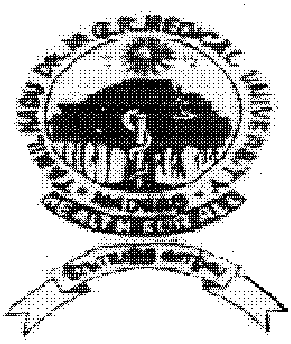
"PREDICTION OF PRETERM LABOUR BY ESTIMATING THE CERVICAL LENGTH AT MID-GESTATION BY TRANSVAGINAL SONOGRAPHY IN TWIN PREGNANCIES"

Dissertation submitted to

The Tamil Nadu Dr. M.G.R. Medical University

in partial fulfilment for the award of the Degree of

M.D. (OBSTETRICS AND GYNECOLOGY)
BRANCH-II



THE TAMIL NADU Dr.M.G.R.MEDICAL UNIVERSITY
INSTITUTE OF SOCIAL OBSTETRICS,
GOVT KASTURBA GANDHI HOSPITAL,
MADRAS MEDICAL COLLEGE & HOSPITAL.
MARCH 2012

BONAFIDE CERTIFICATE

This is to certify that this dissertation entitled **"PREDICTION OF PRETERM LABOUR BY ESTIMATING THE CERVICAL LENGTH AT MID-GESTATION BY TRANSVAGINAL SONOGRAPHY IN TWIN PREGNANCIES"** is the bonafide work done by Dr. DEEPA LAKSHMI.M., post graduate in obstetrics and gynaecology under my over all supervision and guidance in the Institute of Social Obstetrics, Kasturba Gandhi Hospital, Madras medical college Chennai, in partial fulfillment of the requirements of The Tamil Nadu Dr.M.G.R.University for the award of M.D DEGREE in Obstetrics and Gynaecology BRANCH - II.

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CERTIFICATE

This is to certify that the dissertation entitled “PREDICTION OF PRETERM LABOUR BY ESTIMATING THE CERVICAL LENGTH AT MID-GESTATION BY TRANSVAGINAL SONOGRAPHY IN TWIN PREGNANCIES” is a bonafide work done by **Dr. DEEPA LAKSHMI.M.** at **Madras Medical College, Chennai.** This dissertation is submitted to Tamilnadu Dr. M.G.R. Medical University in partial fulfillment of University rules and regulations for the award of M.D. degree in Obstetrics and Gynaecology.

INSTITUTIONAL ETHICAL COMMITTEE
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CERTIFICATE OF APPROVAL

To
Dr. Deepa Lashmi .M
PG in MD Obstetric & Gynaecology
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Dear Dr. Deepa Lakshmi .M

The Institutional Ethical Committee of Madras Medical College reviewed and discussed your application for approval of the project / proposal / clinical trail entitled " Prediction of Spontaneous Preterm Delivery in Twin pregnancies By Cervical Length at Mid – Gestation by transvaginal sonogram" " No 62082010.

The following members of Ethical committee were present in the meeting held on 24.08.2010 conducted at Madras Medical College, Chennai -3.

1. Prof. S.K. Rajan, MD	-- Chairperson
2. Prof. J. Mohanasundaram, MD,Ph.D,DNB Dean, Madras Medical College, Chennai -3	-- Deputy Chairman
3. Prof. A. Sundaram, MD Vice Principal , MMC, Chennai -3	-- Member Secretary
4. Prof R. Nandhini, MD Director, institute of Pharmacology, MMC, Ch-3	-- Member
5. Prof. C. Rajendiran , MD	-- Member
Director, Institute of Internal Medicine, MMC, Ch-3	-- Member
6. Prof. Md. Ali, MD, DM	-- Member
Professor & Head ,,Dept. of MGE, MMC, Ch-3	-- Member
7 Prof. Shantha Ravishankar, MD Professor of Neuro Pathology, MMC, Ch-3	-- Member
8. Tmt. Arnold Soulina	-- Social Scientist

We approve the trail to be conducted in its presented form.

Sd /. Chairman & Other Members

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

Member Secretary, Ethics Committee

CONTENTS

1. INTRODUCTION

Preterm birth is a major public health problem in terms of perinatal mortality, long term morbidity and health economics. It is the leading cause of perinatal morbidity in India. It is responsible for more than half of all neonatal deaths. The economic burden of prematurity relates not only to initial neonatal intensive care but also to the longer term, increased use of medical, social and specialist educational services, as well as the lost economic productivity.

Despite advancing knowledge of the risk factors and mechanism associated with preterm labour and delivery, the preterm birth rate has risen. This increase has been explained in part by a rise in the number of preterm delivery of multiple pregnancies that occurred as a result of assisted reproductive technologies.

Overall, twin pregnancies comprise 15% of all preterm births accounting for a disproportionate share of preterm births. Therefore, there is an urgent need to develop cost-effective tests for the prediction of preterm birth in twin pregnancies. The ability to identify women at high risk for spontaneous preterm birth could allow for patients to undergo

targeted interventions such as transfer to a tertiary care centre, antenatal corticosteroid administration and tocolysis, which might improve perinatal outcomes among twins. Previous reviews have suggested that transvaginal sonographic assessment of cervical length is an effective tool for predicting preterm birth, particularly in asymptomatic women or those at a higher risk of spontaneous preterm birth.

Preterm birth is defined as the onset of labour in patients before 37 weeks in pregnancy beyond 20 weeks of gestation. Preterm birth is associated with 80% of perinatal morbidity and 70% mortality, for infants born without congenital anomalies. About 66% of preterm birth occurs due to preterm labour and 10% results from preterm prelabour rupture of membranes. The remaining 24% are due to medical or obstetric complications. The incidence of preterm labour in twin gestation is 54.9%.

2. AIM OF THE STUDY

The aim of our study is to evaluate the co-relation of the cervical length measured by transvaginal sonography at 20-24 weeks of gestation in twin pregnancies and to follow them up until delivery to assess role of cervical length as a predictor of preterm labour.

3. OVERVIEW

ANATOMY OF CERVIX

The word ‘cervix’ is derived from the Latin word ‘cervix uteri’, meaning ‘neck of the womb’. It is the lower narrow and cylindrical portion of the uterus, which enters the vagina and at the right angles to it. The ectocervix is the portion projecting into the vagina also knows as ‘portiovaginalis’, is convex and elliptical. It measures 3 cm long and 2.5 cm wide. Its opening is called the external os. The size and shape of external os and ectocervix varies with age, hormonal state, and whether the woman has had a vaginal birth.

The endocervical canal is the passage way between the internal os and the uterine cavity. It varies in length and width. Approximately measures 7 to 8 mm at its widest in reproductive aged women.

The internal os is the termination of the endocervical canal inside the uterine cavity.

HISTOLOGY OF THE CERVIX

The ectocervix is composed of keratinized squamous epithelium. The endocervix is composed of simple columnar epithelium[1]. The area adjacent to the border of the endocervix and ectocervix is known as the transformation zone. The transformation zone undergoes metaplasia when the endocervix is exposed to vagina, pregnancy and also when the ectocervix enters the uterine cavity. Nabothian cysts[2] are often found in the cervix.

PHYSIOLOGICAL CHANGES OF CERVIX IN PREGNANCY

During the first trimester, the isthmus hypertrophies and elongates to about 3 times its original length. With advancing pregnancy beyond 12 weeks, it progressively unfolds from above, downwards until it is incorporated into the uterine cavity.

DEFINITION

Preterm labour is defined as the onset of regular, painful, frequent, uterine contractions causing progressive effacement and dilatation of cervix occurring before 37 completed weeks of gestation from the first day of last menstrual period[3].

INCIDENCE

The incidence of preterm labour in developed countries is between 5% to 10%.

AETIOLOGY AND RISK FACTORS[4]

In 20 to 40% of cases, there is no identifiable cause i.e., idiopathic. It is called spontaneous preterm labour (Subclinical infection may be the cause in some of these cases).

In nearly half of these patients there are 2 or more causes suggestive of multi factorial origin of the disorder.

Various risk factors associated with preterm labour are as follows:

A. Demographic risk factors:

Age	:	<18 yrs and >40 yrs. Lumley et al., 1993 reported high incidence of preterm delivery in women under 20 years and over 35 years.
Race[5]	:	Nonwhite in USA.
Socio Economic status	:	Low socioeconomic status.
Education	:	Low education.
Small stature	:	Height< 145 cm.
Weight	:	Underweight. Hickey and colleagues, 1995 have shown low maternal prenatal weight gain specifically associated with preterm birth.

B. Behavioral factors:

Smoking[6], tobacco chewing,

Mental stress[7]

Substance abuse- alcohol, cocaine- Bakketing and Hoffman (1981) reported higher incidence of preterm labour.

Poor nutrition,

Excessive physical activity,

Coitus in last trimester[8].

C. Obstetric risk factors:

Past history- h/o preterm labour (16-41%), second trimester abortion, h/o recurrent abortion, difficult delivery (cervical trauma).

Over distension of uterus- multiple pregnancy[9], Hydramnios,

Fetal causes – IUFD, fetal anomalies, malpresentation, Rh isoimmunization.

Congenital uterine anomalies (1-3%) - septate uterus, unicornuate, bicornuate, cervical incompetence,

Premature rupture of membranes,

Grand multipara,

APH, vaginal bleeding in early pregnancy.

D. Medical causes:

Anemia, liver disease, asthma, PIH, renal disease, tuberculosis, cardiac disease, diabetes, hyperthyroidism, hyperpyrexia, malaria.

E. Infections[10]:

Chorioamnionitis[11] (20-30%) Bobitt and Ledger first suggested that unrecognized Chorioamnionitis may be related to preterm labour. Colonization with Chlamydia trachomatis (Martin et al., Harrison et al.,) [12] Mycoplasma hominis (Klein et al., Harrison et al.,) [13] Ureaplasma urealyticum, Gonorrhea (Edward et al.,) [14] are associated with preterm labour.

Asymptomatic bacteriuria,

Acute appendicitis,

Bacterial vaginosis, [15]

Gastroenteritis,

Intrauterine infection by viruses, bacteria, Chlamydia, protozoa.

F. Iatrogenic:

Elective premature induction due to fetal or maternal indication,

Induction with wrong estimation of gestational age.

G. Miscellaneous:

Abdominal surgery during pregnancy, severe trauma,

Drugs e.g. quinine.

PATHOGENESIS

All the above factors initiate a cascade of mechanism, by increasing the cortisol levels. Cox and colleagues[16] (1992) found that cytokines[17] (IL-1, IL-6 and IL-8, TNFα) are released when there is inflammatory response to infection. Twin pregnancies mainly contribute by increasing mechanical stretch, IL-8, gap junction and Prostaglandin synthetase[18]. These act on chorion, amnion and deciduas to release inflammatory mediators like PGE, PGF2α, TXA2, proteases, collagenases, leucocyte elastase and decreases the PG deydrogenase ultimately resulting in myometrial contractions, cervical ripening and preterm labour. The role of oxytocin and prostaglandin is still unclear[19].

PREDICTORS OF PRETERM BIRTH:

A. WARNING SIGNALS[20]:

Menstrual like cramps,

Low dull backache,

Abdominal cramps,

Feeling of pelvic pressure or heaviness in the vagina,

Increase/change in vaginal discharge: glairy mucoid.

B.TRANSVAGINAL SONOGRAPHY[21]

The patients in whom cervical length < 2.5 cm funneling or widening of cervical canal, (Y, V, U shape), bulging of membranes in cervical canal and thinning of lower uterine segment are noted; they are high risk for preterm labour. Leveno[22] and associates found that one fourth of women whose cervices were dilated 2-3 cms between 26 and 30 weeks delivered before 34 weeks.

This study analyses the value of transvaginal sonographic cervical length for the prediction of spontaneous preterm birth in women with twin pregnancies through the use of formal methods for systematic reviews and Meta analytical technique.

The application of transvaginal sonography for cervical length has emerged as a recommendation by the American college of Radiology,

that the cervix and lower uterine segment be imaged as part of every obstetric examination in the second trimester.

C.BIOCHEMICAL MARKERS:

1. **Fetal fibronectin[23]:**

   It is a glycoprotein produced in 20 different molecular forms by hepatocytes, fibroblast, endothelial cells, and fetal amnion. It is concentrated in amniotic fluid and the extra villous tropho decidual interface. The substance is expressed in cervicovaginal secretions during the first 20 weeks of pregnancy, disappears from the secretions after this period and does not normally reappear until spontaneous rupture of membranes at term. Fetal fibronectin value of >50 ng/ml estimated by ELISA is considered as a positive predictor of preterm labour. Lockwood (1991) and co-workers reported that the presence of fetal fibronectin as a predictor of preterm delivery before 37 weeks had a sensitivity of 92.6%, and a specificity of 51.7%,a positive predictive value of 46.3% and a negative predictive value of 93.9%.

2. **Salivary estriol:**

   A value of more than 2.3 ng/ml predicts preterm labour.

3. **Phosphorylated insulin like growth factor binding protein-1.**
4. **Serum Collagenases.**
5. **Tissue inhibitor of metalloproteinase (TIMP).**
6. **Relaxin.**
7. **Corticotrophin releasing hormone (CRH).**
8. **Mediators of inflammation and infection.**

a) **C-Reactive Protein**[24].
b) **Leucocyte esterase.**
c) **Cytokine.**
d) **Amniotic fluid glucose concentration.**
e) **Zinc.**
f) **Lipocortin – 1.**
g) **Positive cultures.**

D.HOME UTERINE ACTIVITY MONITORING[25]:

Contractions are recorded by telemetry twice a day. It is costly and not easily available equipment. However it is not useful reducing the incidence of preterm labour.

E.FOETAL BREATHING MOVEMENT:

Absence of fetal breathing movements detected on real time ultra sonogram suggests that patients are likely to go in preterm labour within 48 hours.

F.RISK SCORING SYSTEM[26]:

Papiernick (1974) evolved an elaborate scoring system for detection of patient's high risk for spontaneous preterm labour. It was modified by Creasy et al. It is based on socioeconomic factors, previous medical history, daily habits and some aspects of current pregnancy. Score of 10 or more are considered to be at high risk for preterm labour.

ACOG CRITERIA:

ACOG (1997) criteria to diagnose preterm labour:

Contractions of 4 in 20 minutes or 8 in 60 minutes with progressive change in the cervix,

Cervical dilatation more than or equal to 1 cm,

Cervical effacement more than or equal to 80%

PREVENTION OF PRETERM BIRTH:

1. Improvement of socioeconomic condition.
2. Patient education- prepregnancy counseling particularly in high risk patients (regarding warning signals).
3. Identification and correction of risk factor whenever possible-1. Proper nutrition, 2. Avoidance of smoking, alcohol, 3. Adequate rest-avoidance of physical and mental stress, 4. Control of medical diseases, 5.cervical encirclage in proved case of cervical incompetence.
4. Any operation in pregnant woman is planned during second trimester if possible.
5. Proper assessment before induction of labour to avoid iatrogenic prematurity.
6. Treatment of vaginal and cervical infections and asymptomatic bacteriuria during pregnancy should be adequately done. Bacterial vaginosis increases the risk of preterm labour.
7. Coitus late in pregnancy should be avoided. Seminal prostaglandin and female orgasm increases uterine contractions. Also there is increased risk of amniotic fluid infection.

8. Prophylactic tocolysis, even though commonly practiced, is not indicated.
9. Cervical Encerclage[27]- A short cervix diagnosed by ultrasound in asymptomatic women may be an indication for cerclage. The role of cervical cerclage for the prevention of preterm delivery is now disputed as cerclage has an inherent risk which actually increases preterm labour by increasing the pericervical inflammation or infection.
10. Progesterone[28] Weekly intramuscular administration to women at high risk for preterm labour resulted in lower rates of preterm birth and perinatal mortality when compared to placebo. The dose used was 250 mg of 17-hydroxy progesterone caproate intramuscularly every week from 20 to 36 weeks.

DIAGNOSIS OF PRETERM LABOUR

1. Symptoms of preterm labour.
2. Pelvic examination.
3. Ultra sonogram[29].
4. Toco cardiographs.

MANAGEMENT OF PRETERM LABOUR

1. **Bed rest and hydration**[30]**.**
2. **Steroid**[31]**.**

In 1994, a National Institute of Health Consensus Development Panel recommended corticosteroids for fetal lung maturation in preterm labour. Since then, there has been nearly universal acceptance and implementation of these recommendations.

Recommended regimens includes a single course of two doses of 12 mg of betamethasone given intramuscularly 24 hours apart, or four doses of 6mg of dexamethasone given intramuscularly 12 hours apart.

All pregnant women between 24 and 34 weeks of gestation who are at risk of preterm delivery within 7 days should be considered candidates for antenatal corticosteroids.

Although benefit on neonatal outcome is maximum between 24 hours and 7 days after initiation of therapy, steroids confer significant survival advantages even when delivery occurs within 24 hours. Therefore treatment should not be withheld when delivery is probable within 24 hours.

3. **Tocolysis**[32].

Tocolytics are the drugs which inhibit uterine activity.

a. BETA SYMPATHOMIMETICS

Rucker in 1925 noted that small doses of epinephrine inhibited uterine hyperactivity

I generation: Isoxsuprine, orciprenaline, Isoprenaline

II generation: Ritodrine[33],Terbutaline[34], Fenoterol

Unfortunately in terms of clinical effectiveness the inhibition of contractions by β adrenergic agonists is often short lived.

b. MAGNESIUM SULPHATE[35]

$MgSO_4$ uncouples the depolarization contraction Coupling (Elliott, 1983)

Therapeutic level for both indications is 4-8 mmol per litre.

c. PROSTAGLANDIN SYNTHETASE INHIBITORS

Drugs like aspirin, indomethacin[36] are used as an alternative to β agonist to prevent preterm labour in patients with cardiac disease and hyperthyroidism. Not routinely used because of fear of PDA closure and pulmonary hypertension in fetus.

d. CALCIUM CHANNEL BLOCKERS[37]

They are heterogeneous group of organic compounds that inhibit the influx of extracellular calcium across the cell membrane during inward calcium current of action potential. They also inhibit the release of intracellular calcium from the sarcoplasmic reticulum. Thus they reduce the tone of smooth muscles. The commonly used drug Nifedipine is a potent inhibitor of myometrial contractions in non pregnant, pregnant and post partum uterus.

e. OXYTOCIN ANTAGONIST (ATOSIBAN)[38]

There will be increase in myometrial oxytocin receptors in labour. This analogue competitively blocks the oxytocin receptors and inhibits preterm labour. RCOG guidelines suggest that if tocolytics are administered, the first choice should be oxytocin antagonists or Nifedipine. But compared with other tocolytics atosiban therapy is expensive.

EVOLUTION OF SONOGRAPHY

One of the pioneers of medical use of ultrasound was introduced by the Scottish physician, Ian Donald. His article “Investigation of

abdominal masses by Pulsed Ultrasound" was published in "The Lancet" in 1958.

He was an obstetrician with interest in machines and electronics. Along with Tom Brown he invented and constructed the prototype of the first Compound B Mode Contact Scanner. Professor Donald introduced several diagnostic techniques in obstetrics and gynaecology which are till today in use such as the measurement of fetal biparietal diameter.

Today, ultrasound is a sophisticated computer integrated tool. Its use has extended from obstetrics, as in the early days, to image almost every organ system of the body resolving structures down to couple of millimeters in size. Additionally, it has the advantages of involving no ionizing radiation, has no known side effects, is readily available, relatively cheap, non invasive and portable.

CERVICAL EXAMINATIONS

MANUAL CERVICAL EXAMINATION:

The manual assessment of cervical length is subjective and has poor intraobserver variability (Ann J Obstet gynaecol 1995; 173:942-

945). The cervix starts to shorten and dilate at the internal cervical os. The main drawback of the examining finger is the inability to evaluate this part of the internal cervical os. Rozenburg et al., have stopped utilizing digital examination on patients with symptoms of preterm labour. Hence the limitations of these subjective evaluations led to the use of sonography as potentially more objective for examination of cervix.

SONOGRAPHIC CERVICAL EXAMINATION:

The principle of imaging involves a sound wave when strikes an object, it echoes back. By measuring these echo waves, it is possible to determine how for the object is and its size, shape and consistency.

Advantages of ultrasound:

- It is noninvasive and painless.
- It is widely available, simple and less expensive than other imaging modalities.
- It does not use any ionizing radiation.
- It is preferred imaging modality for diagnosis and monitoring of pregnant woman and their unborn baby.
- Gives a clear picture of soft tissue that do not inhibit on x- ray.

- Makes a good tool for minimal invasive technique.

Disadvantages of ultrasound:

- It is not an ideal imaging technique especially when organs are obscured by the bowel.
- Obesity causes poor quality imaging.

TRANSABDOMINAL ULTRASOUND

The women were asked not to void for 1 to 2 hours prior to examination, but an over distended bladder was not required. The patient is positioned lying on the examination table. A clear water-base gel is applied to the area of the skin to secure contact with the transducer. It also minimizes or removes the air pocket .The scans were performed using 3.5 MHz curvilinear probe.

The uterine cervix is best visualized when the bladder is full because this provides an acoustic window. Visual beam is achieved in 86% patients with a full bladder and is reduced to 46% with partial bladder fullness. An over distended bladder fairly increases the cervical length by compressing the lower segment, in addition it may create false funneling.

Limitations:

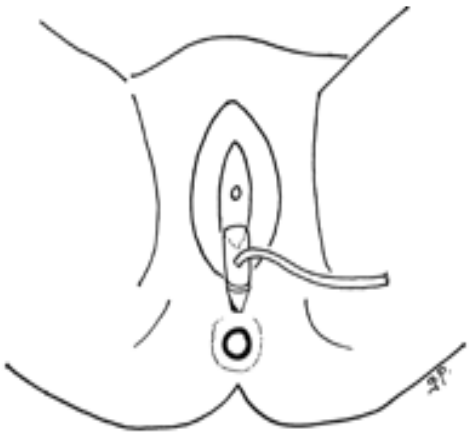
- Over distension of maternal bladder
- The fetal structures which obscures the visualization of the cervix
- The position of the cervix, if retroverted is more difficult
- Maternal habitués like obesity, polyhydramnios and scarred abdomen.

TRANSLABIAL SONOGRAPHY[39, 40]

Tran labial approach is well tolerated by the patient. Partial bladder fullness assists visualization of the cervix. Kirtzman *et al* showed a good correlation between cervical length measurements obtained using transvaginal& transperineal methods.

Limitations:

- Technical factors
- Full bladder and fluid in the vaginal vault mistaken for the cervix
- Poor penetration or too small field of view
- Scan angle
- Bowel gas, cervical cysts, pericervical veins.

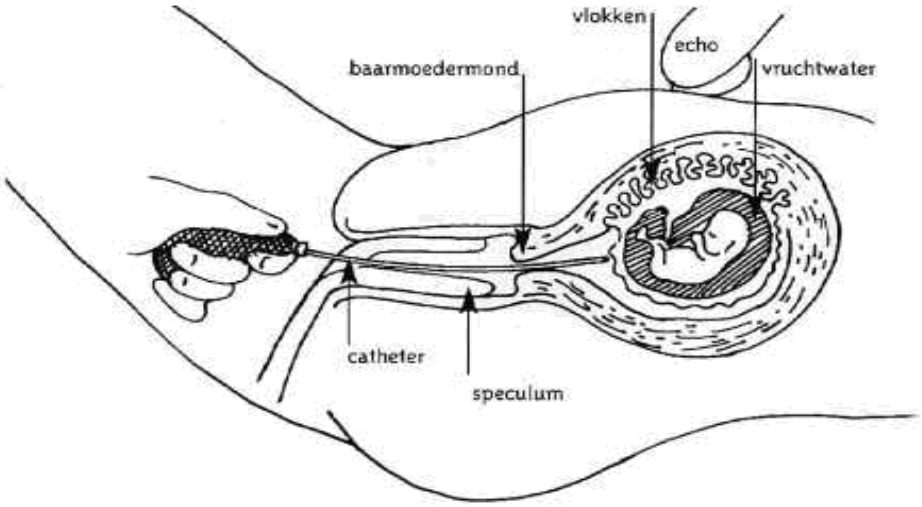


TRANSVAGINAL SONOGRAPHY[41]

The transvaginal sonogram is performed similar to gynaecologic examination. However it is more comfortable than a manual gynaecologic examination. It is a simple, cost-effective, reproducible and reliable method to assess and predict the risk of preterm delivery.

Limitations:

- Incomplete or failure to empty the maternal bladder is associated with false measurement.
- Increased pressure on the vaginal probe.
- Any polyp, fibroid, cervical growth, that obscure proper imaging.
- A poorly developed lower uterine segment.



To reduce the intra-observer variability and improve reproducibility of cervical length measurements, the following conditions are suggested

The internal os is often visualized as a flat dimple or an isosceles triangle.

The whole length of the cervix is visualized.

The external os appears symmetric.

The distance from the surface of posterior lip to the cervical canal is equal to the distance from the surface of the anterior lip to the cervical canal.

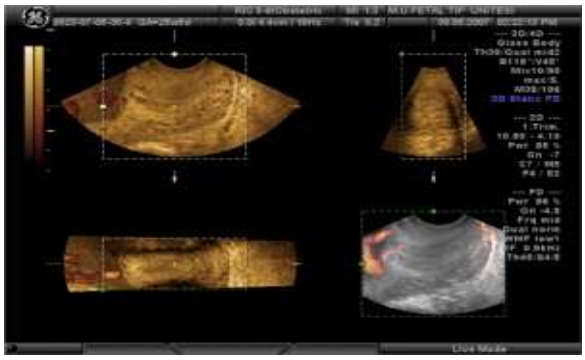
These conditions when met, ensures visualization of the entire cervix and placement of only minimal pressure on the cervix by the transducer (which may falsely include cervical length and create false funneling. Rust et al., have found that, a funnel is a significant risk for preterm labour, But the study had a small sample size and was retrospective in nature. Additional prospective studies will be required to substantiate it.) Using these guidelines, the intra-observer variability decrease from 3.04 to 1.24mm.

Newer modalities such as 3D ultrasound to calculate the cervical volume and blood flow which also includes, Power Doppler angiography (PD) and The Virtual Organ Computer-aided Analysis (VOCAL)

Bega et al., suggested that 3d ultrasound has a more complete assessment of cervix than 2d ultrasound.

Farrel et al., have shown that application of 3D ultrasound volume estimation of the non pregnant cervix is unreliable and inaccurate. But the results of their study cannot be applied to pregnant cervix.

Horreli et al., studies showed a good correlation between cervical length and cervical volume without difference between normal cervix and short cervix group but could not substantiate the benefit of the volume assessment of cervix as compared to length measurement. However presently, the volume and vascularity assessment of the cervix should be considered experimental.



4. REVIEW OF LITERATURE

Leitich et al, pointed that mean cervical lengths are shown to differ in different population, consequently, it may be more appropriate to define reference value of cervical length for the appropriate population.

Hetzberge et al using transvaginal ultra sonogram showed that there was increase in cervical length as gestational age increases. The increase in cervical length with increasing gestational age compare favorably with the results of other researchers too.

Beyond the gestational age of 35- 39 weeks, there is decline in the rate of increase in cervical length- Brieger and co authors which showed that cervical length follows a normal distribution.

Lawson explained that in multiparous and also many primiparous of black descent, the fetal head descent is delayed and hence the cervical measurement by transvaginal ultrasonography may be varied.

Klein k and colleagues estimated cervical length in 262 women in twin pregnancies. Their results showed that there was a significant correlation between cervical length 0f <25 mm and spontaneous delivery before 34 weeks (50%vs13%, p=0.007). They concluded that the risk of

severe preterm delivery in twins is high. Cervical length at mid-gestation was the only predictor of delivery before 34 weeks; our study also proves the same.

Imseis HM Albert TA, lams JD and colleagues conducted a study in identifying twin gestation at low risk for preterm birth with a transvaginal sonographic cervical measurement at 24 to 26 weeks gestation in 85 women .The mean cervical length those delivered at ≥ 34 weeks gestation without intervention (36.4+-5.8 mm) was significantly greater p< 0.0001. Thus women with cervical length >35 mm were identified as low risk for delivery before 34 weeks gestation.

Fuchs and colleagues study by measuring cervical length by transvaginal sonography in 81 women with twin pregnancies presenting with regular and painful uterine contractions at 24 – 36 weeks of gestation .The delivery within 7 days of presentation occurred in pregnancies that was inversely related to cervical length. They concluded that the sonographic measurement of cervical length helped to distinguish those women who deliver within 7 days or not.

Bergelin L.Valentin conducted a study on 20 women with twin pregnancies .The cervical length and width were measured, the internal cervical os was assessed being open or closed, and any dynamic cervical changes were noted with transvaginal sonogram every week from 24 weeks of gestation until delivery. They concluded that pattern of cervical changes from 24 weeks gestation to delivery differ between twin pregnancies delivery pattern (at 32 – 35 weeks) and at term (≥ 36 weeks). In twin pregnancies delivered preterm cervical shortening is more rapid, the cervix does not broaden to the same extent as in twin delivered at term, an open internal cervical os and dynamic cervical changes are seen earlier in gestation.

In a study conducted by J.L Gibson and co-authors which evaluated prospectively the cervical measurement and fetal fibronectin detection as predictor of spontaneous preterm delivery in an unselected population of twin pregnancies. This study confirms the value of transvaginal sonogram accuracy of cervical length as a predictor of preterm delivery in twin pregnancies. However, the poor sensitivity of this test makes it unreliable as a single predictor of preterm delivery.

Fetal fibronectin does not identify twin pregnancies destined to deliver prematurely.

L.Sperling and colleagues published their work on identification of twins at low risk of spontaneous preterm delivery by measuring the cervical length at 23 weeks gestation in 383 twin pregnancies. They recommended that a cut off 25 mm to be taken, as a predictor for spontaneous preterm in twin pregnancies.

The cervical length to predict preterm birth was noted by Anderson et al., The cervical changes in length and width as pregnancy progresses seem to be similar in nulliparous and multiparous women. In twin pregnancies, the cervical length decreases with advancing gestation- Berglin and Valentin et al.,

Conosenti et al., and Cas valho et al., studied unselected pregnant population (that included both singleton and multiple pregnancies), whose results showed cervical length at 11-15 weeks cannot predict preterm delivery and cervical length tends to shorten sometime after 15 weeks of gestation in women who delivered preterm, (because the lower uterine segment may not have developed, a short cervix is difficult to

identify at less than 14 weeks. The bladder reflection has generally been considered the boundary between the lower uterine segment and cervix).

Only one systematic review which included 14 studies involving 159 women has evaluated the accuracy of transvaginal sonographic cervical length in predicting spontaneous preterm birth in twin pregnancies- Honest et al.

Gordon et al., study included 125 women with twin pregnancies were randomly assigned to undergo a transvaginal sonographic cervical length measurement and a cervical digital examination every 4 weeks starting at 16-20 weeks until 28 weeks gestation. Women who underwent transvaginal sonographic cervical examination were treated with predetermined with the use of bed rest and cerclage there was no significant difference between the control and test group.

Newman RB, Gill PJ, Katz Ms- This study was on prelabour uterine activity was monitored daily in a group of ambulatory outpatients who were delivered at term. The study included 22 patients with one fetus and 18 with twin gestations. The mean weekly frequency of uterine activity during twin gestations was found to be significantly higher throughout pregnancy than that identified during pregnancies with a

single fetus. In twin gestations a gradual significant rise in frequency of contractions could be observed with advancing gestational age.

Nathan S. Fox, Andrei Rebarber, Chad K. Klauser, Danielle Peress, Christine V. Gutierrez, Daniel H. Saltzman- This study evaluated the change in cervical length as a predictor of preterm birth in asymptomatic twin pregnancies. It was a historical cohort. The patients in the shortened cervical length group had a significantly higher rate of spontaneous preterm birth <28 weeks, <30 weeks, <32 weeks, and <34 weeks. This study concluded that in twin pregnancies, a cervical length that decreases by 20% over 2 measurements is a significant predictor of very preterm birth, even in the setting of a normal cervical length. Serial cervical length measurements should be considered in twin pregnancies, starting <24 weeks.

Am J Obstet Gynecol. 2000;183:1103–7 . Soriano D, Weisz B, Seidman DS, Chetrit A, Schiff E, Lipitz S, Achiron R- This study included identification of the risk factors for preterm birth in primigravida with twin gestation and the role of transvaginal ultrasonography assessment of the cervix. 54 twin pregnancies were prospectively enrolled. Multiple logistic regression analysis was used to

evaluate the association between the length of the cervix at 18-24 weeks of gestation and outcome variables, controlling for possible confounding factors. This study concluded that there was no statistically significant difference between women who delivered before or after 34 weeks of gestation in regard to maternal age, body mass index (BMI), weight gain in pregnancy, smoking and work during pregnancy. The mean cervical length of patients who delivered before 34 weeks of gestation (30.1 +/- 6.1 mm) was significantly shorter than that of women who delivered after 34 weeks of gestation (42.2 +/- 6.2 mm; P < 0.001). Cervical length longer than 35 mm predicted delivery.

Am J Obstet Gynecol. 2002; 187:1596–604- This study determined the accuracy of cervical length and funnelling of the internal os in the prediction of the spontaneous very preterm birth of twin pregnancies. For spontaneous delivery before 32 and 35 weeks of gestation, the sensitivity of cervical length < or =30 mm was 46% and 27%, respectively; the specificity was 89% and 90%, respectively. The sensitivity of funnelling was 54% and 33%, and its specificity 89% and 91%, respectively. The study concluded that for spontaneous delivery before 32 and 35 weeks of gestation, the sensitivity of cervical length < or =25 mm was

100% and 54%, respectively, and the specificity was 84% and 87%, respectively. The sensitivity of funnelling was 86% and 54%, and the specificity 78% and 82%, respectively. After multivariate analysis, both indicators remained significant for delivery before 35 weeks of gestation. Funnelling after transfundal pressure at 22 or 27 weeks did not predict very preterm delivery.

Arabin B, Roos C, Kollen B, van Eyck J- This study evaluated whether serial transvaginal sonographic examination of the cervix with the woman in a standing position improves the prediction of spontaneous preterm birth compared with the conventional posture. In 363 pregnancies at risk for spontaneous preterm birth, we determined prospectively CL and funnel width (FW) including differences between the positions and between longitudinal measurements from 15 weeks onwards. The incidence of funnelling was greater in an upright compared with a recumbent maternal position by 12.3% in singleton and 13.1% in twin pregnancies before 25 weeks, and by 13.0% and 21.6% between 25 and 30 weeks, respectively. The study concluded that evaluation of the cervix with the woman in the upright position permits earlier detection of

funnelling. This may enable earlier and more appropriate intervention to avoid spontaneous preterm birth.

Several published studies have demonstrated inverse relationship between cervical length and incidence of preterm delivery. In primigravida population, the smaller the cervix, they were more prone to preterm labour. However, in the multiparous women, the internal os dilatation was a more useful predictor. Hence the authors have concluded that the length of the cervix was possibly an indirect indicator of preterm labour.

The process of the changes of the internal os often is better determined well before the recognition of external os changes. The cervical effacement may occur slowly and often precedes clinically evident preterm labour.

5. MATERIALS AND METHODS

It is an observational prospective study conducted in Institute of Social Obstetrics and Government Kasturba Gandhi Hospital, Madras Medical College, Chennai from October 2010 to September 2011.

- This systematic review was conducted following a prospective protocol to determine the correlation between cervical lengths estimated at 20-24 weeks along with period of gestation at delivery in twin pregnancies over a period of 1 year.
- This study group included 115 women who attended our hospital.

INCLUSION CRITERIA

Primigravida with twin pregnancy

Multigravida with twin pregnancy

Low risk patients

Good dates

Booked in our hospital

Under regular antenatal follow up in our hospital

To deliver in our hospital

Consent taken for their participation.

EXCLUSION CRITERIA

Maternal factors

- Singleton pregnancies
- Pregnancy induced hypertension
- Gestational diabetes mellitus
- Ante partum hemorrhage
- Other maternal illness
- Patient in other therapeutic trials

Fetal factors

- Fetal congenital anomalies
- Intrauterine death

PARTICIPANT CHARACTERISTICS

This included demographic data, obstetric and medical histories, at their first visit to the hospital. Ultrasound findings were recorded in the data base at the time of scan, and the patient were under follow up until delivery.

SUBJECT AND METHODS

This was a prospective study in women with twin pregnancy who presented to us at 20-24 weeks scan; women were also offered the option of having transvaginal sonographic assessment of their cervices along with the anomaly scan.

Women were asked to empty their bladder and were placed in dorsal lithotomy position. Transvaginal sonography with 5MHz transducer (2D ultra sonogram unit) was done by sonographer. A protective cover is placed over the transducer, lubricated with a small amount of gel. The probe was placed in the anterior fornix of the vagina and a sagittal view of the cervix, with the ecogenic endocervical mucosa along with the length of the canal was obtained, care was taken to avoid exerting undue pressure on the cervix. The cervix should occupy at least 50% to 75% of the screen. Calipers were used to measure the distance between the triangular area of ecodensity at the external os and the v – shaped notch at the internal os. At least 3 measurements were obtained; the shortest best measurement is recorded. Burger et al., observed an average intra observer difference of 1.24 mm. Rust et al., have found that

as a categorical variable (present or absent), a funnel is a significant risk factor for preterm labour.

6. ANALYSIS OF RESULTS

Total number of patients enrolled in the study-115

Number of patients who completed the study -112

Number of patients who were excluded-10

Final list of patients-102

Total number of patients who delivered preterm-21

Incidence of preterm in the study-20.5%

Number of preterm babies who required NICU admission-(25)60%

Number of babies who were born at term required NICU admission-(5)3%

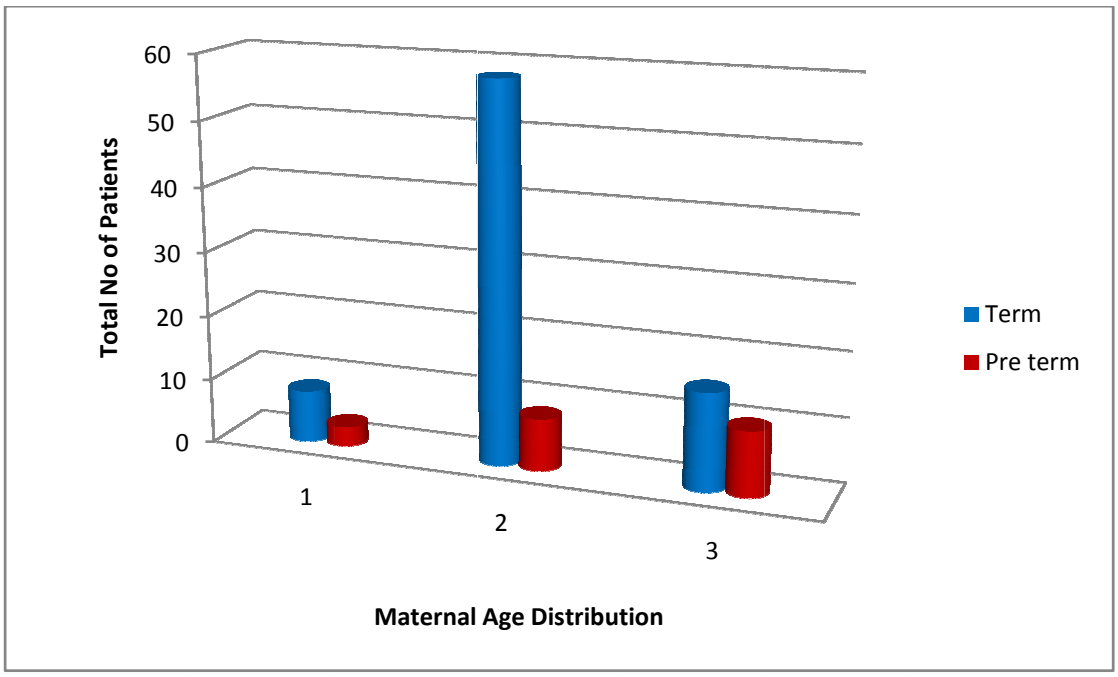
TABLE-1

Maternal age group relation in preterm labour

			GA Group		Total
			0	1	
AgeGroup ≤20 years	1	Count	8	3	11
		% within GA Group	9.9%	14.3%	10.8%
		% of Total	7.8%	2.9%	10.8%
21-25 years	2	Count	58	8	66
		% within GA Group	71.6%	38.1%	64.7%
		% of Total	56.9%	7.8%	64.7%
26-30 years	3	Count	15	10	25
		% within GAGroup	18.5%	47.6%	24.5%
		% of Total	14.7%	9.8%	24.5%
	Total	Count	81	21	102
		% within GAGroup	100.0%	100.0%	100.0%
		% of Total	79.4%	20.6%	100.0%

Chi-Square Tests			
	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	8.957[a]	2	.011
Likelihood Ratio	8.430	2	.015
N of Valid Cases	102		

a. 1 cells (16.7%) have expected count less than 5. The minimum expected count is 2.26.



$p < 0.011$ SIGNIFICANT.

The above table gives the details of maternal age distribution in relation to preterm labour. According to which, out of 21 cases of preterm delivery 10 cases were in the age group of 26-30 years i.e., 47.6% whereas more than 80% of term delivery were in the age group of 21-25 years and only 18.5% of preterm delivery belonged to this group.

Inference: there is higher incidence of preterm labour in women with advanced maternal age.

TABLE- 2

Working group

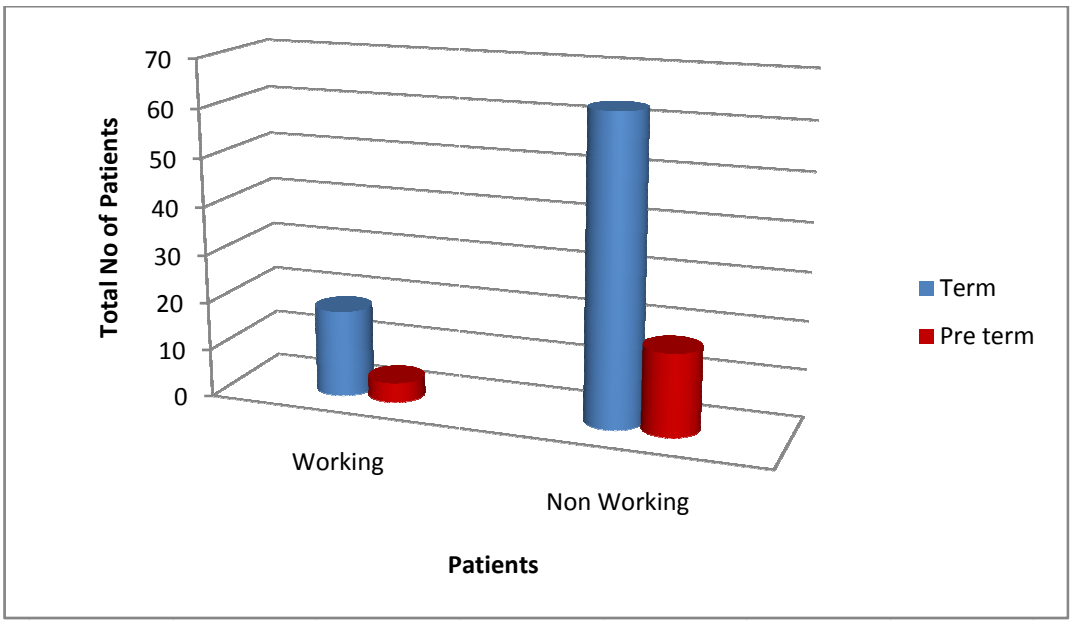
			Gestational age at delivery Group		
			0	1	Total
Working	0	Count	18	4	22
		% within Gestational age at delivery Group	22.2%	19.0%	21.6%
		% of Total	17.6%	3.9%	21.6%
	1	Count	63	17	80
		% within Gestational age at delivery Group	77.8%	81.0%	78.4%
		% of Total	61.8%	16.7%	78.4%
	Total	Count	81	21	102
		% within Gestational age at delivery Group	100.0%	100.0%	100.0%
		% of Total	79.4%	20.6%	100.0%

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	.099[a]	1	.753		
Continuity Correction	.000	1	.986		
Likelihood Ratio	.102	1	.750		
Fisher's Exact Test				1.000	.507
Linear-by-Linear Association	.098	1	.754		
N of Valid Cases	102				

a. 1 cells (25.0%) have expected count less than 5. The minimum expected count is 4.53.

b. Computed only for a 2x2 table



Chi-square = 0.099 p < 0.753 NOT SIGNIFICANT

The above table gives the details of working patients and their relation with preterm labour. From the above data, there was no increase in preterm labour in patients belonging to working group.

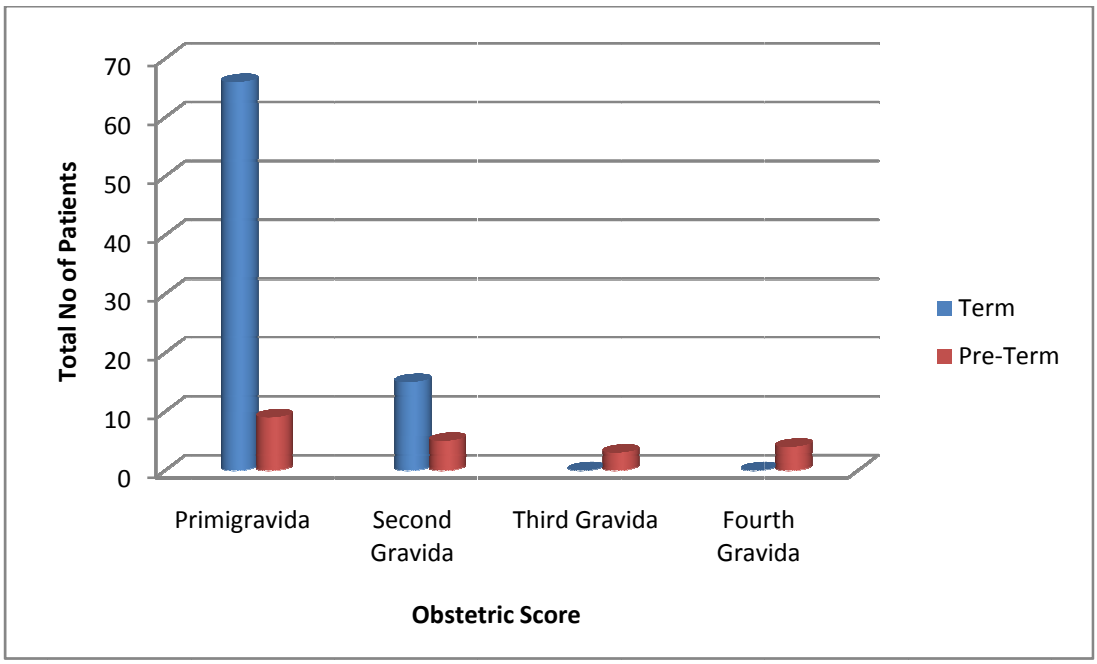
TABLE -3

Obstetric score

			GAGroup		
			0	1	Total
Obstetric Score	1	Count	66	9	75
		% within GAGroup	81.5%	42.9%	73.5%
		% of Total	64.7%	8.8%	73.5%
	2	Count	15	5	20
		% within GAGroup	18.5%	23.8%	19.6%
		% of Total	14.7%	4.9%	19.6%
	3	Count	0	3	3
		% within GAGroup	.0%	14.3%	2.9%
		% of Total	.0%	2.9%	2.9%
	4	Count	0	4	4
		% within GAGroup	.0%	19.0%	3.9%
		% of Total	.0%	3.9%	3.9%
	Total	Count	81	21	102
		% within GAGroup	100.0%	100.0%	100.0%
		% of Total	79.4%	20.6%	100.0%

Chi-Square Tests

	Value	Df	Asymp. Sig. (2-sided)
Pearson Chi-Square	30.622[a]	3	.000
Likelihood Ratio	26.192	3	.000
Linear-by-Linear Association	25.908	1	.000
N of Valid Cases	102		



$p < 0.001$ SIGNIFICANT

The above table gives the relation of parity with preterm labour. According to this study, patients who were primigravida had lesser incidence of preterm labour when compared to patients with multigravida with 42.9% and 57.1% respectively.

Inference: Women with increasing parity were more prone for preterm labour. The preterm labour is directly proportional to the increasing parity.

TABLE-4

Previous abortions

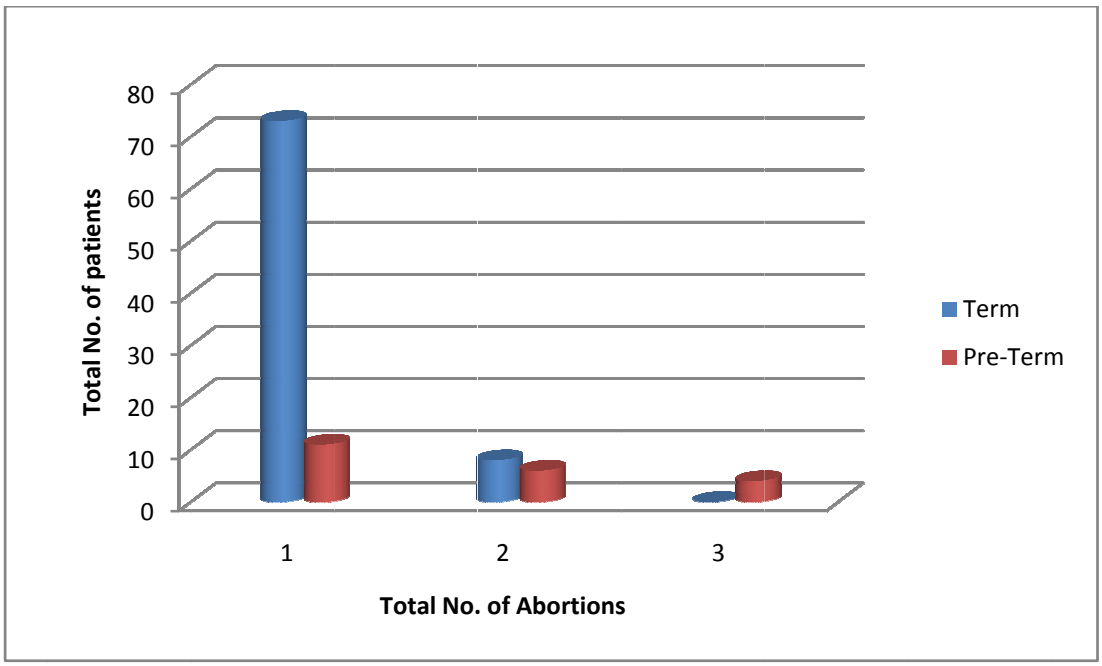
			GAGroup		
			0	1	Total
Abortion	0	Count	73	11	84
		% within GAGroup	90.1%	52.4%	82.4%
		% of Total	71.6%	10.8%	82.4%
	1	Count	8	6	14
		% within GAGroup	9.9%	28.6%	13.7%
		% of Total	7.8%	5.9%	13.7%
	2	Count	0	4	4
		% within GAGroup	.0%	19.0%	3.9%
		% of Total	.0%	3.9%	3.9%
	Total	Count	81	21	102
		% within GAGroup	100.0%	100.0%	100.0%
		% of Total	79.4%	20.6%	100.0%

Chi-Square Tests

	Value	Df	Asymp. Sig. (2-sided)
Pearson Chi-Square	22.560[a]	2	.000
Likelihood Ratio	19.386	2	.000
N of Valid Cases	102		

			GAGroup		
			0	1	Total
Abortion	0	Count	73	11	84
		% within GAGroup	90.1%	52.4%	82.4%
		% of Total	71.6%	10.8%	82.4%
	1	Count	8	6	14
		% within GAGroup	9.9%	28.6%	13.7%
		% of Total	7.8%	5.9%	13.7%
	2	Count	0	4	4
		% within GAGroup	.0%	19.0%	3.9%
		% of Total	.0%	3.9%	3.9%
	Total	Count	81	21	102
		% within GAGroup	100.0%	100.0%	100.0%

a. 3 cells (50.0%) have expected count less than 5. The minimum expected count is .82.



p< 0.001 SIGNIFICANT

The above table shows the co-relation of abortion and preterm labour. In this study, patients who went in for preterm labour had a previous history of abortion 47.6%, whereas 11% of patients with preterm labour had no history of previous abortion.

Inference: Patients with previous pregnancy loss had a predilection towards preterm labour.

TABLE-5

Features of Urinary tract Infection

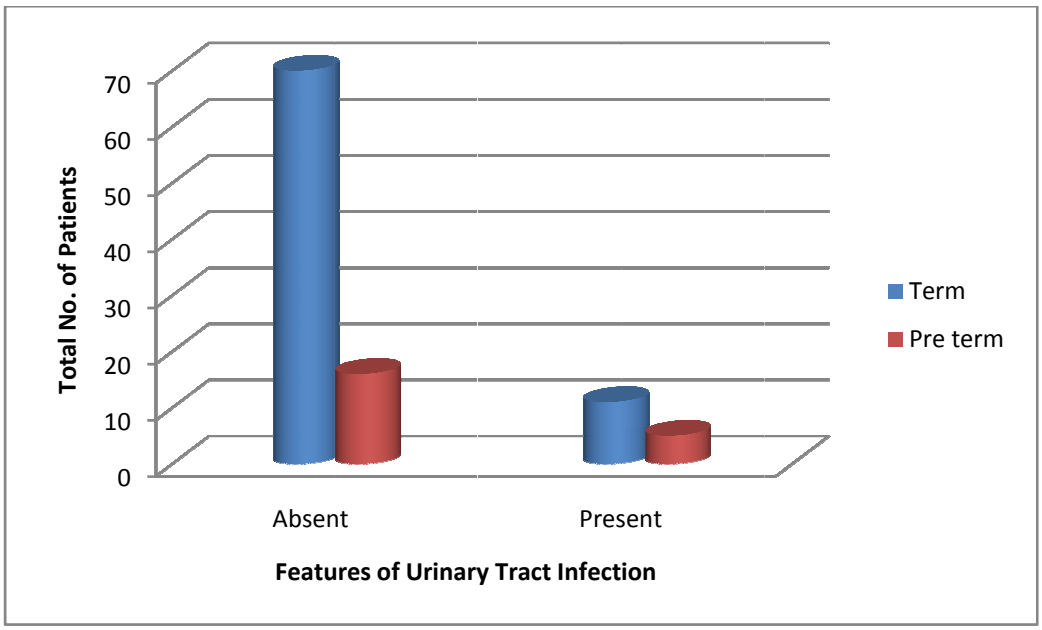
			GAGroup		
			0	1	Total
Features of Urinary tract infection	0	Count	70	16	86
		% within GA Group	86.4%	76.2%	84.3%
		% of Total	68.6%	15.7%	84.3%
	1	Count	11	5	16
		% within GA Group	13.6%	23.8%	15.7%
		% of Total	10.8%	4.9%	15.7%
	Total	Count	81	21	102
		% within GA Group	100.0%	100.0%	100.0%
		% of Total	79.4%	20.6%	100.0%

Chi-Square Tests

	Value	Df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	1.319[a]	1	.251		
Continuity Correction[b]	.659	1	.417		
Likelihood Ratio	1.213	1	.271		
Fisher's Exact Test				.312	.204
Linear-by-Linear Association	1.306	1	.253		
N of Valid Cases	102				

a. 1 ce lls (25.0%) have expected count less than 5. The minimum expected count is 3.29.

b. Computed only for a 2x2 table



Chi-square = 1.319 p< 0.251 NOT SIGNIFICANT

The above table shows the relation between patients with urinary tract infections and preterm labour. According to which, women who showed features of urinary tract infection did not have preponderance to preterm labour.

TABLE 6

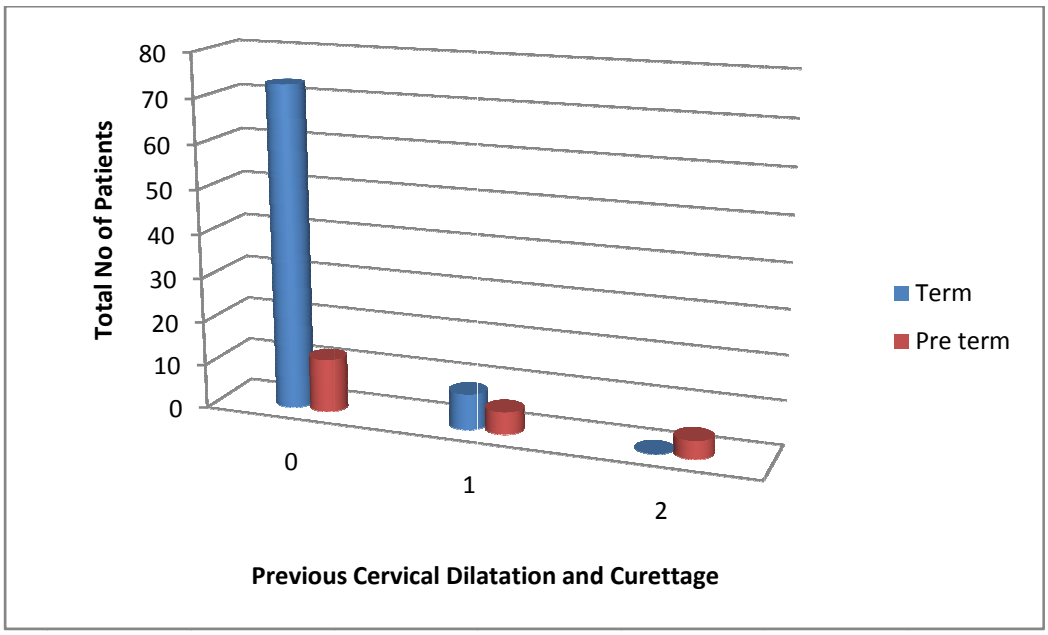
Previous Dilatation and Curettage

			GAGroup		
			0	1	Total
Previous Dilatation & curettage	0	Count	73	12	85
		% within GAGroup	90.1%	57.1%	83.3%
		% of Total	71.6%	11.8%	83.3%
	1	Count	8	5	13
		% within GAGroup	9.9%	23.8%	12.7%
		% of Total	7.8%	4.9%	12.7%
	2	Count	0	4	4
		% within GAGroup	.0%	19.0%	3.9%
		% of Total	.0%	3.9%	3.9%
	Total	Count	81	21	102
		% within GAGroup	100.0%	100.0%	100.0%
		% of Total	79.4%	20.6%	100.0%

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	20.145[a]	2	.000
Likelihood Ratio	17.195	2	.000
N of Valid Cases	102		

a. 3 cells (50.0%) have expected count less than 5. The minimum expected count is .82.



p<0.000<0.005 SIGNIFICANT.

The above table shows the relation of previous dilatation and curettage with preterm labour. According to this study, patients who had previous history of cervical intervention had higher incidence of preterm labour when compared to patients with no history of previous cervical interventions, with 57.1% and 42.9% respectively.

INFERENCE- Patients with previous history of cervical interventions were prone for preterm labour.

Table-7

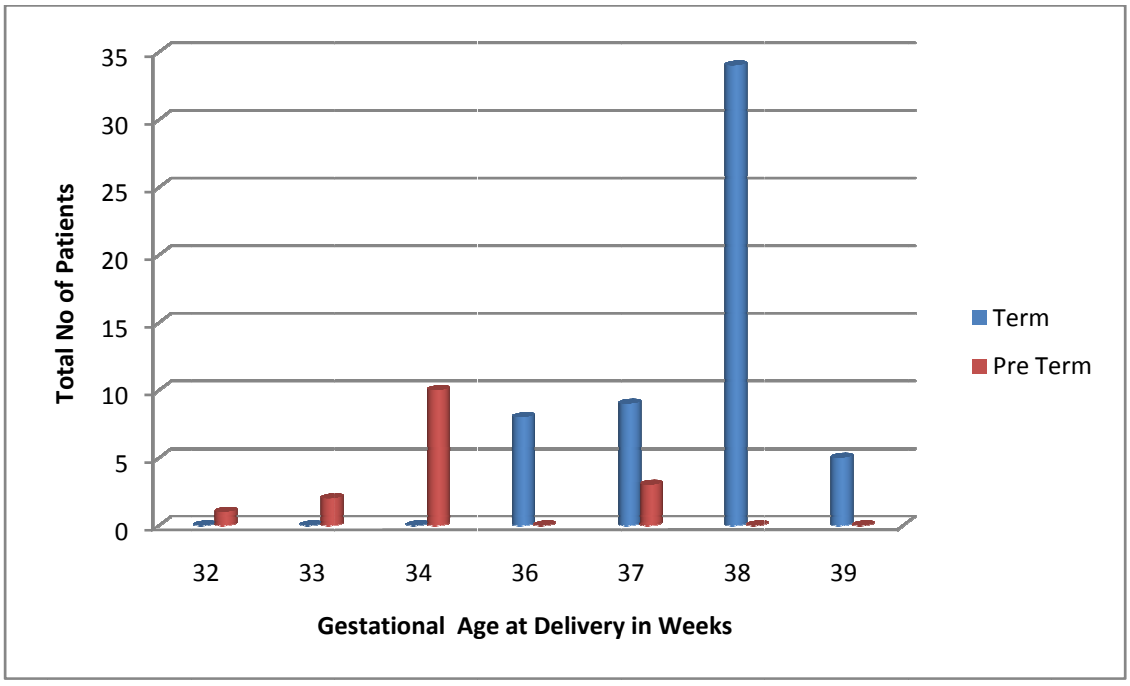
NICU Admission

Gestational age at delivery (weeks) * NICU					
			NICU Admission		
			0	1	Total
Gestational age at delivery (weeks)	32	Count	0	1	1
		% within NICU Admission	.0%	6.3%	1.0%
		% of Total	.0%	1.0%	1.0%
	33	Count	0	2	2
		% within NICU Admission	.0%	12.5%	2.0%
		% of Total	.0%	2.0%	2.0%
	34	Count	0	10	10
		% within NICU Admission	.0%	62.5%	9.8%
		% of Total	.0%	9.8%	9.8%
	36	Count	8	0	8
		% within NICU Admission	9.3%	.0%	7.8%
		% of Total	7.8%	.0%	7.8%
	37	Count	39	3	42
		% within NICU Admission	45.3%	18.8%	41.2%
		% of Total	38.2%	2.9%	41.2%
	38	Count	34	0	34
		% within NICU Admission	39.5%	.0%	33.3%
		% of Total	33.3%	.0%	33.3%
	39	Count	5	0	5
		% within NICU Admission	5.8%	.0%	4.9%
		% of Total	4.9%	.0%	4.9%
	Total	Count	86	16	102
		% within NICU Admission	100.0%	100.0%	100.0%
		% of Total	84.3%	15.7%	100.0%

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	80.937[a]	6	.000
Likelihood Ratio	67.009	6	.000
Linear-by-Linear Association	63.041	1	.000
N of Valid Cases	102		

a. 8 cells (57.1%) have expected count less than 5. The minimum expected count is .16.



CHI-SQUARE= 80.937 p<0.000<0.005 SIGNIFICANT

GA Group		N	Mean	Std. Deviation	Std. Error Mean
Twin A, Baby's Weight (kg)	1	21	2.0933	.18494	.04036
	0	81	2.3107	.09172	.01019
Twin B, Baby's Weight (kg)	1	21	2.1100	.19877	.04338
	0	81	2.3142	.08633	.00959

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means
		F	Sig.	T
Twin A, Baby's Weight (kg)	Equal variances assumed	28.307	.000	-7.621
	Equal variances not assumed			-5.223
Twin B, Baby's Weight (kg)	Equal variances assumed	49.131	.000	-7.082
	Equal variances not assumed			-4.597

Independent Samples Test

		t-test for Equality of Means		
		df	Sig. (2-tailed)	Mean Difference
Twin A, Baby's Weight (kg)	Equal variances assumed	100	.000	-.21741
	Equal variances not assumed	22.609	.000	-.21741
Twin B, Baby's Weight (kg)	Equal variances assumed	100	.000	-.20420
	Equal variances not assumed	21.991	.000	-.20420

Twin A Baby's weight- $p<0.000$ SIGNIFICNT
Twin B Baby's weight- $p<0.000$ SIGNIFICNT

Group Statistics A

GA Group		N	Mean	Std. Deviation	Std. Error Mean
APGAR SCORE 1 MINUTE	1	21	5.86	1.558	.340
	0	81	7.33	.880	.098
APGAR SCORE 5 MINUTES	1	21	6.57	1.434	.313
	0	81	8.11	.837	.093

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means
		F	Sig.	T
APGAR SCORE 1 MINUTE	Equal variances assumed	16.432	.000	-5.733
	Equal variances not assumed			-4.172
APGAR SCORE 5 MINUTES	Equal variances assumed	17.557	.000	-6.379
	Equal variances not assumed			-4.716

Independent Samples Test

		t-test for Equality of Means		
		Df	Sig. (2-tailed)	Mean Difference
APGAR SCORE 1 MINUTE	Equal variances assumed	100	.000	-1.476
	Equal variances not assumed	23.406	.000	-1.476
APGAR SCORE 5 MINUTES	Equal variances assumed	100	.000	-1.540
	Equal variances not assumed	23.638	.000	-1.540

Group Statistics B

GA Group		N	Mean	Std. Deviation	Std. Error Mean
APGAR SCORE 1 MINUTE	1	21	5.71	1.707	.373
	0	81	7.35	.924	.103
APGAR SCORE 5 MINUTES	1	21	6.33	1.528	.333
	0	81	8.16	.782	.087

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means
		F	Sig.	T
APGAR SCORE 1 MINUTE	Equal variances assumed	25.274	.000	-5.921
	Equal variances not assumed			-4.222
APGAR SCORE 5 MINUTES	Equal variances assumed	30.854	.000	-7.632
	Equal variances not assumed			-5.304

Independent Samples Test

		t-test for Equality of Means		
		Df	Sig. (2-tailed)	Mean Difference
APGAR SCORE 1 MINUTE	Equal variances assumed	100	.000	-1.631
	Equal variances not assumed	23.121	.000	-1.631
APGARSCORE 5 MINUTES	Equal variances assumed	100	.000	-1.827
	Equal variances not assumed	22.783	.000	-1.827

Twin A APGAR Score

1 Minute- $p<0.000$ SIGNIFICANT

5 Minute- $p<0.000$ SIGNIFICANT

Twin B APGAR Score

1 Minute- $p<0.000$ SIGNIFICANT

5 Minute- $p<0.000$ SIGNIFICANT

The above tables show the co-relation between the incidence of NICU admission and low birth weight with the preterm labour. According to this study neonates belonging to preterm birth had higher incidence of neonatal intensive care admissions along with low APGAR score when compared to the neonates of term delivery which is 81.3%% and 18.7% respectively.

Furthermore, twins belonging to preterm birth had low birth weight, more so with the second twin when compared to the term neonates.

Table -8

Pre-pregnancy weight

	GA Group	N	Mean	Std. Deviation	Std. Error Mean
Pre pregnancy Weight (Kg)	1	21	57.95	8.925	1.947
	0	81	55.68	4.488	.499

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means
		F	Sig.	T
Pre preganancy Weight (Kg)	Equal variances assumed	26.426	.000	1.640
	Equal variances not assumed			1.131

Independent Samples Test

		t-test for Equality of Means		
		df	Sig. (2-tailed)	Mean Difference
Pre pregnancy Weight (Kg)	Equal variances assumed	100	.104	2.273
	Equal variances not assumed	22.685	.270	2.273

p > 0.104 NOT SIGNIFICANT

The above table includes the data of pre-pregnancy weight and preterm labour. In this study when only pre pregnancy weight alone was taken into consideration, it did not have any correlation with the preterm labour.

Table-9

Height

Group Statistics

	GA Group	N	Mean	Std. Deviation	Std. Error Mean
Height Cm)	1	21	536.24	1744.999	380.790
	0	81	156.16	16.668	1.852

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means	
		F	Sig.	t	Df
Height Cm)	Equal variances assumed	17.304	.000	1.989	100
	Equal variances not assumed			.998	20.001

Independent Samples Test

		t-test for Equality of Means		
		Sig. (2-tailed)	Mean Difference	Std. Error Difference
Height Cm)	Equal variances assumed	.049	380.078	191.134
	Equal variances not assumed	.330	380.078	380.795

p<0.049 SIGNIFICANT.

The above table shows the relation of maternal height with preterm labour. Patients with height <155 cms had a preponderance to preterm labour.

Table -10

Body mass index

GA Group		N	Mean	Std. Deviation	Std. Error Mean
Body Mass Index (Kg/m2)	1	21	24.014	3.4647	.7561
	0	81	22.004	2.7180	.3020

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means	
		F	Sig.	T	df
Body Mass Index (Kg/m2)	Equal variances assumed	7.525	.007	2.848	100
	Equal variances not assumed			2.469	26.721

Independent Samples Test

		t-test for Equality of Means		
		Sig. (2-tailed)	Mean Difference	Std. Error Difference
Body Mass Index (Kg/m2)	Equal variances assumed	.005	2.0105	.7059
	Equal variances not assumed	.020	2.0105	.8141

$p < 0.005$ SIGNIFICANT

The above table shows the relation of body mass index with preterm labour. Patients with increased body mass index had preponderance to preterm labour when compared to patients with normal body mass index. Similarly, patients with low body mass index did not show any preponderance towards preterm labour in our study.

Table-11

Haemoglobin

GA Group		N	Mean	Std. Deviation	Std. Error Mean
Haemoglobin (gldl)	1	21	9.105	.5005	.1092
	0	81	9.374	.3549	.0394

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means	
		F	Sig.	T	df
Haemoglobin (gldl)	Equal variances assumed	5.698	.019	-2.832	100
	Equal variances not assumed			-2.319	25.446

Independent Samples Test

		t-test for Equality of Means		
		Sig. (2-tailed)	Mean Difference	Std. Error Difference
Haemoglobin (gldl)	Equal variances assumed	.006	-.2693	.0951
	Equal variances not assumed	.029	-.2693	.1161

$p<0.006$ SIGNIFICANT

The above table includes the details of hemoglobin and preterm labour Preterm labour was more prevalent in patients with low hemoglobin, more so with hemoglobin $\leq$ 8.8 gm/dl.

Table-12

ROC curve

Variable	Transvaginal_cervical_length _cm_
Classification variable	Gestational_age_at_delivery_Group
Positive group	
Gestational_age_at_delivery_Group	= 1
Sample size	21
Negative group	
Gestational_age_at_delivery_Group	= 0
Sample size	81
Disease prevalence (%)	20.6
Area under the ROC curve (AUC)	0.886
Standard error	0.0332
95% Confidence interval	0.808 to 0.941
z statistic	11.643
Significance level P (Area=0.5)	0.0001

Criterion values and coordinates of the ROC curve

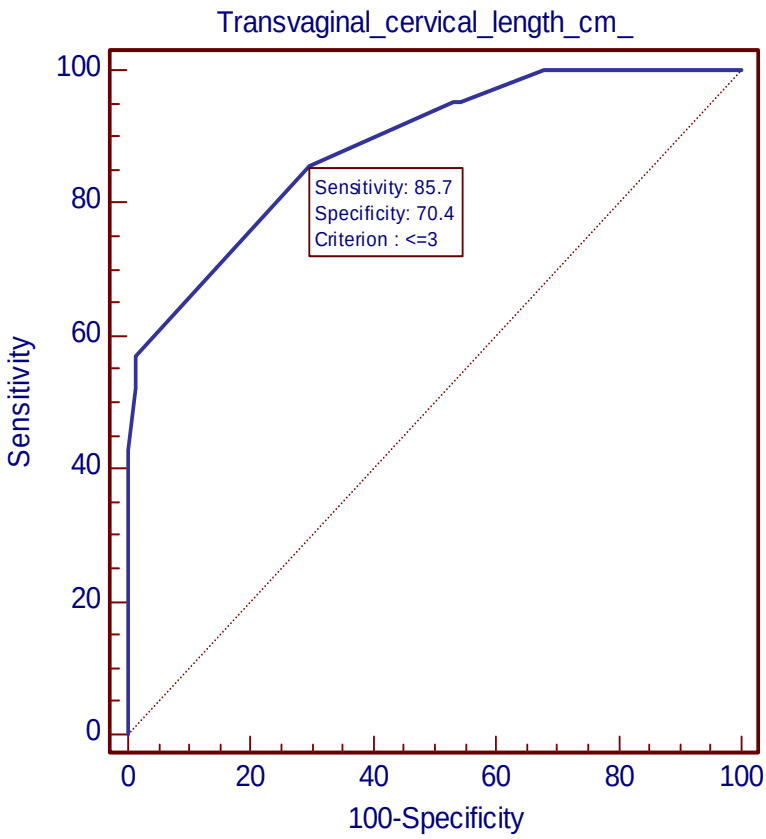
Criterion	Sensitivity	95% CI	Specificity	95% CI	+LR	-LR	+PV	-PV
< 2	0.00	0.0 - 16.3	100.00	95.5 - 100.0		1.00		79.4
<=2	4.76	0.8 - 23.9	100.00	95.5 - 100.0		0.95	100.0	80.2
<=2.3	19.05	5.6 - 41.9	100.00	95.5 - 100.0		0.81	100.0	82.7
<=2.4	42.86	21.9 - 66.0	100.00	95.5 - 100.0		0.57	100.0	87.1
<=2.5	52.38	29.8 - 74.3	98.77	93.3 - 99.8	42.43	0.48	91.7	88.9
<=2.6	57.14	34.0 - 78.1	98.77	93.3 - 99.8	46.29	0.43	92.3	89.9
<=3 *	85.71	63.6 - 96.8	70.37	59.2 - 80.0	2.89	0.20	42.9	95.0
<=3.2	95.24	76.1 - 99.2	46.91	35.7 - 58.3	1.79	0.10	31.7	97.4
<=3.3	95.24	76.1 - 99.2	45.68	34.6 - 57.1	1.75	0.10	31.3	97.4
<=3.4	100.00	83.7 - 100.0	32.10	22.2 - 43.4	1.47	0.00	27.6	100.0
<=3.5	100.00	83.7 - 100.0	30.86	21.1 - 42.1	1.45	0.00	27.3	100.0
<=3.6	100.00	83.7 - 100.0	14.81	7.9 - 24.5	1.17	0.00	23.3	100.0
<=3.8	100.00	83.7 - 100.0	2.47	0.4 - 8.7	1.03	0.00	21.0	100.0
<=4	100.00	83.7 - 100.0	1.23	0.2 - 6.7	1.01	0.00	20.8	100.0
<=8	100.00	83.7 - 100.0	0.00	0.0 - 4.5	1.00		20.6	

+LR : Positive likelihood ratio

-LR : Negative likelihood ratio

+PV : Positive predictive value

-PV : Negative predictive value



The above table describes the Receiver-Operating Characteristic curve for all the values obtained by measuring the cervical length by transvaginal sonography at 20 to 24 weeks of gestation in twin pregnancies.

Considering the cervical length cut-off of 2.5cm the sensitivity, specificity, positive likelihood ratio, negative likelihood ratio, positive predictive value and negative predictive value were 52.38%, 98.77%, 42.43, 0.48, 91.7 and 88.9 respectively.

Similarly considering the cervical length cut-off of 3.0cm, the sensitivity, specificity, positive likelihood ratio, negative likelihood ratio, positive predictive value and negative predictive value were 85.71%, 70.37%, 2.89, 0.20, 42.9, and 95.0 respectively.

Inference: from the above data we infer that the cervical length measurement of 3.0 cm would be a better predictor of preterm labour.

7. SUMMARY

This prospective study was conducted at Institute of Social Obstetrics and Government Kasturba Gandhi hospital from September 2010 to October 2011. The study included 115 patients with twin pregnancies (primigravida and multigravida) who were booked here, had their regular antenatal follow up and accomplished their deliveries in our hospital. These women underwent a transvaginal sonographic estimation of their cervical length at 20 to 24 weeks gestation which was coupled with the routine anomaly scan.

Besides detailed history taking, clinical examination and initial investigation which included the first trimester ultrasound for fetal viability, patients were followed until 20 to 24 weeks of gestation wherein a transvaginal sonographic measurement of cervical length was taken that was coupled with routine anomaly scan.

The total number of patients enrolled in our study-115

Total number of patients who completed the study -112

Total number of patients who were excluded due to complications-10

The final list of patients -102.

The study analyzed the values of transvaginal sonographic measurement of cervical length and its predictor as a preterm labour. Along with the other variables – maternal age, height, pre-pregnancy weight, body mass index, parity, previous pregnancy loss, previous cervical dilatation and curettage, hemoglobin, and features of urinary tract infection. The incidence of NICU admissions and low birth weight were also analyzed.

- In patients with maternal age group of 26 to 30 years 47.6% had preterm labour, whereas 80% of term deliveries were in age group of 20 to 25 years and only 18.5% went in for preterm labour, $p<0.0011$ which is significant. Hence advancing gestational age had higher predilection for preterm labour.
- The relation of women in working group for risk of preterm labour describes the Chi-square = 0.09 and $P < 0.753$ which is not significant. Thus women who belonged to the working group did not have a predilection of preterm labour.
- According to this study, patients who were primigravida had lesser incidence of preterm labour when compared to patients with multigravida with 42.9% and 57.1% respectively. $p < 0.001$

Significant. That concludes that women with increasing parity were more prone for preterm labour.

- In this study, patients who went in for preterm labour had a previous history of abortion 47.6%, whereas 11% of patients with preterm labour had no history of previous abortion. P<0.001 which is significant. Patients with previous pregnancy loss had a predilection towards preterm labour.
- The relation between patients with urinary tract infections and preterm labour determined the Chi-square = 1.31 p < 0.251, which is not significant. Women who showed features of urinary tract infection did not have preponderance to preterm labour.
- The relation of previous cervical interventions on preterm labour determined the Chi-square = 20.145 p<0.000<0.005 which is significant. Thus women who had previous cervical interventions had a higher incidence of preterm labour.
- The co-relation between the incidence of NICU admission and low birth weight with the preterm labour describes the Chi-square=49.077 p<0.000<0.005 which is significant. According to this study neonates belonging to preterm birth had higher incidence

of neonatal intensive care admissions along with low APGAR score when compared to the neonates of term delivery which is 61.9% and 38.1% respectively. Furthermore, twins belonging to preterm birth had low birth weight, more so with the second twin when compared to the term neonates.

- The study data of pre-pregnancy weight and preterm labour, gave $p > 0.005$ which is not significant. In this study when only pre-pregnancy weight alone was taken into consideration, it did not have any correlation with the preterm labour.
- The association of height with preterm labour, $p<0.049$ which is significant. Preterm labour was more common among patients with height $\leq$155 cm's.
- The relation of body mass index with preterm labour determined $p<0.005$ which is significant. Patients with increased body mass index had preponderance to preterm labour when compared to patients with normal body mass index. Similarly, patients with low body mass index did not show any preponderance towards preterm labour in our study.

- The relation of hemoglobin and preterm labour determined $p<0.006$ which is significant. Preterm labour was more prevalent in patients with low hemoglobin, more so with hemoglobin $\leq$ 8.8 gm/dl.
- When the cervical length cut-off of 3.0cm is considered the sensitivity, specificity, positive likelihood ratio, negative likelihood ratio, positive predictive value and negative predictive value were 85.71%, 70.37%, 2.89, 0.20, 42.9 and 95.0 respectively when compared to the cervical length cut-off of 2.5cm the sensitivity, specificity, positive likelihood ratio, negative likelihood ratio, positive predictive value and negative predictive value were 52.38%, 98.77%, 42.43, 0.48, 91.7 and 88.9 respectively. Hence from our study we conclude that a cervical length cut-off of 3.0 cm would predict a better obstetric outcome.

9. CONCLUSION

This prospective study was conducted from September 2010 to October 2011 in Institute of Social Obstetrics and Government Kasturba Gandhi Hospital for Women and Children. Madras Medical College, that included all women who were both primigravida and multigravida belonging to low risk group, among 115 twin pregnancies 3 defaulted the study, 10 were excluded, hence the study included total number of 102 patients.

Our study concluded that:

- Patients with advancing maternal age had a more predilection towards preterm labour.
- Patients who were working did not go in for preterm labour
- The pre-pregnancy weight was not useful in predicting the preterm labour.
- Patients whose height was ≤155 cm's had a predilection towards preterm labour.

- Patients with higher body mass index had more predilections to preterm labour. But patients with lower body mass index did not have any such preponderance.
- Patients with primigravida twin pregnancies had a lower risk of preterm labour when compared to multigravida twin pregnancies.
- Patients who had previous pregnancy loss were more prone for preterm labour. The magnitude increases as the number of pregnancy loss increases.
- Patients who had previous dilatation and curettage were at high risk of preterm labour.
- Patients who had low hemoglobin went in for preterm labour.
- Patients who had features of urinary tract infection did not go in for preterm labour.
- Neonates belonging to the preterm had low birth weight along with increased morbidity.
- Finally our study concluded that measuring transvaginal sonographic cervical length at 20 to 24 weeks in twin pregnancies is a valuable predictor of preterm labour when the cut-off of

cervical length is more than 30mm. Moreover, it is a simple cost-effective, reproducible, and non-invasive method.

Recommendations suggested from our study:

- Every patient with twin pregnancies irrespective of their parity to be considered as a high risk for preterm labour.
- These patients besides the routine fetal anomaly scan, it is mandatory to have their cervical length measured by transvaginal sonography at 20 to 24 weeks gestation with a cut-off> 30mm along with the other initial investigations.
- Ante partum in utero transfer to be provided for the patients with their cervical length ≤2.9 cm's to tertiary institute for better neonatal salvage ability and obstetric outcome.

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10. PROFORMA

NAME : AGE :

ADDRESS : IP NO :

OCCUPATION :

HEIGHT :

WEIGHT :

B0DY MASS INDEX :

OBSTETRIC CODE :

LAST MENSTRUAL PERIOD :

EXPECTED DATE OF DELIVERY :

GESTATIONAL AGE :

BOOKED/UNBOOKED :

SOCIO ECONOMIC STATUS :

HISTORY OF PRESENT ILLNESS:

MENSTRUAL HISTORY :

MARITAL HISTORY :

OBSTETRIC HISTORY :

PAST HISTORY :

H/o preterm labour / Abortion – induced or spontaneous/ still birth

DM/ heart disease/hypertension/TB/Epilepsy/renal disease

PERSONAL HISTORY :

GENERAL EXAMINATION :

Pallor :

Edema :

Febrile :

VITALS :

Temperature :

Pulse Rate :

Blood Pressure :

Respiratory Rate :

SYSTEMIC EXAMINATION:

Cardio Vascular System :

Respiratory System :

Central Nervous System :

Abdominal examination :

INVESTIGATIONS :

Urine – sugar/ albumin/microscopy/culture sensitivity

Complete haemogram

Blood sugar

Blood urea

Vaginal swab culture sensitivity

Dating Ultra sonogram

Anomaly ultra sonogram

Transabdominal Ultra sonogram	Twin A	Twin B
Biparietal diameter		
Femur Length		
Placenta		
Amniotic Fluid		
Fetal Congenital Anomalies		
Gestational Age		

Transvaginal Ultra sonogram

Cervical Length

DELIVERED AT

Gestational age in weeks

NICU ADMISSIONS

Neonatal Morbidity

Neonatal Mortality

11.MASTERCHART

S NO	Patient Number	Name	Age (years)	Height (Cm)	Prepreganancy Weight (kgs)	Body Mass Index (kg/m2)	Working	Obstetric Score	Abortion	Previous dilatation & curettage	Hemoglobin (g/dl)	Features of Urinary tract infection	Transvaginal cervical length (cm)	Transvaginal cervical length Group	Transvaginal cervical length (Abnormal/Normal)	Gestational age at delivery (weeks)	Gestational age at delivery Group	Twin A Baby's Weight (kgs)	Twin B Baby's Weight (kgs)	Twin A APGAR score 1 minute	Twin A APGAR score 5 minute	Twin B APGAR Score 1 minute	Twin B APGAR Score 5 minute	NICU Admission
	7071	Diliamma	24	152	60	25.9	1	3	1	1	9.2	0	2	1	1	34	1	1.92	1.94	4	5	5	5	2
47	22525	Anjammal	28	158	68	27.2	1	4	2	2	8.8	1	2.3	1	1	32	1	1.88	1.85	4	5	4	5	2
67	1757	Chellamma	28	154	68	28.6	0	4	2	2	8.6	0	2.3	1	1	34	1	1.86	1.87	4	5	4	4	2
93	10020	Rani	22	154	68	28.6	1	1	0	0	9.4	0	2.3	1	1	34	1	1.89	1.9	4	6	5	6	2
15	12082	Menaka	28	168	68	24.9	1	4	2	2	8.2	0	2.4	1	1	33	1	1.96	1.99	5	5	4	6	2
35	17928	Noorjahan	28	156	72	29.5	1	3	1	1	8.6	0	2.4	1	1	33	1	1.98	1.99	5	5	4	5	2
56	24618	Mallar	26	158	72	28.8	1	4	2	2	8.8	0	2.4	1	1	34	1	2.01	1.98	5	6	4	5	2
83	7519	Mumtaz	19	144	42	20.2	1	1	0	0	9.8	0	2.4	1	1	34	1	2.1	2.12	6	6	5	6	2
84	7708	Moogambigai	28	150	64	28.4	1	3	1	1	9.6	0	2.4	1	1	34	1	2.12	2.19	6	6	5	5	2
1	5869	Lalitha	20	164	52	19.3	1	1	0	0	8.8	0	2.5	1	1	34	1	1.85	1.82	4	5	4	5	2
7	8945	Varalakhsmi	24	150	52	23.1	0	1	0	0	9.2	0	2.6	1	1	36	1	2.01	2.03	8	8	7	7	0
14	11220	Sumithra	26	145	52	24.7	0	2	1	0	9.8	1	3	1	1	36	1	2.3	2.33	7	8	9	9	0
21	13594	Kamala	25	160	60	23.4	1	1	0	0	9.4	1	3	1	1	36	1	2.28	2.24	8	8	7	8	0
29	15920	Thilagam	26	158	48	19.2	1	2	1	1	8.8	0	2.5	1	1	34	1	2.01	2.02	6	7	5	5	2
63	1389	Divya	26	158	56	22.4	1	1	0	0	9.8	1	2.5	1	0	37	0	2.25	2.25	5	5	5	6	2
81	6874	Dhanalakshmi	24	152	45	19.4	1	1	0	0	8.8	0	3	1	1	34	1	2.01	1.98	5	6	4	5	2

99	12821	Kumudha	26	156	50	20.5	1	2	0	0	9.8	0	3	1	1	34	1	2.11	2.28	5	6	6	7	1
10	10021	Malliga	26	158	62	24.8	1	2	1	1	8.2	0	3	2	0	38	0	2.18	2.19	7	8	7	8	0
70	2068	Poornima	22	158	56	22.4	1	2	0	0	9.2	1	3	2	0	37	0	2.28	2.31	7	8	7	8	0
94	10531	Poorna	21	158	56	22.4	1	1	0	0	9.2	1	3	2	0	38	0	2.31	2.33	7	8	7	8	0
95	10895	Sandhya	22	156	54	22.1	1	1	0	0	9.8	0	3	2	0	38	0	2.31	2.32	7	8	7	8	0
18	12892	Mala	22	15	58	23.2	1	1	0	0	9.1	1	3	2	0	37	0	2.33	2.42	7	9	7	8	0
27	15621	Pramila	21	158	62	24.8	0	1	0	0	9.4	0	3	2	0	37	0	2.54	2.52	7	7	7	7	0
31	16875	Beevi	25	160	60	23.4	1	1	0	0	9.8	0	3	2	0	38	0	2.21	2.24	7	8	8	8	0
44	20890	Valli	20	168	62	21.9	1	1	0	0	9.6	0	3	2	0	37	0	2.21	2.21	8	8	8	8	0
45	21156	Nithya	22	154	60	25.2	1	1	0	0	9.8	1	3	2	0	37	0	2.12	2.1	8	9	7	7	0
51	23771	Alisha	24	168	64	22.6	1	1	0	0	9.2	0	3	2	0	38	0	2.51	2.53	5	7	5	7	0
54	20021	Kalyani	26	158	52	20.8	1	2	1	1	9.6	0	3	2	0	37	0	2.32	2.33	7	8	7	8	0
64	1490	Chitra	24	156	58	21.3	1	2	0	0	9.6	0	3	2	0	37	0	2.26	2.28	8	9	7	9	0
88	8201	Seetha	19	150	44	19.5	1	1	0	0	8.8	1	3	2	0	37	0	2.34	2.34	9	9	8	8	0
92	9987	Ananthi	26	152	54	23.3	1	2	1	1	9.6	0	3	2	0	37	0	2.36	2.36	8	8	7	8	0
97	11821	Rosika	22	166	58	21	1	1	0	0	9.2	0	3	2	0	37	0	2.28	2.32	7	8	7	8	0
5	7764	Gowri	22	154	52	21.8	0	1	0	0	9.4	0	3	2	0	38	0	2.51	2.51	7	7	7	8	0
6	7872	Jamuna	26	148	50	22.8	1	2	1	1	8.6	1	3	2	0	37	0	2.21	2.21	7	7	7	8	0
12	11929	Esther	22	162	58	22.1	0	1	0	0	9.4	0	3	2	0	37	0	2.27	2.3	7	7	5	7	1
20	13232	Banu	20	156	52	21.3	0	1	0	0	9.2	0	3	2	0	36	1	2.35	2.38	9	9	9	9	0
24	14212	Lakshmi	26	154	54	22.7	1	2	1	1	9.8	1	3	2	0	36	1	2.41	2.42	7	9	7	8	0
42	20032	Nalini	22	168	62	21.9	0	1	0	0	9.2	1	3	2	0	38	0	2.34	2.36	8	9	8	9	0
52	23889	Runiri	21	166	62	22.1	1	1	0	0	9.4	0	3	2	0	39	0	2.42	2.43	7	7	7	7	0
62	1281	Suraari	20	156	48	19.7	0	1	0	0	8.8	0	3	2	0	37	0	2.21	2.21	7	8	8	8	0
65	1510	Ambika	19	156	52	21.3	0	1	0	0	8.8	0	3	2	0	38	0	2.31	2.28	8	8	7	9	0
100	13921	Pushpa	22	152	52	22.5	1	0	0	0	9	0	3	2	0	37	0	2.28	2.26	8	8	8	9	0
8	9421	Loganayaki	22	150	48	21.3	1	1	0	0	8.8	0	3.2	3	0	37	0	2.32	2.36	8	9	8	8	0

16	12259	Jyothi	24	160	58	22.6	1	1	0	0	9.2	1	3.2	3	0	36	1	2.21	2.22	7	7	7	8	0
17	12602	Sudha	26	164	52	19.3	1	1	0	0	9	0	3.2	3	0	37	0	2.01	2.12	6	7	7	7	0
19	18061	Nirmala	24	8152	56	24.2	1	1	0	0	8.2	0	3.2	3	0	36	1	2.4	2.42	8	9	8	8	0
25	14514	Kokila	22	164	64	23.7	1	1	0	0	9.2	0	3.2	3	0	37	0	2.4	2.34	7	8	8	9	0
26	14524	Sulochana	22	156	60	24.6	1	1	0	0	9.2	1	3.2	3	0	37	0	2.52	2.5	5	7	5	7	0
28	15975	Malliga	22	145	52	24.7	1	1	0	0	9.6	0	3.2	3	0	38	0	2.31	2.33	7	8	7	8	0
32	16955	Saroja	24	158	52	20.8	1	1	0	0	9.6	0	3.2	3	0	37	0	2.24	2.26	8	8	8	9	0
36	18356	Vennilla	20	156	48	19.7	1	1	0	0	9.8	0	3.2	3	0	37	0	2.41	2.38	8	9	7	8	0
40	19654	Amala	24	158	60	24	1	1	0	0	9.2	0	3.2	3	0	38	0	2.29	2.31	7	8	8	8	0
43	20713	Anitha	24	162	64	24.3	0	1	0	0	9.4	0	3.2	3	0	37	0	2.4	2.38	8	9	7	9	0
46	21546	Prema	24	152	60	25.9	1	2	1	1	9.8	0	3.2	3	0	37	0	2.21	2.22	5	6	5	6	2
53	24064	Saroja	22	164	60	22.3	0	1	0	0	9.8	0	3.2	3	0	38	0	2.5	2.48	8	8	7	8	0
61	1101	Rathra	22	145	52	24.7	1	1	0	0	9.2	0	3.2	3	0	38	0	2.4	2.38	8	8	7	8	0
73	3011	Sastri	26	154	52	21.9	1	1	0	0	9.2	0	3.2	3	0	37	0	2.33	2.32	7	9	9	9	0
76	4221	Selvi	22	156	52	21.3	0	1	0	0	9.2	0	3.2	3	0	37	0	2.31	2.33	7	7	8	8	0
78	5760	Amul	28	160	60	23.4	1	2	1	1	9.8	0	3.2	3	0	38	0	2.32	2.33	7	7	8	8	0
80	6357	Rohini	22	158	52	20.8	1	1	0	0	9.6	0	3.2	3	0	37	0	2.25	2.25	8	8	8	8	0
90	9081	Sujama	22	154	56	23.6	1	1	0	0	9.8	0	3.2	3	0	37	0	2.4	2.38	8	9	8	8	0
98	12042	Sabiya	24	158	52	20.8	0	1	0	0	9.2	0	3.2	3	0	38	0	2.3	2.1	8	8	8	9	0
101	14021	Yasodha	22	160	58	22.6	1	1	0	0	9.6	0	3.2	3	0	37	0	2.31	2.33	7	7	8	8	0
48	22801	Meena	22	160	58	22.6	1	1	0	0	9.6	0	3.3	3	0	38	0	2.28	2.28	8	9	8	9	0
2	5924	Indira	22	160	56	21.8	1	2	0	0	9.2	0	3.4	3	0	36	1	2.3	2.34	6	7	7	7	0
22	14042	Crystal	28	160	58	22.6	1	2	0	0	8.8	0	3.4	3	0	37	0	2.32	2.33	8	8	8	9	0
30	16211	Ranju	24	158	58	23.2	1	1	0	0	9.2	0	3.4	3	0	38	0	2.33	2.33	7	8	8	8	0
33	17409	Deivam	22	164	52	19.3	1	1	0	0	9.4	0	3.4	3	0	37	0	2.26	2.28	7	9	8	9	0
37	18581	Kartika	21	162	58	2.21	1	2	1	1	9.2	0	3.4	3	0	38	0	2.31	2.33	9	9	7	8	0
50	23691	Princy	22	156	60	24.6	1	1	0	0	9.2	0	3.4	3	0	38	0	2.32	2.33	8	9	7	8	0

55	24542	Jameela	19	162	48	18.2	1	1	0	0	8.6	0	3.4	3	0	37	0	2.02	2.04	8	8	8	8	0
75	3421	Banumathi	24	150	52	23.1	0	1	0	0	9.4	0	3.4	3	0	38	0	2.28	2.28	8	8	8	9	0
77	4621	Saradha	24	154	52	23.6	1	1	0	0	9.4	0	3.4	3	0	38	0	2.24	2.25	5	7	5	7	0
82	7161	Victoria	26	156	58	23.8	1	2	0	0	9.4	0	3.4	3	0	37	0	2.21	2.22	7	9	7	9	0
91	9421	Swathi	24	156	52	21.3	0	1	0	0	9.8	0	3.4	3	0	38	0	2.38	2.38	7	9	7	9	0
102	14331	Uma	24	150	52	21.3	1	1	0	0	9.8	0	3.4	3	0	38	0	2.3	2.28	8	9	9	9	0
57	4	Sathya	22	162	58	22.1	1	1	0	0	9.8	0	3.5	3	0	38	0	2.32	2.33	9	9	9	9	0
3	6821	Faridha	21	158	54	21.6	1	1	0	0	9.6	0	3.6	4	0	37	0	2.46	2.43	6	7	6	7	0
9	9965	Satya	24	156	60	24.6	1	2	0	0	9	0	3.6	4	0	37	0	2.21	2.24	7	8	8	9	0
23	14052	Sunitha	24	158	52	20.8	1	1	0	0	9.6	0	3.6	4	0	38	0	2.42	2.4	7	8	8	8	0
34	17411	Sumathy	21	160	58	22.6	0	1	0	0	9.2	0	3.6	4	0	37	0	2.28	2.31	8	9	9	9	0
39	19200	Gayathri	20	152	52	22.5	1	1	0	0	9.4	0	3.6	4	0	37	0	2.28	2.32	7	8	8	9	0
41	19891	Amudha	26	164	58	21.5	1	1	0	0	9.8	0	3.6	4	0	39	0	2.32	2.33	8	8	7	9	0
58	92	Pattu	26	168	62	21.9	1	2	0	0	9.6	0	3.6	4	0	39	0	2.41	2.41	7	9	7	9	0
60	982	Babitra	22	158	58	23.2	1	1	0	0	9.4	0	3.6	4	0	37	0	2.32	2.33	8	9	8	9	0
68	1982	Devi	24	152	52	22.5	1	1	0	0	9.6	0	3.6	4	0	38	0	2.33	2.34	7	8	8	9	0
71	2462	Nazeema	24	156	52	21.3	0	1	0	0	9.8	0	3.6	4	0	39	0	2.28	2.28	8	8	8	8	0
79	6091	Sangeetha	26	162	58	22.1	1	1	0	0	9.8	0	3.6	4	0	38	0	2.26	2.28	7	8	7	8	0
86	7788	Bhagya	20	162	56	21.3	0	1	0	0	9.4	0	3.6	4	0	37	0	2.26	2.28	8	8	8	8	0
89	8546	Elizabeth	24	152	58	25.1	1	1	0	0	9.2	0	3.6	4	0	37	0	2.35	2.36	7	9	8	8	0
13	11009	Karpargam	24	160	56	21.8	1	1	0	0	9.6	0	3.8	4	0	38	0	2.28	2.32	7	9	7	8	0
38	18921	Bhavani	22	160	56	21.8	1	1	o	0	9.6	0	3.8	4	0	37	0	2.26	2.28	8	8	7	9	0
59	221	Mary	24	158	52	20.8	1	1	0	0	9.8	0	3.8	4	0	38	0	2.36	2.32	7	8	7	8	0
66	1672	Kala	21	154	50	21	1	1	0	0	9.8	0	3.8	4	0	39	0	2.34	2.32	7	8	8	8	0
69	2042	Vinodhini	26	160	58	22.6	0	2	1	1	9.4	0	3.8	4	0	38	0	2.35	2.3	7	7	7	7	0
72	2958	Anjali	22	158	54	21.6	0	1	0	0	9.8	0	3.8	4	0	37	0	2.3	2.31	7	9	7	9	0
74	3359	Vimala	22	152	50	21.6	1	1	0	0	9	1	3.8	4	0	37	0	2.31	2.31	9	9	9	9	0

85	7698	Karpargam	21	158	52	20.8	0	1	0	0	9.2	0	3.8	4	0	38	0	2.38	2.36	8	9	8	9	0
87	7989	Shakila	22	164	50	18.5	1	1	0	0	8.6	0	3.8	4	0	38	0	2.32	2.33	7	9	7	8	0
96	10900	Madhiya	26	162	58	22.1	1	2	0	0	9.4	0	3.8	4	0	38	0	2.33	2.34	7	9	7	9	0
11	10981	Annamal	21	164	64	23.7	1	1	0	0	9.2	1	4	4	0	38	0	2.3	2.27	7	7	6	6	0
49	23085	Sharmila	24	162	58	22.1	1	1	0	0	9.4	0	8	4	0	38	0	2.3	2.31	9	9	7	8	0