the chronology of foetal development.

Around 50% of antenatal women who claim to know their last menstrual dates with surety have a disparity of 2 weeks. 2 weeks disparity can be significant for a foetus who has to be delivered early due to some antenatal complication. The neonatal morbidity rate doubles for each week decrease in gestational age[51]. The importance of a precise EDD cannot be overemphasised. The accuracy of an EDD can be categorised as excellent , good or poor by a set of criteria .

RELIABILITY OF EDD[1]

EXCELLENT DATES

1. Patients with a reliable clinical examination (patients with a known LMP, with no oral contraceptives usage and a uterine size correlating with the dates) and an ultrasound done between 16 - 24 weeks correlates with the clinical dating.
2. Patients with inadequate clinical examination but has got 2 ultrasounds done between 16 - 24 weeks depicting a linear growth and similar dates.

GOOD DATES

1. Patients with adequate clinical findings and an confirmatory sonogram done after 24 weeks.
2. Patients with inadequate clinical findings but with 2 or more sonograms depicting adequate growth and similar dates .

POOR DATES

Any clinical scenario varying from the above are termed poor dates. Clinical dating is not always accurate. A confirmatory sonogram should also be done to complement a reliable clinical dating. The foetal parameters like BPD, FL, AC, HC are said to be more predictive of the estimated date of delivery. Foetal biometric age assessment is an inference derived from the foetal size and hence is erroneous with advancing gestation. Moreover inter observer variations and erroneous foetal measurements due to foetal positioning could alter the measurements. Hence BPD, HC, AC, FL have an error of ± 3 weeks in gestational age assessment in the third trimester. This study is conducted to uphold the greater role of placental thickness in estimating gestational age.

THE ROLE OF MULTIPLE GROWTH PARAMETERS

One of the greatest accomplishment of an obstetric ultrasound is the estimation of gestational age. CRL is invaluable in the first trimester dating. After 12 weeks, Biparietal diameter (BPD), Head Circumference (HC), Femur Length (FL), Abdominal Circumference (AC).

The age in weeks is derived for each parameter and the mean is the estimated gestational age of the foetus. This method has widely replaced the good old methods like GASA (Growth Adjusted Gestational Age) and MPGA (Mean Projected Gestational Age) which utilise BPD as a single parameter. The utilisation of multiple parameters is far better than any method of the past. Multiple tables providing the gestational age in weeks from the foetal biometric assessment are available.

BPD is especially unreliable in microcephaly, hydrocephalus, deeply engaged head, foetal growth restriction, polyhydramnios, occipitoposterior position, breech and in a moving foetus.

LIMITATIONS OF THE STUDY

1) The present study is a cross-sectional study obtained by observing various individuals. This is not a true growth curve as a true growth can only be obtained from serial measurements on the same person. However this is a reasonable approximation of a true growth curve.
2) Short placental insertion site can erroneously suggest thickened placenta.
3) Cord insertion is difficult to trace especially in posteriorly implanted placenta.
4) The placental thickness would vary among different population groups. Hence population based nomograms based on greater sample size is required for greater precision.
5) Precise measurement depends on scanning perpendicular to the placenta. Scanning obliquely through the placenta could result in spuriously thick placenta.

PLACENTAL THICKNESS MEASUREMENT - WHY IT SHOULD BE DONE ?

Before the introduction of prenatal diagnostic techniques, the morphological placental examination was done to gather mere retrospective information and had no impact on the pregnancy management .With the introduction of the sonogram, the placenta could be studied in detail right from the first trimester. In 1965, Donald introduced placental localisation by ultrasound. Few years back, placenta was visualised merely to look for placental separation and maturation.

Previously the sonologists considered the placenta to be static in a dynamic system. While all the foetal parameters were related to the LMP, a single cut - off point judges whether a placenta is normal or abnormal. The present study is an evidence to say that placental thickness is a function of foetal age. Any abnormality from the usual thickness of the placenta is correlated from the other estimates of gestational age. Sonographic placental measurements have been available for the past few years. To determine whether a given placental thickness is normal or abnormal, the placental thickness should be defined for each week of the gestation.

With the introduction of the 3D sonogram, volumetric assessment of the placenta is possible which is far better than placental thickness in assessment of gestational age. But volumetric measurements are too cumbersome and hence placental thickness retains its utility in dating.

COMPARISON BETWEEN MY STUDY AND OTHER STUDIES

In my study, there was no statistically significant correlation between placental thickness and maternal age $p > 0.05$, as shown by table 6, consistent with Elchelal[50] et al and Durnwald[49] et al study.

In my study, there was no statistically significant relationship between placental thickness and parity $p > 0.05$, as shown by table 7 consistent with Durnwald et al study.

Amniotic fluid index negatively correlated with placental thickness $r = -0.163$ as shown by table 15. In my study the anterior, lateral and the fundal placenta are thicker than the posterior implantation of the placenta as shown by table 11 which is in contrast to the study of Durnwald et al which showed that the posterior and the fundal placenta are thicker than the anterior placenta.

Grannum et al reported that there is a gradual decline in placental thickness as the placenta matures. But in my study, the placenta thickness increased with advancing gestation. The foetal weight positively correlated with increase in placental thickness as $p < 0.001$, as shown by table 10 which is very much statistically significant . Hence it could be inferred that abnormally thin placenta is associated with low birth weight as stated by Habib et al. Inspite of meticulous clinical examination and obtaining sonographic foetal growth parameters, many of the low birth infants are not diagnosed till birth . It is known that the sonographically detected estimated foetal weight has an error of atleast ± 300 gms. It is also known that the growth weight prediction is particularly erroneous in both extremities of weight. Hence additional parameters like placental thickness can help in estimating foetal weight.

According to my study the mean placental thickness increased with advancing gestational age, as shown by table 8 consistent with the findings of Mittal et al and Anupama et al. The mean placental thickness of Early 2^{nd}, late 2^{nd} and 3^{rd} trimesters were 13.6±1.4 mm, 21.8±3.4 mm and 34.8±4.5 mm respectively.

This is in accordance with the study of Mittal et al (2002) who stated that placental thickness in mm directly correlated with the gestational age in weeks between 22-35 weeks. Anupama[42] et al also stated that placental thickness matched with gestational age between 27-33 weeks.

Tongsong et al did a regression analysis and concluded that Placental thickness (mm) = Gest age (weeks) ×1.4 -5.6 (r = 0.82). In my study, gestational age could be derived from the placental thickness using the following regression equation.

Y = 3.776 +0.951 X

X - Placental thickness

Y - Gestational age (LMP)

R = 0.951

Similarly regression equations have been developed to correlate the relationship of placental thickness with

- Scan GA
- Foetal weight

With advancing gestational age, placental thickness in mm almost correlated with the gestational age in weeks. Therefore it is inferred that placental thickness could be used as a reliable parameter for gestational age assessment in the third trimester and in certain situations like

polyhydramnios, breech, hydrocephalus, microcephaly, IUGR, deeply engaged head, occipitoposterior position, dolichocephaly, brachycephaly, a moving foetus and skeletal dysplasia.

THE FUTURE UTILITY OF PLACENTAL THICKNESS

The changes in placental thickness are reflections of the normal growth of the foetoplacento-maternal unit which is easily measurable by sonologists and describes the normal physiology.

1) In gestational age assessment especially in the late second and third trimesters of pregnancy when the duration of pregnancy is doubtful.
2) Midtrimester placental thickness (18 - 21 weeks) could predict Hb Bart disease and thus would avoid unnecessary invasive procedure.
3) In prediction of homozygous alpha thalassemia.
4) As a predictor of low birth weight.
5) As a predictor of gestational age when any of the multiple variables like BPD, FL, AC, HC is doubtful especially in skeletal dysplasia.
6) As a predictor of foetal growth retardation.
7) As a diagnostic clue in certain pathologic conditions like preeclampsia, gestational diabetes mellitus.

SUMMARY

Ultrasonogram is a shadow of a modern obstetrician. The ultrasound measurement of the placental thickness, at the cord insertion site is very simple and clinically useful. It helps in evaluating and detecting certain placental abnormalities that significantly impact the management and outcome of pregnancies.

In my study, placental thickness and other biometric parameters were measured in antenatal mothers with known LMP. In my study, age and parity of the mother have no correlation with placental thickness.

The amniotic fluid index of the foetus has a negative correlation with placental thickness in my study. Placental thickness has a positive correlation with foetal weight. The study shows that the gestational age obtained using placental thickness almost matches with the gestational age obtained by composite growth parameters.

It can be summarised that the placental thickness has a linear increase with advancing gestation. Using regression equations, gestational age could be calculated when placental thickness is known. It has got immense value when one of composite growth parameter is fallacious. In future, if large studies are conducted, the role of placental thickness in

gestational age assessment could be established. Placental thickness could serve as an important parameter for age assessment especially in the late second and third trimesters.

Apart from this, placental thickness helps in early diagnosis of Hb Bart and hydropsfoetalis and helps in avoiding invasive iagnostic techniques. Placental thickness could be also helpful in early identification of pathological foetal growth restriction and gestational diabetes mellitus.

Placental thickness which was once considered an insignificant measurement can become an important one, especially in low resource settings in rural INDIA.

CONCLUSION

1. There is a linear and direct relationship between the placental thickness and gestational age.

2. The placental thickness did not vary with parity or maternal age.

3. The placental thickness has a direct correlation with estimate foetal weight of the foetus.

4. Meticulous measurement of the placental thickness aids in the early diagnosis of Hb Bart disease, homozygous alpha thalassemia, foetal growth restriction, Diabetes and Hydropsfoetalis.

5. Placental thickness correlates best with the gestational age especially in the third trimester.

6. Placental thickness could be considered as an additional parameter in estimating gestational age in the third trimester.

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PROFORMA

PLACENTAL THICKNESS – FOR ESTIMATION OF GESTATIONALAGE

Name :

Age :

LMP :

EDD :

Gestational age (by LMP):

Menstrual History : Regular / Irregular Cycles

Obstetrics History :

AN/Medical disorders :

USG details :

USG done on :

No. of Fetus :

Presentation :

HC _____ mm _____ weeks

BPD: _____ mm _____ weeks

AC: _____ mm _____ weeks

FL: _____ mm _____ weeks

Placental thickness :

Placental Grade :

Placental Location :

Maturity :

Amniotic Fluid :

Fetal Spine :

Any Other :

Placental thickness

S. NO	Patient Name	Age	Parity	BPD	FL	AC	HC	Weight	Weight	AFI	LMP GA	Placental Thickness	ultrasound gestational age	Placental position
		yrs		mm	mm	mm	mm	Mean	SD	cm	wks	mm	wks	
1	Mrs. Sironmani	31	primi	84	68	319	310	2455	**388**	12	36	36	35	**Left posterior**
2	Mrs. Silviya	22	multi	58	41	196	211	660	**96**	18	22	22	24	Right Anterior
3	Mrs. Janaki Prabha	31	primi	88	72	337	330	2949	**474**	15	37	41	37	Anterior
4	Mrs. Pappa	21	multi	89	69	327	324	2730	**429**	14	36	38	36.5	Left Anterior
5	Mrs. Diwan Beevi	23	primi	55	41	193	216	621	**621**	16	23	23	23	Left Anterior
6	Mrs. Muthu Lakshmi	24	primi	49	30	144	173	306	**306**	17	21	19	20	Posterior
7	Mrs. Sudha	25	primi	76	56	266	273	1447	**226**	11	31	29	30	Right Anterior
8	Mrs. Sumathi	30	multi	86	69	323	323	2726	**427**	7	35	37	36	Right Anterior
9	Mrs. Arunadevi	25	multi	91	70	325	328	2784	**450**	10	38	40	37	Fundal
10	Mrs. Jeyaselvi	25	primi	87	69	304	315	2352	**373**	12.7	36	34	35	Anterior
11	Mrs. Sathya	22	G2A1	83	62	281	310	1823	**295**	5.5	34	34	33	Fundal
12	Mrs. Syed Ali Fathima	35	primi	91	69	316	323	2602	**409**	11.7	35	36	36	Fundal Posterior
13	Mrs. Parameshwari	25	G2A1	23	11	69	92	78	**11**	16	16	15	14	Posterior
14	Mrs. Amudha	28	primi	65	47	225	234	931	**136**	12.9	28	27	26	Posterior
15	Mrs.Selvi	23	multi	51	34	157	188	389	**57**	16	22	19	21	Fundal
16	Mrs. Ramalakshmi	26	primi	57	40	187	215	587	**86**	15	23	23	23	Fundal Posterior
17	Mrs. Jeyalakshmi	26	multi	78	62	291	290	1803	**293**	12.9	33	33	32	Right Anterior
18	Mrs. Sudha	20	primi	90	73	331	331	2872	**462**	12.6	37.5	51	37.5	Fundal Right
19	Mrs. Noorjahan	30	multi	22	12	76	88	86	**13**	14	14	11	14	Fundal Anterior
20	Mrs. Velkani	24	primi	53	34	152	209	389	**57**	16	23	24	22	Posterior
21	Mrs. Arunachalavadivu	23	primi	62	49	221	243	938	**137**	10.8	28	25	26	Fundal Posterior
22	Mrs. Mallika	25	G2P1L1	85	70	323	321	2652	**516**	6.9	36	35	36	Anterior
23	Mrs. Packia Lakshmi	27	primi	25	10	69	87	76	**11**	14	16	14	14	Anterior
24	Mrs. Mathina Saliha Banu	21	G2P1LI	86	66	313	311	2359	**374**	10.3	35	37	35	Right Anterior
25	Mrs. Mymoon Rasitha	32	G2P1L1	87	70	316	329	2595	**408**	9.9	36	33	36	Anterior
26	Mrs. Sundari	24	primi	90	73	335	331	3006	**483**	8.2	38	40	37.5	Anterior
27	Mrs. Muppidathi	23	primi	52	39	151	191	432	**63**	12	23	22	21.5	Fundal Posterior
28	Mrs. Swarna	25	G2P1L1	83	67	291	308	2072	**332**	11.2	34	35	34	Fundal Posterior
29	Mrs. Tamilarasi	21	primi	85	67	295	310	2159	**344**	12.1	34	34	34.5	Fundal Posterior
30	Mrs. Saratha	23	primi	93	72	342	332	3002	**482**	13.1	38	38	38	Fundal
31	Mrs. Janani	24	G2A1	39	27	148	153	275	**40**	14	35	19	18.5	Anterior
32	Mrs. Susila Anbarasan	31	multi	87	67	298	314	2189	**349**	15.2	35	33	35	Fundal Anterior
33	Mrs. Mahadevi	29	primi	75	59	281	277	1653	**256**	12	31.5	32	31	Fundal Posterior

34	Mrs. Kalaiselvi	30	primi	89	69	325	326	2689	**422**	10.6	36.5	36	36	Left Anterior
35	Mrs. Fathima Jamin	20	multi	47	33	145	177	336	**49**	11	21	21	20	Posterior
36	Mrs. Mangala Selvi`	31	primi	66	50	239	238	989	**159**	16.6	28	25	27	Anterior
37	Mrs. Susila Antony	25	primi	52	38	177	192	495	**72**	13	23	22	22	Fundal Posterior
38	Mrs. Pappa	29	primi	68	53	246	259	1137	**181**	14.1	29	30	28	Anterior
39	Mrs. Murugalakshmi	26	multi	80	62	284	297	1868	**287**	12.6	33	35	32.5	Posterior
40	Mrs. Kasithai	23	primi	79	63	280	292	1842	**284**	14.8	33	31	32	Anterior
41	Mrs. Shenbagavalli	28	multi	92	70	314	330	2633	**414**	11.6	37	37	36.5	Fundal Posterior
42	Mrs. Kanaga Revathi	26	multi	89	72	327	327	2930	**472**	12.3	37	37	37	Anterior
43	Mrs. Jeyalakshmi	25	primi	90	74	350	330	3133	**561**	14.9	38	38	38	Anterior
44	Mrs. Dhanalakshmi	30	primi	94	77	362	337	3542	**561**	11.3	40	39	39	Fundal Left
45	Mrs. Stella	27	multi	84	69	316	310	2626	**383**	11.6	35	35	35	Fundal
46	Mrs. Sandhya	25	primi	83	65	307	314	2210	**352**	9.8	34	36	34	Anterior
47	Mrs. Selvi	31	primi	57	42	196	209	644	**94**	16	25	25	23.5	Posterior
48	Mrs. Thiruvalarselvi	24	multi	51	35	170	195	467	**68**	15	23	24	22	Posterior
49	Mrs. Muthumari	23	G2A1	48	32	151	179	346	**51**	14	22	21	20.5	Posterior
50	Mrs. Nambinatchiyar	32	primi	57	43	183	214	614	**90**	16	25	26	23.5	Posterior
51	Mrs. Selvakumari	24	primi	54	38	196	205	592	**86**	8	24	27	23	Fundal Posterior
52	Mrs. Rekha	24	multi	59	43	195	215	665	**97**	14	26	24	24	Posterior
53	Mrs. Vasanthi	29	primi	83	66	307	314	2295	**364**	12	35	33	34.5	fundal
54	Mrs. Shanthi	36	multi	86	71	332	321	2845	**458**	14	36.5	37	36.5	Anterior
55	Mrs. Lakshmi	24	primi	26	15	81	103	100	**15**	15	15	16	14.5	Posterior
56	Mrs. Rathinakumari	25	primi	81	65	284	300	1879	**304**	12	33	32	33	Fundal
57	Mrs. Jothi	25	primi	42	31	150	162	318	**46**	14	20.5	20	19.5	Posterior
58	Mrs. Priyanka	22	primi	77	65	287	289	1843	**298**	13	33	33	32	Anterior
59	Mrs. Saraswathy	28	primi	59	40	197	221	643	**94**	15	25	26	24	Anterior
60	Mrs. Jannath Firthouse	22	multi	46	33	152	174	350	**51**	14	21	21	20	Posterior
61	Mrs. Megala	24	G2A1	53	38	191	211	572	**84**	16	24	24	23	Posterior
62	Mrs. Perumal Selvi	24	primi	77	64	284	289	1804	**293**	11	33	31	32	Anterior
63	Mrs. Sivagami	27	multi	42	30	136	161	283	**41**	13	20	21	19	Posterior
64	Mrs. Sumithra	28	primi	64	48	217	238	901	**132**	10.4	27	26	26	Posterior
65	Mrs. Petchiammal	35	multi	52	37	172	202	473	**69**	13	23	23	22	Fundal Posterior
66	Mrs. Banumathi	26	primi	73	52	251	270	1214	**192**	14	30	29	29	Fundal Posterior
67	Mrs. Priyanka devi	22	G2A1	84	66	286	312	2003	**322**	11	34.5	33	34	Anterior
68	Mrs. Maheshwari	25	multi	94	75	343	338	3184	**509**	12	38.5	40	38.5	Left Anterior
69	Mrs. Ponnukili	23	primi	83	64	293	298	1945	**313**	6	34	33	33	Anterior
70	Mrs. Annammal	25	multi	65	53	232	243	1010	**162**	12	28	27	27	Left posterior
71	Mrs. Yasmini	20	primi	29	14	90	110	108	**16**	13	16	14	15	Posterior
72	Mrs. Lakshmi	33	primi	44	31	154	167	336	**49**	14	19	20	20	Fundal Posterior
73	Mrs. Selvarani	20	primi	59	36	181	219	518	**76**	12	24	24	23	Anterior
74	Mrs. Kulalamani	36	primi	82	64	285	305	1859	**301**	16	34	33	33	Anterior
75	Mrs. Mahuthali	25	G2A1	86	69	315	322	2517	**397**	6	36	35	37	Fundal Posterior

76	Mrs. Esakkiammal	25	primi	89	71	329	325	2714	**440**	12	36.5	44	36.5	Fundal
77	Mrs. Jannath Firthouse	29	primi	81	64	297	298	2033	**326**	6	34	34	33	Fundal
78	Mrs. Thangam	23	primi	69	49	217	251	951	**139**	19	28	27	27	Anterior
79	Mrs. Mariyal	31	multi	54	41	186	200	580	**84**	15	24	24	23	Fundal Posterior
80	Mrs. Muthulakshmi	23	primi	36	20	115	130	167	**24**	14	18	17	17	Posterior
81	Mrs. Revathy	33	multi	90	71	307	326	2498	**394**	9	36	34	36	Anterior
82	Mrs. Lakshmi Bharathi	26	G2A1	58	45	199	225	728	**106**	12	25	25	24.5	Fundal Anterior
83	Mrs. Radhika	30	primi	59	42	192	215	634	**93**	11	29	30	28	Anterior
84	Mrs. Rajeshwari	27	multi	94	75	341	336	3130	**501**	14	38	40	38	Anterior
85	Mrs. Sheela	25	multi	90	69	309	321	2473	**390**	14	36	38	36	Anterior
86	Mrs. Avudai Aachi	25	primi	50	35	166	189	423	**62**	12	21.5	21	21	Anterior
87	Mrs. Sentamil	32	multi	51	35	154	187	391	**57**	13	22	21	21	Fundal Posterior
88	Mrs. Gokila Lakshmi	27	primi	59	42	192	215	634	**93**	12	24.5	25	24	Anterior
89	Mrs. Mary	28	multi	81	64	288	312	1935	**312**	18	33	33	33.5	Anterior
90	Mrs. Jannath	23	multi	77	57	250	279	1358	**213**	11	31	32	30	Left posterior
91	Mrs. Antonyammal	31	primi	87	68	310	315	2383	**377**	9	35	36	35	Fundal Left
92	Mrs. Loorthu Jeniva	28	primi	77	61	265	285	1637	**254**	14	32	33	31	Anterior
93	Mrs. Mariya Pushpam	26	primi	24	11	78	94	86	**13**	15	15	14	14	Posterior
94	Mrs. Mala	24	multi	56	43	210	217	736	**108**	14	25	24	23.5	Posterior
95	Mrs. Seetha Lakshmi	23	primi	86	67	310	312	2391	**378**	8	35	35	35	Fundal
96	Mrs. Esakkiammal	22	G2A1	91	71	328	327	2757	**446**	12	37	36	37	Fundal
97	Mrs. Evanjaline Jeba	27	primi	81	64	300	296	2024	**325**	16	33.5	32	33	Anterior
98	Mrs. Nagavalli	33	G2A1	86	68	326	317	2609	**410**	13	36	39	35.5	Fundal
99	Mrs. Saratha	23	multi	93	76	345	334	3259	**520**	12	39	43	39	Fundal
100	Mrs. Usha	34	primi	58	38	169	217	488	**71**	11	24	22	23	Fundal Posterior
101	Mrs. Saraswathy	30	primi	86	66	318	310	2360	**374**	13	35	32	35	Anterior
102	Mrs. Sivasakthi	28	primi	40	30	135	151	271	**40**	14	20	20	19	Anterior
103	Mrs. Janaki	30	multi	44	30	149	164	316	**46**	13	20.5	22	19.5	Posterior
104	Mrs. Subha	23	G2A1	92	75	332	335	2963	**476**	13	38	41	38	Fundal
105	Mrs. Sudha	22	primi	75	58	275	276	1585	**246**	11	31	31	30.5	Fundal Posterior
106	Mrs. Rajeshwari	24	primi	86	71	308	313	2436	**385**	14	36	33	35	Fundal Posterior
107	Mrs. Fathima Fasmina	20	multi	72	60	260	288	1531	**238**	15	31.5	30	30.5	Anterior
108	Mrs. Jesinthai	22	primi	52	41	178	210	558	**81**	16	24	23	23	Anterior
109	Mrs. Jeya	23	primi	72	56	264	280	1412	**221**	14	30.5	30	30	Fundal Right
110	Mrs. Maheshwari	19	G2A1	60	47	198	233	762	**111**	13	26	26	25	Fundal Posterior
111	Mrs. Zeenath	25	primi	47	36	171	186	443	**65**	14	22.5	22	21	Anterior
112	Mrs. Manicka	25	primi	85	67	309	316	2428	**384**	8	35..5	36	35	Fundal Anterior
113	Mrs. Uma	25	multi	53	37	169	197	470	**69**	14	23.5	21	22	Anterior
114	Mrs. Ramalakshmi	24	primi	83	65	288	309	1997	**321**	17	34	34	33.5	Anterior
115	Mrs. Reichel Grace	33	primi	91	67	314	324	2487	**392**	9	36	35	36	Anterior
116	Mrs. Fathima Rufina	21	multi	90	70	338	335	2864	**462**	14	37.5	41	37	Anterior
117	Mrs. Soniya	25	primi	60	47	203	232	812	**119**	16	27	25	25	Anterior

118	Mrs. Selvi	27	primi	58	37	177	215	503	**73**	17	24.5	39	23	Fundal Posterior
119	Mrs. Mariammal	25	primi	94	71	345	341	3103	**497**	15	38.5	38	38	Anterior
120	Mrs. Theresha	27	multi	93	72	337	335	2941	**473**	15	38	36	38	Anterior
121	Mrs. Sreekala	36	G2A1	87	71	326	321	2665	**418**	12	36	35	36	Anterior
122	Mrs. Vivy	25	primi	55	38	170	202	487	**71**	14	20.5	22	22.5	Fundal
123	Mrs. Kalpana	28	G2A1	49	37	171	186	462	**68**	15	20.5	23	21.5	Anterior
124	Mrs. Muthu Selvi	28	multi	76	62	276	294	1754	**271**	12	32	34	32	Fundal
125	Mrs. Muthamil Selvi	22	multi	88	74	331	322	2798	**452**	11	36.5	39	36.5	Posterior
126	Mrs. Rajammal	30	primi	62	47	211	238	828	**112**	21	26	25	25.5	Posterior
127	Mrs. Vasanthi	24	G2A1	41	27	134	162	254	**37**	11	19	20	19	Posterior
128	Mrs. Jeyarani	28	multi	21	10	67	81	72	**11**	12	14	14	13	Fundal Posterior
129	Mrs. Sundari	23	primi	52	37	178	194	496	**73**	13	23	20	22	Posterior
130	Mrs. Sharmila Lakshmi	31	multi	76	62	279	294	1790	**276**	12	32	32	32	Posterior
131	Mrs. Maheshwari	28	primi	81	73	341	332	3007	**483**	7	38	44	37.5	Fundal
132	Mrs. Geetha	29	multi	59	45	194	229	686	**100**	11	25	21	24.5	Fundal Anterior
133	Mrs. Maheshwari	29	primi	62	49	221	241	975	**142**	12	27	28	26	Posterior
134	Mrs. Sabura Beevi	38	primi	47	32	151	173	343	**50**	14	21	19	20	Anterior
135	Mrs. Murugathal	25	multi	91	76	345	318	3101	**497**	13	38	36	37.5	Anterior
136	Mrs. Manju	27	primi	93	72	364	333	3399	**540**	8	38.5	39	38.5	Fundal Posterior
137	Mrs. Devi	29	primi	76	58	260	278	1444	**226**	13	31.5	31	30.5	Fundal Posterior
138	Mrs. Selvaramani	25	multi	47	33	155	181	359	**53**	13	21.5	21	20.5	Anterior
139	Mrs. Beaulah	33	multi	91	72	326	331	2784	**450**	914	38	37	37	Anterior
140	Mrs. Mariammal	32	primi	80	60	280	292	1730	**267**	14	32	33	32	Anterior
141	Mrs. Pappa	23	multi	86	70	328	322	2708	**425**	14	36	39	36	Fundal Posterior
142	Mrs. Mutharasi	20	G2A1	53	39	185	187	538	**79**	15	24	22	22	Fundal Posterior
143	Mrs. Selvajothi	26	multi	65	47	209	237	836	**122**	10	27	28	26	Fundal Posterior
144	Mrs. Sangeetha	26	primi	56	41	193	208	647	**95**	11	24	23	23.5	Anterior
145	Mrs. Radha	33	primi	87	67	311	317	2482	**392**	12	36	34	35.5	Left posterior
146	Mrs. Maheshwari	19	multi	56	39	177	201	528	**77**	13	24	22	23	Posterior
147	Mrs. Kartheeshwari	21	G2A1	44	32	153	177	346	**51**	12	20	20	20	Anterior
148	Mrs. Rani Mary Deepthi	26	multi	24	13	73	99	88	**13**	11	15	16	14	Posterior
149	Mrs. Rahiyathul Kuruthiya	23	primi	71	53	240	263	1118	**178**	11	28	27	28.5	Fundal Posterior
150	Mrs. Backiya Lakshmi	26	primi	46	33	148	173	339	**50**	12	20	20	21	Anterior
151	Mrs. Mala	34	multi	48	31	138	172	298	**44**	13	19	20	20	Anterior
152	Mrs. Suganthi	32	primi	42	29	136	159	268	**39**	14	19	18	19	Fundal Anterior
153	Mrs. Subbulakshmi	24	primi	40	26	128	141	229	**33**	15	22	19	18	Fundal Posterior
154	Mrs. Chitra	23	primi	85	64	297	314	2078	**333**	10	35	36	34	Fundal Posterior
155	Mrs. Ambika	27	multi	63	47	214	233	867	**127**	10	27	28	26	Posterior
156	Mrs. Anisha	25	primi	85	63	284	305	1920	**310**	13	35	33	34	Fundal Posterior
157	Mrs. Ramalakshmi	23	multi	82	68	292	306	2089	**334**	8	35	33	34	Posterior
158	Mrs. Beaulah	24	G2A1	82	65	276	305	1805	**293**	10	34	30	33	Fundal Left
159	Mrs. Shanmuga Sundari	29	primi	79	64	289	291	1851	**300**	1010	33	32	32.5	Fundal

160	Mrs. Fathima	30	multi	81	65	300	296	2035	**326**	10	33.5	34	33	Fundal Posterior
161	Mrs. Sugirtha	23	primi	89	73	338	324	2915	**468**	11	37	42	37	Fundal Posterior
162	Mrs. Ajantha	24	multi	76	60	277	288	1706	**264**	12	32	31	31.5	
163	Mrs. Ramala Begum	19	multi	85	71	329	321	2738	**429**	5	36.5	40	36	Right Anterior
164	Mrs. Sudalai Vadivoo	21	primi	28	15	85	104	103	**15**	13	16	17	15	Posterior
165	Mrs. Charlet	29	primi	74	52	247	277	1192	**189**	13	30.5	29	29	Anterior
166	Mrs. Prema	27	multi	69	52	244	262	1112	**177**	11	30	29	28	Posterior
167	Mrs. Lakshmi	25	multi	93	73	360	338	3302	**526**	6	38.5	45	38	Fundal
168	Mrs. Shanthi	33	primi	86	64	309	309	2241	**356**	12	35.5	35	35	Fundal Posterior
169	Mrs. Thirumagal	33	multi	84	69	305	322	2358	**374**	9	35.5	36	35	Fundal Posterior
170	Mrs. Susila	31	primi	92	70	332	333	2822	**456**	18	37	37	37	Anterior
171	Mrs. Jesibai	27	G2A1	84	63	286	308	1895	**306**	26	34	32	33.5	Posterior
172	Mrs. Mallika	31	primi	89	74	365	333	3397	**540**	12	38	49	38	Fundal Anterior
173	Mrs. Jeyalakshmi	23	primi	83	65	300	305	2285	**363**	11	35	36	34	Anterior
174	Mrs. Santhana Mari	26	multi	70	55	249	272	1192	**189**	13	30	28	29	Anterior
175	Mrs. Mutheswari	23	primi	81	69	301	303	2207	**351**	10	35	35	34	Anterior
176	Mrs. Angel	22	primi	48	34	165	182	407	**59**	14	23	23	21	Posterior
177	Mrs. Saroja	30	primi	41	28	137	152	264	**39**	13	19	20	19	Posterior
178	Mrs. Selvarani	24	multi	95	79	340	337	3218	**514**	13	39	43	39	Anterior
179	Mrs. Magarajothi	25	primi	66	49	213	233	892	**130**	11	28	26	26	Right Anterior
180	Mrs. Muthukodi	19	primi	87	73	327	323	2807	**454**	10	37	38	37	Left Anterior
181	Mrs. Annakili	35	multi	44	32	150	163	327	**48**	13	20	22	20	Fundal Posterior
182	Mrs. Shanthaveni	22	multi	43	30	137	155	281	**41**	14	19	19	19	Posterior
183	Mrs. Chitra	25	primi	62	47	223	237	915	**134**	12	27.5	25	26	Anterior
184	Mrs. Karpagavalli	24	multi	79	56	254	282	1379	**216**	13	32	33	30.5	Fundal Posterior
185	Mrs. Karpagajothi	31	primi	89	73	323	330	2718	**441**	17	38	40	37	Fundal
186	Mrs. Sumathi	27	multi	83	66	307	313	2235	**356**	16	35.5	35	34.5	Fundal Posterior
187	Mrs. Ashwini	28	primi	19	7	59	75	60	**9**	13	14	13	12.5	Posterior
188	Mrs. Thirumani	24	multi	73	52	253	262	1203	**191**	14	29.5	29	29.5	Right Anterior
189	Mrs. Sumathy	22	primi	85	70	329	313	2677	**420**	8	36	35	35.5	Fundal Left
190	Mrs. Backiya Lakshmi	27	G2A1	86	63	306	302	2176	**347**	12	35	36	34.5	Anterior
191	Mrs. Sabitha	20	primi	79	58	265	280	1528	**237**	13	32	35	31	Fundal
192	Mrs. Vanathirtham	26	primi	53	39	177	200	516	**75**	14	26	25	22.5	Posterior
193	Mrs. Kulalamani	36	multi	86	71	314	309	2524	**398**	10	36	35	35	Anterior
194	Mrs. Padma	24	primi	64	46	219	244	890	**130**	12	27.5	26	26	Posterior
195	Mrs. Meenatchi	27	multi	22	9.6	64	84	69	**10**	13	14	13	13	Anterior
196	Mrs. Thirumalaikani	28	G2A1	49	35	152	184	381	**56**	12	20	22	21	fundal
197	Mrs. Karpagavalli	28	primi	86	68	323	316	2439	**385**	11	36	38	35	Anterior
198	Mrs. Muthulakshmi	24	primi	84	64	289	303	1949	**324**	8	34	32	33.5	Anterior
199	Mrs. Chellammal	22	primi	64	51	227	251	947	**153**	10	28	27	27	Posterior
200	Mrs. Habifa Begum	25	multi	95	76	361	342	3549	**563**	14	39.5	39	39.5	Fundal
201	Mrs. Gomathy	26	multi	72	54	233	263	1099	**175**	15	29.5	29	28.5	Posterior

202	Mrs. Chitra	23	primi	90	69	329	316	2716	**426**	15	36	37	36	Left Anterior
203	Mrs. Gokila	26	primi	47	31	147	173	323	**47**	14	22	23	20	Fundal
204	Mrs. Iyyankani	23	G2A1	84	67	318	303	2451	**387**	10	35	37	34.5	Fundal
205	Mrs. Jency	23	multi	73	57	257	266	1365	**214**	15	31.5	31	3029	Anterior
206	Mrs. Mumtaj	26	multi	71	58	262	277	1452	**227**	14	31	29	30	Anterior
207	Mrs. Mallika	47	primi	19	7.5	59	77	61	**9**	13	14	12	13	Posterior
208	Mrs. Muthulakshmi	26	primi	86	67	309	311	2318	**368**	10	36	34	35	Anterior
209	Mrs.Umapathy	26	primi	91	75	350	335	3234	**516**	12	38	38	38	Anterior
210	Mrs. Sujarani	38	multi	50	33	165	177	394	**58**	13	23	22	21	Fundal Posterior
211	Mrs. Ramzanbegum	29	primi	43	34	144	170	329	**48**	11	20	20	20	Anterior
212	Mrs. Nilofer Bismi	20	primi	80	65	297	304	2170	**346**	8	34.5	38	34	Fundal Posterior
213	Mrs. Saroja	37	primi	82	58	260	297	1541	**240**	12	32	35	32	Anterior
214	Mrs. Deiva Nayagi	26	multi	83	65	299	308	2195	**350**	12	34	34	34	Fundal Anterior
215	Mrs. Sakthiya	27	primi	35	19	103	123	143	**21**	11	17.5	17	16	Posterior
216	Mrs. Pandeeswari	32	G2A1	22	10	70	85	76	**11**	12	14	15	13.5	Posterior
217	Mrs. Kavitha	26	G2A1	83	66	296	303	2063	**330**	8	34	35	34	Fundal
218	Mrs. Revathy	20	primi	69	56	237	254	1167	**185**	11	28	29	28.5	Fundal Posterior
219	Mrs. Priya	29	primi	36	21	106	134	159	**23**	13	19	27	17	Anterior
220	Mrs. Santhana Mari	32	multi	58	41	197	219	654	**96**	14	25.5	27	24	Fundal Posterior
221	Mrs. Prabha	27	multi	35	21	107	134	162	**24**	13	18.5	18	17	Anterior
222	Mrs. Revathy	28	multi	42	25	129	149	226	**33**	11	20	18	18	Posterior
223	Mrs. Sudha	25	primi	47	32	156	180	358	**52**	10	22.5	21	20.5	Posterior
224	Mrs. Kala	31	primi	72	58	263	276	1447	**226**	12	31.5	33	30	Posterior
225	Mrs. Packiaselvi	26	multi	90	70	313	325	2436	**385**	8	36	38	36	Fundal Posterior
226	Mrs. Sumathi	32	multi	85	68	308	307	2327	**369**	14	35	34	35	Right Anterior
227	Mrs. Ramalakshmi	32	primi	86	69	327	316	2622	**412**	12	36	36	35.5	Right Anterior
228	Mrs. Seetha	22	primi	48	39	178	188	480	**70**	11	23	23	22	Posterior
229	Mrs. Sophia	24	G2A1	52	37	184	194	511	**75**	11	23	21	22	Right Anterior
230	Mrs. Bala Sundari	26	G2A1	67	52	225	255	1005	**161**	14	28	28	27.5	Posterior
231	Mrs. Brindha	23	primi	46	31	156	176	349	**51**	13	22	22	20	Posterior
232	Mrs. Renu Padmavathy	23	primi	83	64	297	310	2048	**328**	8	34	32	34	Right Anterior
233	Mrs. Muthulakshmi	33	primi	86	68	324	310	2537	**400**	13	35	39	35	Fundal Posterior
234	Mrs. Selvakumari	31	primi	52	36	165	184	427	**62**	11	22.5	24	21.5	Fundal Anterior
235	Mrs. Arputha Selvi	27	G2A1	54	40	177	200	533	**78**	12	23.5	23	22.5	Posterior
236	Mrs. Selvi	28	primi	65	46	201	231	768	**112**	11	26	27	25.5	Posterior
237	Mrs. Arulmathi	29	multi	84	68	299	319	2246	**352**	10	35	35	35	Anterior
238	Mrs. Valliammal	20	multi	75	65	276	282	1713	**265**	9	31.5	31	31	Anterior
239	Mrs. Jeba Pon Malar	22	primi	60	46	202	223	763	**111**	10	26	37	25	Left Anterior
240	Mrs. Epsiba Marginal	22	G2A1	80	63	273	303	1811	**279**	11	32	34	32.5	Fundal Posterior
241	Mrs. Jancy Melkis	36	multi	85	66	313	309	2309	**366**	11	35	34	34.5	Anterior
242	Mrs. Valliammal	30	primi	46	30	144	169	299	**44**	1033	19.5	21	19.5	Left Anterior
243	Mrs. Jesime Babitha	23	primi	92	76	335	325	3008	**433**	6	38	41	38	Fundal

244	Mrs. Sneha	25	primi	51	33	168	195	415	**61**	12	23	22	21.5	Fundal
245	Mrs. Shyamala Juliet	23	multi	88	71	314	322	2596	**408**	20	36	36	36	Anterior
246	Mrs. Joice	29	multi	54	37	181	195	511	**75**	13	23	23	22.5	Fundal Anterior
247	Mrs. Rathina Bala	27	multi	88	71	335	323	2753	**446**	13	36	35	36.5	Right Anterior
248	Mrs. Anitha Epsi	23	primi	90	74	332	319	2830	**457**	12	37.5	37	37	Fundal Posterior
249	Mrs. Kalaivani Viji	25	multi	48	32	146	176	330	**48**	14	20.5	20	20	Anterior
250	Mrs. Saroja	24	mmm	90	74	339	324	2934	**472**	15	36	40	37	Fundal Posterior
251	Mrs. Sabeena	24	primi	35	21	111	127	167	**24**	14	18	20	17	Posterior
252	Mrs. Chinnammal	29	multi	83	71	309	314	2422	**383**	7	35.5	35	35	Left Anterior
253	Mrs. Esakkiammal	26	primi	81	66	313	302	2018	**324**	9	34	33	33.5	Right Anterior
254	Mrs. Nithya	24	multi	52	39	184	204	543	**79**	11	23.5	24	22.5	Fundal Posterior
255	Mrs. Thenmozhi	31	multi	48	35	162	181	405	**59**	10	22	21	21	Fundal Anterior
256	Mrs. Rahamath Nisha	34	primi	85	65	318	316	2371	**375**	13	35	37	35	Fundal Posterior
257	Mrs. Peratchiselvi	36	G2A1	29	16	87	112	116	**17**	14	16	15	15	Posterior
258	Mrs. Murugeshwari	26	multi	83	64	313	308	2241	**356**	17	34	37	34	Anterior
259	Mrs. Priyanka	23	primi	95	75	335	328	3015	**484**	11	38	38	38	Posterior
260	Mrs. Kanagaselvi	27	G2A1	43	27	137	163	263	**38**	13	19	19	19	Anterior
261	Mrs. Sridevi	26	multi	81	61	271	296	1714	**200**	13	32	33	32	Fundal Posterior
262	Mrs. Jeya	26	primi	65	47	218	246	907	**30**	14	26	26	26.5	Anterior
263	Mrs. Mythili	29	multi	52	35	153	180	382	**56**	11	22.5	21	21	Fundal Posterior
264	Mrs. Santhana Mari	25	G2A1	82	62	282	303	1800	**292**	12	32	31	33	Fundal
265	Mrs. Nagakanni	23	primi	52	36	176	197	474	**69**	13	23	21	22	Fundal Posterior
266	Mrs. Jeyalakshmi	25	multi	74	60	270	279	1598	**248**	14	31	32	31	Anterior
267	Mrs. Kalavathi	28	multi	40	22	119	148	191	**28**	11	20	17	18	Anterior
268	Mrs. Selvi	27	primi	87	74	336	329	3029	**486**	13	38	38	37	Anterior
269	Mrs. Radha	21	multi	65	49	217	241	928	**136**	11	28	26	27	Fundal Anterior
270	Mrs. Sangeetha	24	multi	41	29	142	161	287	**42**	12	20	19	19	Fundal Posterior
271	Mrs. Karpagavalli	21	primi	85	71	312	322	2520	**397**	10	36	35	35.5	Anterior
272	Mrs. Fathima Parveen	29	primi	90	76	340	338	3121	**30**	11	38	37	38	Fundal Posterior
273	Mrs. Selvi	26	primi	64	48	212	239	883	**129**	13	26	25	26	Anterior
274	Mrs. Sankareshwari	20	primi	93	69	329	327	2764	**447**	8	37	37	37	Left Anterior
275	Mrs. Thanalakshmi	23	multi	84	70	318	315	2503	**395**	8	36	36	35	Anterior
276	Mrs. Malar	33	multi	90	72	320	327	2742	**430**	14	37	42	37	Posterior
277	Mrs. Dargila	31	primi	39	29	128	156	252	**37**	11	20	20	18.5	Anterior
278	Mrs. Muthukrishnakumari	34	G2A1	47	31	152	182	340	**50**	121	22	21	20	Anterior
279	Mrs. Shanmuga Sundari	32	multi	60	46	207	222	786	**115**	13	26	25	25	Fundal
280	Mrs. Elizabeth	28	primi	87	67	321	313	2497	**394**	12	36	34	35	Fundal
281	Mrs. Yasmin Fathima	21	multi	47	31	148	176	324	**47**	11	20	23	20	Posterior
282	Mrs. Muthulakshmi	24	G2A1	87	65	315	311	2347	**372**	7	35	34	35	Anterior
283	Mrs. Rajalakshmi	26	primi	72	55	241	269	1199	**190**	14	28	30	29	Anterior
284	Mrs. Sudha	24	multi	85	69	294	311	2190	**349**	9	35	34	34.5	Anterior
285	Mrs. Krishnaveni	30	multi	38	23	115	135	179	**26**	10	19	19	17	Fundal

286	Mrs. Sudha @ Sudali	23	primi	92	74	324	336	2781	**450**	11	37.5	37	37.5	Left Anterior
287	Mrs. Kamalini Anish	27	multi	69	56	240	258	1191	**189**	8	29	29	28.5	Right Anterior
288	Mrs. Raja Priyadharshini	24	multi	46	31	164	174	369	**54**	12	21	21	20	Anterior
289	Mrs. Maharasi	22	primi	84	65	289	314	2013	**323**	11	35	34	34	Anterior
290	Mrs. Subbulakshmi	26	G2A1	26	13	77	101	92	**3**	10	15	14	14.5	Anterior
291	Mrs. Muthulakshmi	27	G2A1	39	24	126	147	211	**31**	11	19	18	18	Anterior
292	Mrs. Subha Muthulakshmi	22	primi	92	71	329	328	2800	**453**	13	37	37	37	Right Anterior
293	Mrs. Rukmani	21	primi	45	31	154	173	319	**47**	11	20	21	20	Anterior
294	Mrs. Muppidathy	29	primi	90	75	355	327	3311	**527**	10	38	37	38	Anterior
295	Mrs. Usha	23	multi	62	44	209	221	763	**111**	11	27	26	26	Posterior
296	Mrs. Suganthi	27	primi	42	27	128	152	239	**35**	12	19	19	18.5	Anterior
297	Mrs. Maheshwari	19	multi	73	57	239	273	1249	**197**	131	30	34	29.5	Fundal Posterior
298	Mrs. Jeyalakshmi	26	G2A1	84	69	310	318	2420	**383**	13	35	34	35	Anterior
299	Mrs. Rajam	30	primi	57	42	184	212	602	**88**	11	24	24	23.5	Anterior
300	Mrs. Shanmuga Sundari	29	multi	82	69	317	312	2426	**383**	7	36	36	35	Fundal
301	Mrs. Pearly Henita	24	multi	92	71	320	331	2743	**430**	13	38	41	37	Posterior
302	Mrs. Santha	31	primi	70	52	241	264	1112	**177**	11	29	28	28.5	Anterior
303	Mrs. Siva Sakthi	23	G2A1	58	41	206	230	706	**103**	4	24	26	24.5	Anterior
304	Mrs. Uma Maheshwari	24	multi	60	42	198	216	669	**98**	10	24	25	24	Anterior
305	Mrs. Mahesh	23	primi	89	65	293	317	2099	**336**	13	35	33	35	Anterior
306	Mrs. Gandhimathi	29	G2A1	80	60	282	281	1739	**269**	18	32	31	31.5	Left Anterior
307	Mrs. Murugeshwari	26	multi	53	38	172	201	489	**71**	11	23	22	22	Anterior
308	Mrs. Angeline	31	G2A1	52	35	162	202	422	**62**	12	23	22	22	Fundal Posterior
309	Mrs. Suba	28	primi	50	36	169	194	452	**66**	13	22.5	21	21.5	Anterior
310	Mrs. Bella Godwin	30	primi	88	73	331	325	3083	**450**	121	37	36	37	Anterior
311	Mrs. Muthumari	30	multi	88	70	333	321	2788	**436**	13	36	38	36	Fundal Posterior
312	Mrs. Syed Ali	29	primi	85	71	318	321	2608	**410**	6	36	36	36	Right Anterior
313	Mrs. Shanthi	31	primi	93	71	330	333	2763	**447**	13	37	38	37	Left Anterior
314	Mrs. Balammal	25	G2A1	30	15	83	112	108	**16**	11	17	15	15	Fundal Posterior
315	Mrs. Rehka	24	primi	62	47	204	227	792	**116**	12	26	20	25	Anterior
316	Mrs. Kamala Mary	29	primi	84	67	312	319	2369	**375**	14	36	36	35	Left Anterior
317	Mrs. Thangapappa	23	multi	67	49	223	243	946	**138**	13	28	26	26.5	Fundal Posterior
318	Mrs. Mariammal	21	primi	84	68	297	309	2167	**146**	14	34	35	34	Anterior
319	Mrs. Jancy Melkis	36	multi	86	71	337	314	2751	**446**	9	36	36	36	Anterior
320	Mrs. Siva Sankari	22	G2A1	83	69	307	309	2309	**366**	11	35	37	34.5	Fundal
321	Mrs. Petchiammal	26	multi	87	67	316	317	2434	**385**	13	36	36	35	Fundal Anterior
322	Mrs. Syed Ali Fathima	26	primi	84	67	294	316	2064	**331**	11	35.5	35	34.5	Posterior
323	Mrs. Kalpana	31	multi	89	71	343	325	2909	**469**	12	37	38	37	Fundal Posterior
324	Mrs. Thanga Murugeshwari	25	primi	74	57	267	274	1476	**230**	12	31	30	30	Anterior
325	Mrs. Amma Ponnu	25	G2A1	89	71	316	313	2589	**407**	7	36	35	36	Right Anterior
326	Mrs. Kalaiselvi	26	primi	41	28	130	153	252	**37**	11	19	20	18.5	Posterior
327	Mrs. Thanga Mariammal	30	multi	50	34	170	193	422	**62**	12	23	21	21	Fundal Posterior

328	Mrs. Subbulakshmi	29	multi	55	44	189	209	640	**94**	13	24	23	23.5	Anterior
329	Mrs. Misiriya	30	primi	71	55	242	266	1173	**186**	12	29	28	29	Fundal
330	Mrs. Sudha	26	G2A1	87	69	315	318	2525	**398**	13	35.5	35	35.5	Fundal Posterior
331	Mrs. Sabana	21	multi	54	41	178	203	558	**82**	11	24	23	23	Fundal Posterior
332	Mrs. Maheshwari	28	primi	80	62	291	303	1841	**298**	12	34	33	33	Fundal
333	Mrs. Ajiesh	23	G2A1	48	34	143	179	338	**49**	11	20	21	20	Anterior
334	Mrs. Nithya	29	primi	84	64	289	309	1951	**314**	14	34	20	34	Fundal Posterior
335	Mrs. Thanga Pushpam	26	primi	46	33	154	180	362	**53**	14	20	20	20.5	Anterior
336	Mrs. Kamalini	27	primi	74	58	252	276	1367	**214**	9	31	30	30	Right Posterior
337	Mrs. Megala	27	primi	48	31	151	178	336	**214**	11	22	20	20	Anterior
338	Mrs. Uma	27	G2A1	55	38	180	202	516	**75**	10	23	23	22.5	Fundal Posterior
339	Mrs. Isai Jeyapratha	22	multi	89	71	341	330	2901	**467**	12	37.5	37	37	Fundal
340	Mrs. Christy	30	primi	28	16	93	117	117	**17**	11	18	21	15	Posterior
341	Mrs. Muthumari	21	multi	46	33	140	170	317	**46**	13	22	21	20	Anterior
342	Mrs. Selvi	30	G2A1	88	71	320	333	2690	**422**	9	37	36	37	Anterior
343	Mrs. Jeba Princy	26	multi	84	68	307	311	2290	**364**	17	35	36	34.5	Right Anterior
344	Mrs. Bagavathi	29	primi	51	39	167	188	468	**68**	11	24	22	22	Anterior
345	Mrs. Kangaiselvi	22	multi	67	56	246	259	1209	**68**	11	30	27	28.5	Anterior
346	Mrs. Deepa	26	G2A1	40	27	136	153	253	**37**	14	19	19	18.5	Anterior
347	Mrs. Subbulakshmi	26	primi	73	54	260	276	1359	**213**	14	31	30	30	Fundal Posterior
348	Mrs. Natchiyar	27	multi	87	72	326	324	2782	**435**	13	37	36	36	Anterior
349	Mrs. Sudha	18	multi	55	40	192	209	597	**87**	11	24	23	23	Posterior
350	Mrs. Anitha	21	primi	85	67	312	318	2388	**378**	14	35	34	35	Anterior
351	Mrs. Mercy	28	multi	93	72	331	341	2907	**468**	14	38	38	38	Fundal
352	Mrs. Avudaiammal	32	multi	58	41	185	215	588	**86**	12	23.5	25	23.5	Posterior
353	Mrs. Anitha Ramdoss	32	G2A1	58	42	204	219	682	**100**	11	24	25	24	Fundal Posterior
354	Mrs. Rasool Mydeen	23	primi	85	70	317	315	2555	**402**	13	36	36	35.5	Fundal Posterior
355	Mrs. Sreedevi	28	primi	78	59	286	296	1759	**271**	14	32	31	32	Right Anterior
356	Mrs. Amutha	19	primi	46	29	139	174	298	**44**	14	20.5	20	19.5	Fundal Posterior
357	Mrs. Amsath Meera	20	primi	77	56	268	281	1395	**2181**	19	30	30	29	Fundal Anterior
358	Mrs. Selvanayaki	26	G2A1	27	11	70	91	80	**12**	11	15	13	14	Anterior
359	Mrs. Livingsta	22	multi	60	43	199	222	700	**102**	12	24	26	24.5	Fundal Posterior
360	Mrs. Muthuselvi	23	primi	43	30	144	163	300	**44**	13	20	19	19	Anterior
361	Mrs. Chitra	24	multi	45	33	165	178	388	**57**	14	21.5	22	20.5	Fundal Posterior
362	Mrs. Abirami	25	primi	79	62	273	285	1730	**267**	11	32	32	32	Left Anterior
363	Mrs. Bruntha Vishu	23	primi	51	36	161	201	451	**66**	10	23	22	22	Anterior
364	Mrs. Supriya	20	primi	57	38	183	210	547	**80**	12	23	23	23	Posterior
365	Mrs. Mariammal	32	G2A1	88	69	312	318	2390	**378**	10	36	36	35	Anterior
366	Mrs. Muthulakshmi	22	multi	81	65	276	305	1891	**291**	8	34	33	33	Fundal
367	Mrs. Santhosa Parameshwar	28	multi	75	60	272	290	1692	**262**	13	32.5	31	31.5	Fundal Anterior
368	Mrs. Sudha	22	primi	70	54	232	232	1081	**173**	14	30	27	28	Anterior
369	Mrs. Shunmugathai	28	G2A1	45	33	154	171	352	**51**	11	22	19	20	Fundal Posterior

370	Mrs. Shunmugathai	39	multi	45	33	144	167	326	**48**	10	22	21	20	Anterior
371	Mrs. Rahamath kamar Nisha	20	primi	68	53	228	250	1026	**165**	11	28	29	28	Fundal Posterior
372	Mrs. Muthuselvi	23	multi	74	58	272	290	1593	**247**	12	32	33	33	Fundal Posterior
373	Mrs. Roseline	21	multi	36	21	112	139	172	**104**	13	19	19	17	Right Anterior
374	Mrs. Vimala	28	primi	59	41	208	225	714	**104**	12	24	22	22	Anterior
375	Mrs. Epsiba Marginal	22	G2A1	86	69	305	308	2313	**367**	9	36	35	35	Fundal Posterior
376	Mrs. Sahaya Rexline	28	primi	93	72	342	340	3077	**493**	13	38	41	38	Fundal Posterior
377	Mrs. Mariselvi	23	primi	89	71	335	340	2878	**464**	13	38	36	37.5	Anterior
378	Mrs. Subbulakshmi	30	primi	77	58	260	285	1486	**232**	11	32	33	31	Posterior
379	Mrs. Ashraf John	24	primi	85	68	297	313	2204	**351**	16	36	35	34.5	Right Anterior
380	Mrs. Sathya	25	primi	77	59	257	287	1476	**230**	13	32	31	31	Fundal Posterior
381	Mrs. Jeyalakshmi	21	G2A1	53	39	180	203	526	**77**	12	24	22	22.5	Anterior
382	Mrs. Muthulakshmi	28	multi	67	53	233	256	1062	**70**	11	29	28	29	Fundal
383	Mrs. Kavitha	21	multi	83	62	277	305	1889	**290**	12	34	32	33	Fundal Posterior
384	Mrs. Subha	26	primi	45	31	155	174	337	**49**	11	23	22	20	Posterior
385	Mrs. Muthuselvi	28	multi	86	70	324	320	2627	**413**	8	36	36	36	Fundal
386	Mrs. Lakshmi	30	multi	58	40	191	214	609	**89**	13	25	23	23	Anterior
387	Mrs. Parvathy	22	primi	87	68	327	317	2632	**413**	12	36	36	36	Anterior
388	Mrs. Shanthi	26	G2A1	46	35	155	181	385	**56**	11	22	20	21	Left Posterior
389	Mrs. Chermasundari	25	multi	72	55	261	272	1361	**213**	3	31	30	29.5	Posterior
390	Mrs. Saburabeevi	38	multi	64	47	215	229	861	**26**	12	27	25	26	Left Anterior
391	Mrs. Esakkiammal	30	primi	53	36	165	195	441	**64**	11	27	21	26	Fundal Posterior
392	Mrs. Usharani	29	primi	87	73	324	327	2782	**435**	12	37	37	36.5	Fundal
393	Mrs. Poomari	24	G2A1	72	55	255	266	1290	**203**	12	29	29	29	Left Anterior
394	Mrs. Nisha	22	multi	50	36	176	188	475	**69**	13	23	24	22	Fundal Anterior
395	Mrs. Esakkiammal	39	primi	53	37	167	207	465	**67**	14	24	21	22	Right Posterior
396	Mrs. Arulprabha	24	primi	69	52	226	254	984	**158**	12	29	28	27.5	Anterior
397	Mrs. Syed Ali Fathima	31	primi	61	46	216	231	841	**123**	13	27	26	25.6	Right Anterior
398	Mrs. Selvakumari	25	multi	53	35	170	193	467	**68**	11	23.5	21	22	Anterior
399	Mrs. Subbulakshmi	25	multi	43	32	141	166	303	**44**	12	20.5	20	19.5	Anterior
400	Mrs. Twinkle Geojini	27	primi	51	39	159	193	446	**65**	11	24	21	22	Right Anterior
401	Mrs. Venila	21	primi	75	56	256	278	1341	**210**	10	31	24	30	Left
402	Mrs. Muthuselvi	25	multi	74	58	280	282	1637	**254**	13	32	30	31	Anterior
403	Mrs. Vasantha	26	multi	66	47	2919	242	909	**133**	10	27	26	26.5	Posterior
404	Mrs. Kamalini	27	multi	79	61	286	297	1849	**285**	8	33	32	32	Fundal Right
405	Mrs. Sheetal	29	primi	58	44	193	213	663	**97**	15	25	24	24	Anterior
406	Mrs. Muthumari	22	primi	89	69	321	320	2621	**412**	13	36	33	36	Left Anterior
407	Mrs. Kaviarasi	25	G2A1	40	29	148	151	291	**43**	12	19	19	19	Posterior
408	Mrs. Deepa	32	primi	90	73	327	328	2784	**450**	13	36	36	37	Anterior
409	Mrs. Ponmani	18	G2A1	60	43	188	223	639	**93**	11	25	24	24	Anterior
410	Mrs. Mohamec Sabeena	23	primi	86	66	313	307	2351	**373**	5	37	37	36.5	Fundal
411	Mrs. Anitha	27	primi	80	61	280	307	1785	**275**	11	33	31	32.5	Anterior

412	Mrs. Nathiya	25	multi	70	52	223	264	978	**157**	11	28	26	28	Fundal Posterior
413	Mrs. Ancy rani	25	G2A1	81	67	311	303	2291	**364**	13	35	35	34	Fundal
414	Mrs. Sudha	24	multi	73	55	255	263	1103	**176**	14	30	30	28	Fundal Posterior
415	Mrs. Bama Rukmani	29	primi	83	65	305	311	2232	**355**	16	35	30	34	Anterior
416	Mrs. Thangasivanthi	33	multi	58	40	183	209	564	**52**	14	24	21	23	Anterior
417	Mrs. Mahalakshmi	25	primi	89	68	311	321	2437	**385**	10	36	37	35.5	Fundal
418	Mrs. Esakkivadivoo	22	G2A1	58	37	185	217	537	**78**	11	24	23	23	Fundal Posterior
419	Mrs. Maheshwari	24	multi	44	35	158	174	384	**56**	10	20	22	20	Fundal Posterior
420	Mrs. Ellammal	31	primi	53	40	185	213	579	**85**	11	24	24	23	Anterior
421	Mrs. Kalaiselvi	25	primi	82	61	283	296	1716	**265**	15	32	33	32	Anterior
422	Mrs. Stella	30	G2A1	95	76	358	342	3524	**558**	15	39.5	39	39.5	Anterior
423	Mrs. Rengu Indira	22	multi	42	30	143	164	300	**44**	14	21	19	19	Anterior
424	Mrs. Thenmathy	20	multi	91	72	341	338	3016	**484**	12	37	39	38	Fundal Posterior
425	Mrs. Kalaiarasi	33	mmm	48	34	163	183	403	**59**	13	20	20	21	Anterior
426	Mrs. Jeba Princy	26	G2A1	92	74	361	336	3355	**534**	11	38	39	38.5	Right Anterior
427	Mrs. Srijothi	25	primi	21	8.4	60	77	63	**9**	14	12	13	13	Posterior
428	Mrs. Neetu	26	multi	33	17	99	121	130	**19**	15	16	17	16	Posterior
429	Mrs. Vasanthi	21	primi	53	38	187	197	536	**78**	13	24	23	22.5	Fundal Posterior
430	Mrs. Alagulakshmi	20	primi	89	71	315	326	2628	**413**	13	35	35	36.5	Anterior
431	Kavitha	22	G2A1	59	42	190	224	647	**95**	12	24	24	24	Anterior
432	Mrs. Muthumari	25	primi	64	45	212	247	833	**122**	10	25	26	26	Anterior
433	Mrs. Asha	25	multi	87	67	302	318	2267	**460**	8	34	34	35	Fundal Posterior
434	Mrs. Shajitha	25	G2A1	50	38	178	192	488	**71**	11	22	22	22	Fundal Anterior
435	Mrs. Krishnaveni	32	multi	84	66	319	306	2376	**376**	15	33	35	34.5	Anterior
436	Mrs. Mallika	33	primi	50	33	169	181	404	**59**	14	22	23	21	Anterior
437	Mrs. Vidhya Venkat	21	primi	48	36	164	181	422	**62**	13	22	20	21	Anterior
438	Mrs. Selvakani	25	G2A1	48	36	161	176	402	**59**	12	22	21	21	Anterior
439	Mrs. Shanmuga Sundari	19	primi	49	37	179	197	498	**73**	5	23	21	22	Right Anterior
440	Mrs. Stella	24	multi	53	35	159	189	406	**58**	13	23	21	21.5	Anterior
441	Mrs. Jeyachitra	25	primi	90	70	332	327	2751	**445**	13	36	37	37	Right Anterior
442	Mrs. Poomani	26	multi	40	29	139	161	280	**41**	14	21	19	19	Anterior
443	Mrs. Jeyalakshmi	21	G2A1	49	36	158	182	408	**60**	11	22	21	21wks	Posterior
444	Mrs. Sathya Priya	28	primi	59	44	182	210	616	**90**	12	22	25	21	Posterior
445	Mrs. Aswini	28	primi	44	35	156	171	379	**55**	11	22	23	20	Posterior
446	Mrs. Anish Fathima	20	multi	85	69	308	317	2379	**377**	10	35.5	35	35	Left Anterior
447	Mrs. Sudha	34	G2A1	50	34	162	174	391	**57**	15	22	21	21	Anterior
448	Mrs. Alagumari	23	multi	42	32	142	162	215	**31**	10	20	20	19.5	Anterior
449	Mrs. Jansirani	27	primi	72	49	234	264	1018	**163**	13	29	30	28wks	Fundal Posterior
450	Mrs. Vidhya	19	primi	84	63	279	303	1809	**293**	12	33.5	32	33wks	Right Anterior