CERVICAL LENGTH IN MIDPREGNANCY AND LABOUR OUTCOME

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In partial fulfillment for the award of the Degree of

M.S. OBSTETRICS AND GYNECOLOGY

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MADRAS MEDICAL COLLEGE AND

RESEARCH INSTITUTE.

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BONAFIDE CERTIFICATE

This is to certify that this dissertation entitled **"CERVICAL LENGTH IN MIDPREGNANCY AND LABOUR OUTCOME"** is the bonafide work done by **Dr.M.Aruna**, post graduate in the Department of Obstetrics and Gynaecology, Institute of Obstetrics and Gynaecology, Government Women and Children Hospital, Madras Medical College, Chennai, towards partial fulfillment of the requirements of The Tamil Nadu Dr.M.G.R University for the award of M.S Degree in Obstetrics and Gynaecology.

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I, Dr. M. Aruna, solemnly declare that the dissertation titled, **"CERVICAL LENGTH IN MIDPREGNANCY AND LABOUR OUTCOME"** has been done by me. I also declare that this bonafide work or part of this work was not submitted by me for any award, degree, diploma to any other university either in India or abroad.

This is submitted to The Tamil Nadu Dr.MGR medical University, Chennai in partial fulfillment of the rules and regulations for the award of M.S Degree (Obstetrics and Gynaecology) held in April 2017.

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Introduction

INTRODUCTION

Normal parturition at term is dependent on the programmed development of the cervix early in pregnancy. The cervix undergoes preparative changes weeks before the onset of labour. It is well known that a reduced midtrimester cervical length is associated with an increased risk of spontaneous preterm birth. By extrapolating this, an increased midtrimester cervical length would be associated with an increased risk of prolonged pregnancies, failure of spontaneous onset of labour and caesarean delivery during labour.

The caesarean section rates have risen exponentially all over the world in recent years. The major cause of primary caesarean delivery at term is poor progress in labour. More than 85% of primary caesarean deliveries are performed for three reasons – dystocia, fetal distress and abnormal fetal presentation. A number of factors that lead to poor progress in labour have been identified like increasing maternal age, increased body mass index and prolonged pregnancy. The biological mechanisms that are actually responsible for poor labour progress are yet to be fully understood.

Cervical length has been investigated for its role in predicting preterm labour for over two decades. It is a simple, non-invasive and easily accessible tool and it can be combined with the routine anomaly scans.

Since both preterm labour and prolonged pregnancies as well as caesarean deliveries are associated with increased perinatal mortality and morbidity, their early prediction would be helpful in improving their management and outcome.

Aims and Objectives

AIMS AND OBJECTIVES

AIM:

To study the relationship between cervical length in midpregnancy and labour outcome.

PRIMARY OBJECTIVE:

The objective is to study the relationship between cervical length at midpregnancy and

1) Gestational age at delivery

2) Onset of labour, whether spontaneous or induced

3) Mode of delivery

4) Caesarean section due to failed induction

SECONDARY OBJECTIVE:

To determine the mean cervical length in our population.

Overview

OVERVIEW

The word "cervix" is derived from the Latin word 'cervix uteri' meaning "neck of the womb". The cervix is the lower cylindrical portion of the uterus, which enters the vagina and lies at right angles to it. It measures 2 to 4cm in length. Its junction with the uterus is marked by a constriction of the lumen called isthmus. Anteriorly, the cervix is related to the bladder and separated from it by a layer of fatty tissue. Posteriorly, the cervix is covered by peritoneum, which extends to the posterior vaginal wall and then reflects on to the rectum, forming the posterior cul de sac. Laterally the cervix is connected to the parametria and the broad ligament. The cervical canal extends from the internal os, where it joins the uterine cavity, to the external os, which projects into the vagina. Many of these anatomic features are seen on transvaginal ultrasound.

Hegar, in 1895, first described that, at 4-6 weeks gestation, there is a palpable softening of the lower uterine segment and he used this sign to diagnose pregnancy. As early as within one month of conception, there is pronounced softening and cyanosis in the cervix. Thiscould be attributed to the increased vascularity and oedema that occurs in the cervix, along with cervical glandular hypertrophy and hyperplasia (Straach, 2005).The major component of cervix is the connective tissue with a small amount of smooth muscle. This collagen rich connective tissue undergoes rearrangement and

remodelling and this is essential for the diverse functions of the cervix like preservation of a pregnancy to term, dilatation to aid labour, and repair following parturition, so that a successful pregnancy can occur again. Cervical ripening process involves connective tissue remodelling that decreases collagen and proteoglycan concentrations and increases water content compared with nonpregnant cervix. Local estrogen and progesterone metabolism appears to atleast partly regulate this process.

There is marked proliferation of the cervical glands and towards the end of pregnancy, nearly half of the entire cervical mass is occupied by the cervical glands. This contrasts with their rather small fraction in the nonpregnant state. Soon after conception, the profuse tenacious mucous that is secreted by the endocervical mucosal cells close the cervical canal. This profuse tenacious secretion is rich in immunoglobulins and cytokines. These molecules may function as an immunological barrier and thus guard the uterine contents from getting infected. The cervical mucus consistency also changes during pregnancy. These changes are essential for the normal onset and progress of labour.

The cervix has a vital role in pregnancy and does multiple key functions that include 1) Functions as a barrier to preserve and protect reproductive tract from infection. 2) Preservation of cervical competence to protect the contents from the increasing gravitational forces.

3) Orchestration of changes in the extracellular matrix that permit the tissue compliance to progressively increase. Thus, for continuing a normal pregnancy to term, maintenance of the normal cervical anatomy and structural integrity is crucial.

The length of the cervix can be also measured by digital examination. The main drawback of the examining finger is its inability to evaluate the supravaginal portion. Initial changes in the cervix may start with dilatation and funnelling at the internal os level. To detect these subtle changes by digital examination is difficult.

ULTRASOUND MEASUREMENT OF CERVICAL LENGTH:

Ultrasound today, is an integral part of the obstetrician's armamentarium and virtually an extension of the examining finger. It was developed by Professor Langevin during the First World War to combat the growing menace of submarines. Sir Ian Donald was the first to demonstrate the application of this technology to medical diagnosis. Ultrasound assessment of the uterine cervix began in the 1970's and the transvaginal probe which was introduced a decade later enriched the accuracy of measurement and its diagnostic value.

In sagittal plane, the cervix appears cylindrical in shape with moderate echogenicity and has a central canal. The anterior and posterior lips of cervix can sometimes be outlined as it protrudes into the vagina,

which is at right angles to it. In the pregnant state, the internal os is identified with the amniotic membrane or presenting part just superior to it. The cervical canal is surrounded by a hyperechoic or hypoechoic zone identified as cervical gland area. This zone is consistently seen until 31 weeks gestation and disappears as pregnancy advances. In transverse view, the cervix is circular, moderately echogenic structure with a central point corresponding to the cervical canal. Lateral to the cervix, branches of uterine artery can be identified using power doppler imaging.

TECHNIQUE

There are 3 ways to view the uterine cervix by sonography namely transabdominal, transvaginal and tranlabial(transperineal)

TRANSABDOMINAL SONOGRAPHY:

The cervical length is measured by identifying an echogenic line that denotes the endocervical canal and extends from the external cervical os to the internal cervical os. The cervix is best visualised when the bladder is full. But an over distended bladder falsely increases the cervical length by compressing the lower uterine segment. In addition, the over distended bladder may create false funnelling. This limitation is overcome by re-evaluation after partial bladder emptying or by using the transvaginal or translabial approach. Uterine contractions may cause focal narrowing of the uterine cavity inferior to it, stimulating dilatation of the endocervix or

bulging membranes. This limitation may be overcome by waiting for the contraction to subside or by bladder emptying, which may hasten the disappearance of these focal contractions. Visualisation of the cervix may also be limited by maternal habitus and overshadowing by the presenting part.
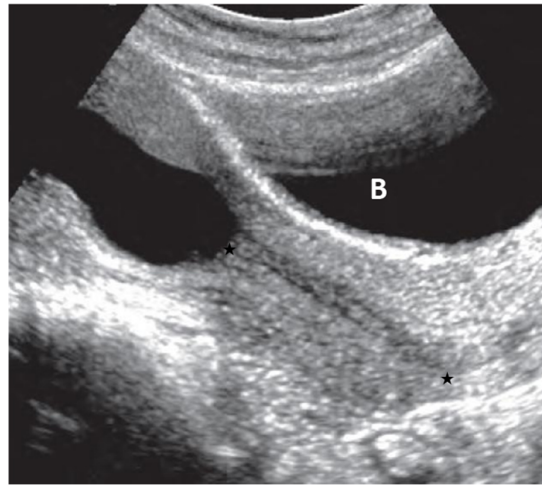

Figure 1 : Normal cervix. Transabdominal full-bladder technique.

Figure 2 : Normal cervix. Transabdominal empty bladder technique. Longitudinal midline image of the cervix obtained by scanning through the amniotic fluid. The cervical canal is indicated by calipers.

Despite these limitations, transabdominal sonography introduced the concept of sonographic evaluation of the cervix and paved the way for a more accurate diagnostic method, the transvaginal sonography.

TRANSVAGINAL SONOGRAPHY

Transvaginal sonographic (TVS) assessment of the uterine cervix is the standard reference technique. It is the reference because dimensions and characteristics of the cervix can be accurately determined transvaginally and in nearly all cases, it gives a very clear image of the cervix. It has a high acceptability rate among patients and over 90% of the patients report that, during the procedure there is only minimal uneasiness or embarrassment.

For a transvaginal study, the patient empties her bladder. She is in a supine position with her hips abducted or placed on stirrups with her hips elevated on a cushion or a wedge. A 3.5 to 8 MHz transvaginal transducer covered with a condom is inserted halfway between the introitus and the cervix oriented in a longitudinal plane. Usually, the transducer is inserted only 3 to 4cm into the vagina to avoid contact with the cervix so that the images will have the cervix within the effective focal range of the transducer. Obtaining a true longitudinal view may require some manipulation of the probe because the cervical axis often does not line exactly up with the maternal sagittal axis.

In order to measure the length of the cervix, the internal os and the external os are identified. The internal os is the site where the echogenic cervical canal, the hypoechoic amniotic sac and the presenting parts meet. The external os is the site where the anterior and posterior lips of the cervix meet. In the presence of funnelling or dilatation of the internal os, the residual cervical length is measured.
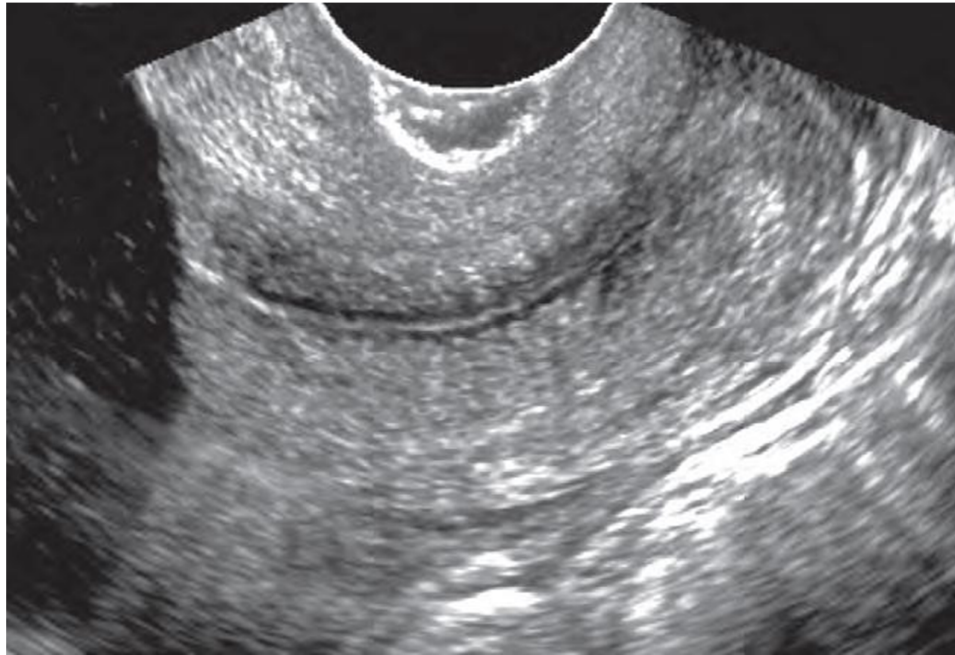
Figure 3A, Transvaginal scan of normal cervix. Suggested placement of cursors for measuring cervical length.

Figure 3B : Normal cervical glandular area. The cervical canal is seen as an echogenic line (arrow) surrounded by a hypoechoic zone resulting from endocervical glands

It is recommended that one first obtain a satisfactory image of the cervix, then the probe is withdrawn till the image is blurred and then the image is restored by reapplying enough pressure. This repositioning of the transducer avoids the error of falsely elongating the cervix with too much pressure of the probe on the anterior cervix.

In cases where the cervix looks curved, the cervical length must be calculated as the sum of multiple individual measurements rather than a line of best fit.

Prolonged observation for 3 to 5 minutes is recommended because dynamic changes such as dilatation of the internal os or funnelling, followed by shortening of the cervical canal can occur in the course of examination.

To ensure measurement of cervical length is reproducible, the following standardised criteria have been developed.

1. The cervical canal must be visualised along its entire length.

2. The internal cervical os identified must be flat or must have a V-shaped notch.

3. The external cervical os must have be a dimple or an echodense triangular area.

4. The distance between the cervical canal and the surface of the anterior lip must be equal to the distance between the cervical canal and the posterior lip. A difference of width indicates too much pressure on the cervix, which could falsely increase the measurement.

Using these standard criteria, the intraobserver and interobserver variations are as low as 3.5mm and 4.2mm respectively.

The transvaginal technique is far superior to transabdominal technique. Higher frequency transducers and close proximity to the structures allow for better resolution. Transvaginal assessment of cervical

length by three-dimensional ultrasonography has been limited to the development of a normal distribution of cervical length through gestation.

Potential complications of transvaginal technique include increased risk of bleeding in the presence of placenta previa, initiation of preterm labour in women with cervical shortening and chorioamnionitis in the presence of ruptured membranes. Several authors have evaluated these potential risks and found they were not true clinical risks.

TRANSPERINEAL/TRANSLABIAL SONOGRAPHY

Transperineal sonography is done in patients for whom cervix cannot be visualised by transabdominal method or if vaginismus prevents the transvaginal approach. It avoids the potential complications of transvaginal approach and is well tolerated by the patient.

A 3.5 to 5 MHz sector or curvilinear transducer is used. To minimize the risk of infection, the probe is covered with a plastic sheath or condom.With the patient in supine position with the hips abducted, the probe is applied in the saggital plane between the labia at the vaginal introitus. Partial bladder fullness assists visualisation of the cervix by conveying sound waves towards the cervix and identifies the bladder as a clearly visible landmark.

The vagina courses directly away from the transducer between the bladder and the rectum. The cervical canal is generally oriented at a right angle from the distal vagina. Although the probe is initially situated sagittal on the perineum, rotation of the probe obliquely in a clockwise or counter-clockwise direction may minimize shadows, which obscure the landmarks identifying the internal and external os.
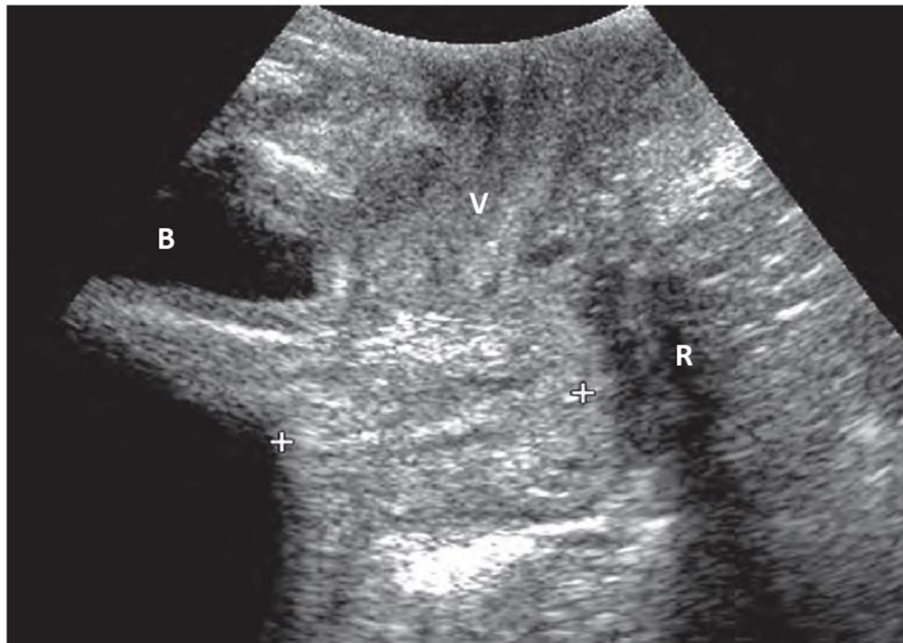

Figure 4 : Transperineal scan of normal cervix. The cervix (calipers) is oriented horizontally, approximately perpendicular to the ultrasound beam. The vagina (V) is oriented in a nearly vertical plane. B, Bladder; R, rectum

Kurtzman et al showed a good correlation between cervical length measurements using transvaginal and transperineal methods. However, transperineal sonography was technically more challenging. The region of the external os may pose difficulty in identification when it is hidden by rectal gas shadows or by the pubic symphysis and the reproducibility of these measurements is poor. These limitations are overcome by elevation of the hips, better application of the transducer on the perineum or changes in the orientation of the probe. Nevertheless, compared with a nearly 100% visualisation using transvaginal sonography, the cervix is adequately visualised in only 90% to 95% of cases with transperineal method.

LABOUR:

The final hours of pregnancy are marked by powerful and painful contractions of the uterus that are essential to cause effective cervical dilatation and effect descent of the fetus through the birth canal. The World Health Organisation defines normal labour as "spontaneous in onset, low risk from the start and remaining so throughout labour and delivery and the infant is born spontaneously in vertex position between 37 and 42 completed weeks of pregnancy, and the mother and infant are in good condition after birth".

Both the cervix and the uterus undergo extensive preparations long before the onset of this process. In the initial 38 to 40 weeks of a normal

pregnancy, the myometrium of the uterus is in a preparatory process yet it maintains an unresponsive state. Concomitantly, the uterine cervix starts the early stage of remodelling named softening, but still the structural integrity of the cervix is maintained. This long quiescent phase is followed by a transitory phase when there is suspension of the myometrial unresponsiveness and there occurs progressive effacement and changes in the structural integrity of the cervix.

Onset of labour and human parturition are regulated by multiple physiological and biochemical processes, yet the exact mechanisms are not fully known and continue to be defined. A sequence of multiple biochemical changes in the uterus and cervix culminate in labour onset. These biochemical changes are the result of endocrine and paracrine signalling originating from both the mother and the fetus. There are interspecies differences in these biological processes and these differences cause difficulty in elucidation of the exact factors that are involved in regulation of human labour. When there is an abnormality in onset or progress of labour, then preterm labour, dystocia or postterm pregnancy would result. These remain some of the key contributors of neonatal mortality and morbidity.

Review of Literature

REVIEW OF LITERATURE

It is well known that the cervical length influences labor outcome. The most common cause of primary cesarean section at term is poor progression of labor (dystocia). It is well recognised that short cervix is associated with preterm labour. By extrapolating this fact, a few researchers have shown that increase in cervical length is associated with an increase in the risk of lengthened induction to delivery interval and poor progress of labour. Increased cervical length at mid trimester is also an independent predictor of cesarean delivery risk in primiparous women. [1-4].

A study by Gordon Smith et al [1] showed that the rate of caesarean delivery increased with increasing cervical length. 27,472 primigravid women were included in the study. These women had a mean cervical length of 16 mm or more. The cervical length was measured at a median gestational age of 23 weeks. They eventually delivered a live baby at term. They found that the cesarean section rate at term was lowest (16.0%) when the midtrimester cervical length was in the lowest quartile (16 to 30 mm) and the cesarean section rate substantially increased to 18.4% when the cervical length was in the second quartile (31 to 35 mm), 21.7% in third quartile (36 to 39 mm), and 25.7% fourth quartile (40 to 67 mm) (P value <0.001). The odds ratio was 1.81 (95% confidence interval [CI], 1.66 to

1.97). It was calculated by comparing the cesarean section rate of women with cervical length in the fourth quartile with the cesarean section rate of women with cervical length in the first quartile. This odds ratio which was calculated after adjusting for confounding factors like age, BMI, smoking, race or ethnicity, duration of pregnancy, spontaneous or induced labour, birth-weight percentile, and place of delivery was 1.68 (95% Confidence Interval is 1.53 to 1.84; P value <0.001). It was found that procedures performed for poor progress in labour was mainly responsible for the increased risk of cesarean delivery.

A study by Kalu CA[2] et al showed that increased cervical length in mid-pregnancy predicts the possibility of caesarean delivery early in pregnancy. They examined 281 primiparous women who had a gestational age of around 22 weeks from the last menstrual period. The cervical length was measured by transvaginal sonography. They were followed upto term. The cervical length was compared with their mode of delivery and was analysed for any association. It was found that 11.7% of patients had a cesarean section at term due to poor progress in labour. The women who had cervical length in the highest quartile (40–67 mm) had a cesarean section rate of about 50% (P value 0.0018 for the trend). 33 women in the study had poor progress in labour and went in for cesarean delivery. Of the 33, 18 women (54.5%) had a midtrimester cervical length that was greater

than 4cm. The likelihood ratio for cesarean delivery at term in view of failed labour progress was 10.28 (P value 0.0013) in women who had their cervical length in the upper quartile. They concluded that cervical length could be of great use in predicting mode of delivery at an early gestational age.

A study by Glovenco T et al [3] showed that an increased cervical length at midtrimester scan is associated with increase in the caesarean section rate. However, it was found that there was no statistically significant association between midtrimester cervical length and mode of delivery, induction of labour or prolonged pregnancy.

A retrospective study was conducted with 1384 women who were admitted in Toowoomba hospital from the 1st of April 2011 to the 31st of December 2012. They measured the transvaginal cervical length at 18 weeks pregnancy. The patients were followed upto delivery and their mode of delivery was analysed for any association. At midtrimester, women who had a caesarean section had a mean cervical length of 3.87 and those who had a vaginal delivery had a mean cervical length of 3.74. They found that this association was statistically significant and had a P-value of <0.001. In women who had spontaneous onset of labour, the mean cervical length at midpregnancy was 3.77 and for those who did not have spontaneous labour onset, the mean cervical length was 3.78. They found that this association

was not statistically significant (P-value: 0.873}. The mean length of the cervix in women who had prolonged labour was 3.78 and did not have prolonged labour was 3.77. This association was not found to be statistically significant and had a p-value of 0.931. The mean length of the cervix in women who had postterm pregnancy was 3.78 and did not have postterm pregnancy was 3.74. This association was not found to be statistically significant with a P-value of 0.361.They concluded that length of the cervix measured by transvaginal sonography at midtrimester scan is an independent predictor of the risk of caesarean delivery at term. However there was no statistically significant association between cervical length at mid trimester and induction of labour or prolonged pregnancy.

E. Jung et al[4] showed that increase in the length of cervix at midtrimester was significantly related to an increased risk of failure of labour induction.

It was retrospective cohort study. 518 women who had a singleton pregnancy were included in the study. These women had a transvaginal cervical length measurement around 19 and 24 weeks of pregnancy. These women had then undergone induction of labour at or later than 33 completed weeks. Cervical length was measured by transvaginal ultrasound both at mid-pregnancy and also around the time of labour induction.

Primary outcome was failed labour induction. All known confounding factors causing failed induction of labour were taken into account in the analysis. The study found that induction of labour failed in 23.9% of pregnancies. It was found that women who had longer cervical lengths at mid-pregnancy had a significantly higher rate of failed induction. It was also found that primigravida and those who had a higher BMI, and an earlier gestational age at induction had an increased chance of failed labour induction.

They did a multivariate analysis which showed that increasing midtrimester cervical length at mid-trimester was significantly associated with failed labour induction after adjusting for confounding factors like BMI, gestational age and nulliparity. When Receiver Operator Characteristic curve was drawn, it was seen that the area under curve for the cervical length at induction of labour was significantly greater than that drawn for the cervical length measured at mid-pregnancy.

A study by Mamta Rath Datta et al[5] found that measurement of transvaginal cervical length at mid pregnancy could be used to determine the risk of primary cesarean section, failure of spontaneous onset of labour and the risk of failed labour induction.

It was a prospective study conducted in the Obstetrics Department of Tata Main Hospital .100 antenatal women who had attended out-patient department, from 1st December 2011 to 1st December 2012 were included in the study. Transvaginal ultrasonography was performed between 18 and 26 weeks. Cervical length was measured and recorded. The patients were followed upto term and their labour details were recorded. The duration of pregnancy, mode of labour onset, either spontaneous or induced, duration of labour and mode of delivery whether vaginal or caesarean and the cause for caesarean delivery were recorded.

They found that there was an increase in the cesarean section rate when the cervical length ≥ 4 cm (P value : <0.0001). About 57.1% of cesarean deliveries occurred when the cervix length was >4cm. They found that those who had spontaneous labor onset had a mean cervical length of 3.11 ± 0.85 cm and those who had need for induced labor had a mean cervical length of 4.36 ± 1.11 cm (P value ≤ 0.001).

They performed a multivariate analysis to analyse the outcome variable of caesarean or vaginal delivery. They found that the length of cervix measured at midtrimester and the induction to delivery interval are independent predictors of the mode of delivery. By using the receiver operating characteristic (ROC) curve analysis, cervical length more than 4cm was considered as the optimum cut-off criterion for the prediction of

primary cesarean section. When cervical length was used as predictor of the mode of delivery, it was found that sensitivity was 54.8%, specificity was 91.4%, positive predictive value was 82.1% and negative predictive value was 73.6%.

N. S. Fox et al [7] studied the cervical length in twin pregnancies. They found a significant association between increased transvaginal cervical length at 30-32 weeks and the chance of caesarean section in labour at term. When the analysis was done adjusting for confounding factors like age, race, parity, chorionicity, assisted reproduction and induced labour, the length of cervix measured transvaginally at 30-32 weeks was an independent predictor of caesarean section.

A study by A. J. Van der Ven et al[9] found that increased cervical length at midpregnancy was associated with a significantly increased chance of both prolonged pregnancy and emergency caesarean delivery. They did a multicentre cohort study involving 5321 nulliparous women. They measured cervical length by transvaginal ultrasonography between 16 and 22 weeks of gestation. From this cohort, only women who delivered after 34 weeks were included. The cervical length measured was divided into quartiles. The probability of emergency caesarean section increased with increasing quartiles of cervical length from 9.4% in the first quartile to 14.9% in the fourth quartile ($P=0.01$). This association was seen only when caesarean

section was taken up for failed induction and not when done for fetal distress.

A meta-analysis by Hatfield AS et al, based on 19 trials in 3061 women found that a short cervical length predicts preterm labour and an increased cervical length is associated with failed labour induction. It had a positive likelihood ratio of 1.66(95% Confidence Interval 1.20-2.31) and a negative likelihood ratio of 1.51(95% Confidence Interval 0.39-0.67).

A study by Datta MR et al[6] found that in nulliparous women, a longer cervical length in midtrimester was associated with greater chance of prolonged pregnancy. It was a prospective cohort study. 9165 women with a singleton pregnancy were included in the study. Transvaginal cervical length was measured in these women at around 18 and 24 weeks. The women were then divided into goups based on the quartiles of cervical length measured. The association of cervical length with postterm pregnancy was analysed by bivariate and multivariate analysis. They concluded that women with increasing quartiles of cervical length had a significantly greater risk of having a postterm pregnancy.

A meta analysis by Verhoeven CJ et al[10] found that transvaginal ultrasonographic measurement of cervical length at term or near term when

done before induction of labour can be used to predict the outcome of labour.

Numerous studies have shown correlation between midtrimester cervical length and preterm labour. A systematic review by Crane JM (11) et al found that transvaginal ultrasonographic measurement of cervical length in asymptomatic high-risk women can be used to predict spontaneous preterm birth before 35 weeks. They studied fourteen articles involving 2258 women who met the criteria of the systematic review. When they used a smaller cut-off of cervical length, there was a higher positive likelihood ratio (LR). Cervical length < 25 mm was the most commonly used cut-off. When this value was used to predict preterm birth before 35 weeks, it had a positive likelihood ratio (LR+) of 4.31 (95% Confidence Interval, 3.08-6.01); when measured at 20-24 weeks, it had an LR+ = 2.78 (95% Confidence Interval, 2.22-3.49); and when measured at > 24 weeks, LR+ = 4.01 (95% Confidence Interval, 2.53-6.34). Thus, they concluded that cervical length measured by transvaginal ultrasonography predicts spontaneous preterm birth.

Another systematic review by Honest H et al [12] studied the accuracy with which transvaginal cervical sonography predicts spontaneous preterm birth. They studied 46 primary articles. This involved around 31,577 antenatal women, from 33 studies involving asymptomatic and 13 studies

involving symptomatic women. This systematic review concluded that it is possible to predict spontaneous preterm birth by using transvaginal sonographic cervical length measurement. But, there was marked variation between studies with regard to gestational age at which cervical length was measured, what was the cervical length cut-off taken and when it was labelled as preterm labour. Testing was most commonly done in asymptomatic women before 20 weeks gestation, using cervical length cut off of 25 mm and spontaneous preterm birth defined as that occuring before 34 completed weeks.

The Likelihood Ratio for this entire group was 6.29 (95% Confidence Interval, 3.29-12.02). Thus, they concluded that it is possible to predict spontaneous preterm birth in asymptomatic women by using cervical length measurement and funneling, either alone or in combination and it must be performed in all high risk antenatal women.

Materials and Methods

MATERIALS AND METHODS

It is a prospective study conducted in Institute of Obstetrics and Gynaecology, Egmore, Chennai. Informed written consent was obtained from all antenatal women who had participated in this study.

Subject Selection:

Subjects were selected from the antenatal clinic, Institute of Obstetrics and Gynaecology.

Duration of the study: 1year 6months

Inclusion Criteria:

1) Asymptomatic primigravida with singleton pregnancies between 19-24 weeks attending the antenatal clinic.

2) No medical disorders

3) No factors predisposing to preterm labour like previous preterm labour, surgery on cervix, pre eclampsia

Exclusion Criteria:

1. Women unsure of dates

2. Multiple pregnancy

3. Women with previous history of caesarean section

4. Polyhydramnios

5. Women with Haemoglobin <8g%

6. Women with suspected foetal abnormalities

7. Extremely short statured women

8. Women with skeletal abnormalities

9. Smokers

Assessment of parameters:

    i)   Clinical variables – Patient details like age, socio economic status, maternal weight, height, body mass index, gravidity , parity, any history of abortion, and medical complications were recorded

    ii)   Cervical length at 20 – 24 weeks

    iii)   Labour outcome

Screening Procedures/ Visits

I) Determination of cervical length:

This was done between 19 to 24 weeks. The gestational age was calculated from the Last Menstrual Period(LMP) and confirmed by the first trimester ultrasound measurement of fetal crown rump length. Cervical length was measured by transvaginal ultrasound.

The women were examined with an empty bladder in dorsal position. The internal os, external os, cervical canal and endocervical mucosa were

identified. The endocervical mucosa was used to define the site of the internal os. The image was magnified. The distance between the internal and external os was measured.

Three measurements were taken over a period of 3 minutes to observe any dynamic changes in the cervix and the mean of these three measurements was considered. The presence of funneling and diameter of internal os was noted.

II) Follow up procedure:

The women were followed upto term. They were subsequently managed according to hospital protocol. Data on labour outcome including the gestational age at delivery, mode of onset of labour whether spontaneous or induced, mode of delivery and indication for cesarean section were recorded.

Preterm labour is defined by ACOG as the onset of regular, painful, frequent, uterine contractions causing progressive effacement and dilation of cervix occurring before 37 completed weeks of gestation from the period of viability.

Postterm pregnancy is defined by ACOG as pregnancies longer than 42 completed weeks or longer than 294 days from the first day of last

menstrual period. Prolonged pregnancy is taken in our study as longer than 40 completed weeks or 280 days from the first day of last menstrual period.

Poor progress in labour is defined as failure of cervical dilatation to progress at 1cm per hour during active phase labour in the presence of adequate uterine contractions (even after augmentation with oxytocin) in the absence of cephalo pelvic disproportion. Failed induction is defined as failure of onset of active phase of labour after one cycle of treatment (one dose of Prostaglandin tablets or gel followed by a second dose after 6 hours if labour is not established up to a maximum of two doses)

Analysis of Results

ANALYSIS OF RESULTS

In this study, 500 antenatal women were enrolled and cervical length was measured at 19-24 weeks. The patients were followed up to delivery and their outcome was analysed

Sample size : 500

Table 1 : MEAN CERVICAL LENGTH IN THE STUDY POPULATION				
	N	Mean	Std. Deviation	Std. Error Mean
CERVIX LENGTH AT 19 TO 24 WEEKS	500	3.632	.4703	.0210

The mean cervical length in our study population of 500 antenatal women was 3.632 with a standard deviation of 0.4703.

Table 2 : PRETERM LABOUR

PRETERM	Frequency	Percent	Valid Percent	Cumulative Percent
NO	470	94.0	94.0	94.0
YES	30	6.0	6.0	100.0
Total	500	100.0	100.0	

Of the 500 women in the study, 30(6%) went in for preterm labour.

Table 3 : PROLONGED PREGNANCY

PROLONGED PREGNANCY		Frequency	Percent	Valid Percent	Cumulative Percent
	NO	396	79.2	79.2	79.2
	YES	104	20.8	20.8	100.0
	Total	500	100.0	100.0	

Of the 500 women in the study, 104 (20.8%) had prolonged pregnancy. The rest of the patients delivered before their Expected Date of Delivery.

Table 4 : ONSET OF LABOUR

ONSET OF LABOUR	Frequency	Percent	Valid Percent	Cumulative Percent
SPONTANEOUS	346	69.2	69.2	69.2
INDUCED	154	30.8	30.8	100.0
Total	500	100.0	100.0	

Of the 500 women in the study, 346 (69.2%) had spontaneous onset of labour. In the rest, labour was induced due to a varied indications.

Table 5 : MODE OF DELIVERY

MODE OF DELIVERY	Frequency	Percent	Valid Percent	Cumulative Percent
VAGINAL	225	45.0	45.0	45.0
CESAREAN	275	55.0	55.0	100.0
Total	500	100.0	100.0	

Of the 500 women in the study, 225(45%) had vaginal delivery including operative vaginal delivery, 275 (55%) had caesarean delivery.

Table 6 : CESAREAN SECTION DUE TO FAILED INDUCTION

| Cesarean section due to failed induction	Frequency	Percent	Valid Percent	Cumulative Percent
NO	393	78.6	78.6	78.6
YES	107	21.4	21.4	100.0
Total	500	100.0	100.0	

Of the 500 women in the study, 107 (21.4%) had caesarean section due to failed induction. The rest of the women had either vaginal delivery or caesarean delivery for other indications.

ASSOCIATION BETWEEN AGE GROUP AND PRETERM LABOUR

Table 7

	PRETERM	N	Mean	Std. Deviation	Std. Error Mean	T	P
AGE	YES	30	24.03	3.882	0.709	-0.494	0.622
	NO	470	24.39	3.775	0.174		

Bar Chart
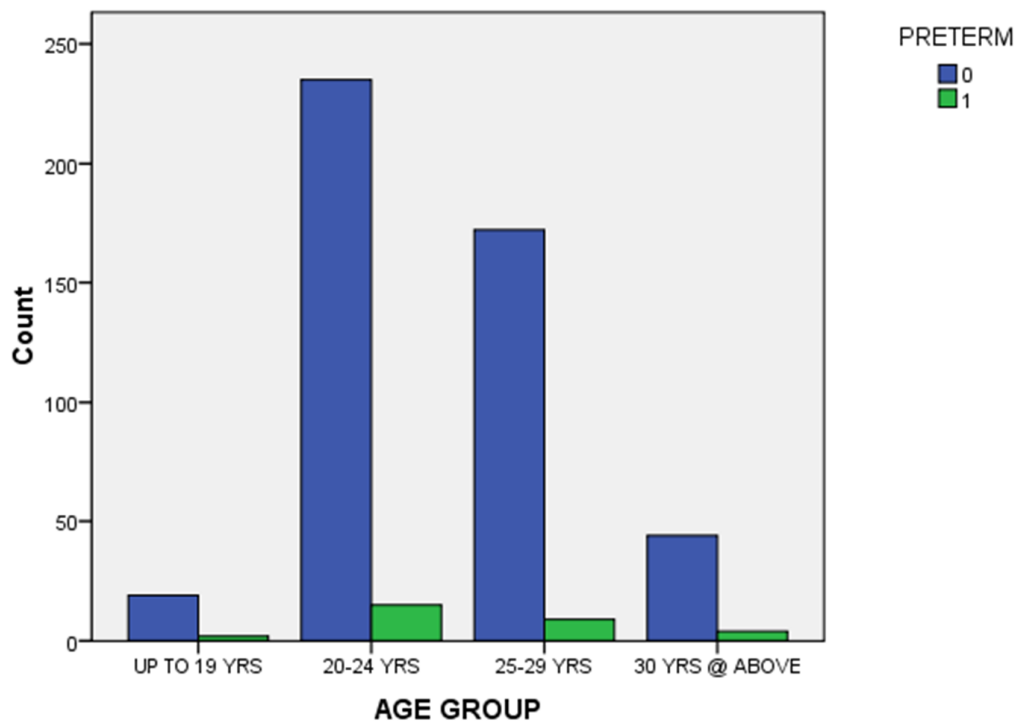
CHI SQUARE=1.265

P =0.738

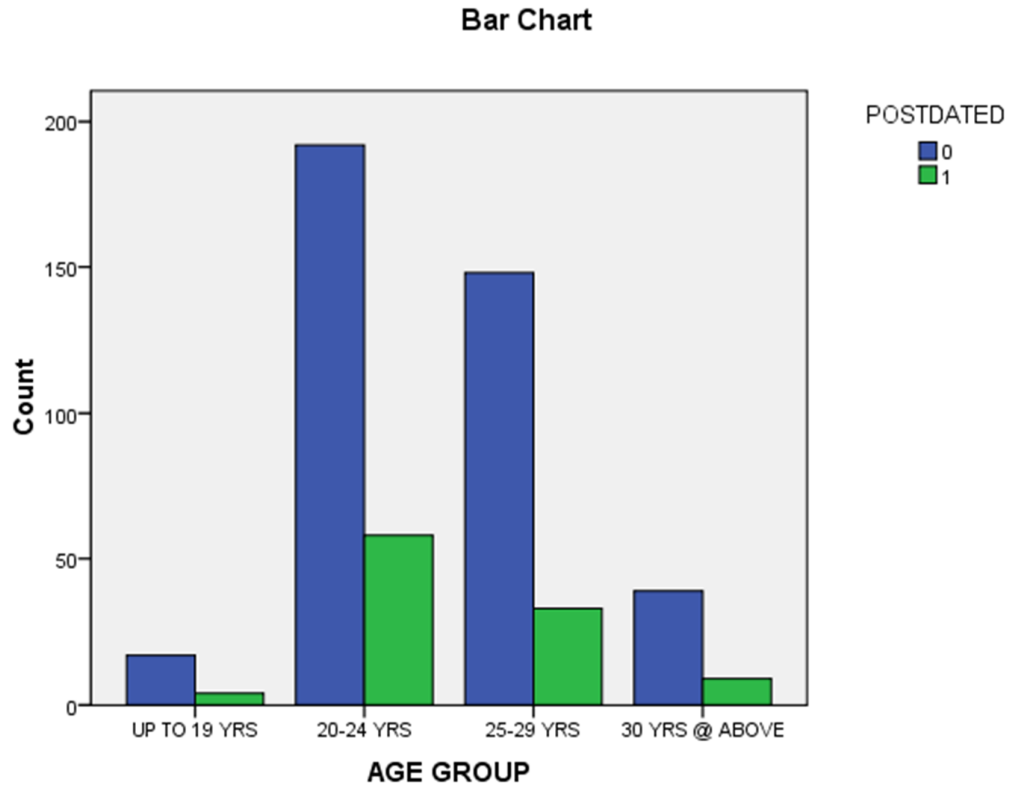There is no significant association between age group and pretrerm labour.

ASSOCIATION BETWEEN AGE GROUP AND PROLONGED PREGNANCY

Table 8

	PROLONGED PREGNANCY	N	Mean	Std. Deviation	Std. Error Mean	T	P
AGE	YES	104	24.05	3.482	.341	-.958	.338
	NO	396	24.45	3.852	.194		

Table 9

AGE GROUP	PROLONGED PREGNANCY		TOTAL
	YES	NO	
UPTO 19	17	4	21
	4.3%	3.8%	4.2%
20-24	192	58	250
	48.5%	55.8%	50.0%
25-29	148	33	181
	37.4%	31.7%	36.2%
MORE THAN 30	39	9	48
	9.8%	8.7%	9.6%

Bar Chart

CHI SQUARE=1.760

P =0.624

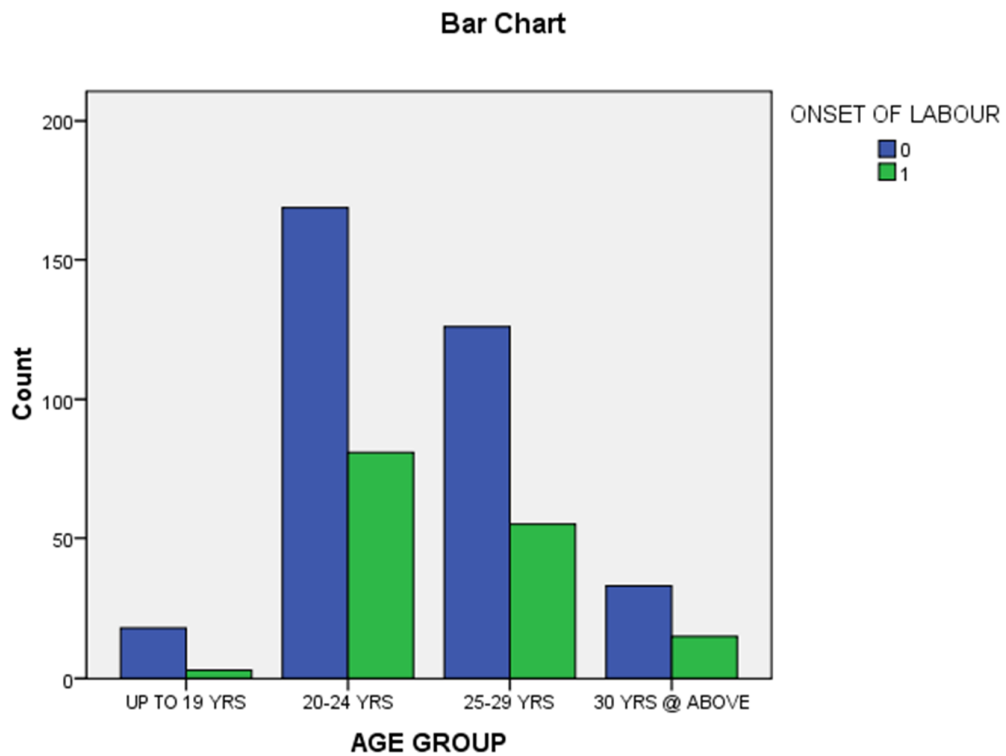There is no significant association between age group and prolonged pregnancy.

ASSOCIATION BETWEEN AGE GROUP AND ONSET OF LABOUR

Table 10

	ONSET OF LABOUR	N	Mean	Std. Deviation	Std. Error Mean	T	P
AGE	INDUCED	154	24.38	3.530	.284	.050	.960
	SPONTANEOUS	346	24.36	3.889	.209		

Table 11

AGE GROUP	ONSET OF LABOUR		TOTAL
	SPONTANEOUS	INDUCED	
UPTO 19	18	3	21
	5.2%	1.9%	4.2%
20-24	169	81	250
	48.8%	52.6%	50%
25-29	126	55	181
	36.4%	35.7%	36.2%
MORE THAN 30	33	15	48
	9.5%	9.7%	9.6%

Bar Chart

CHI SQUARE=3.006

P =0.391

There is no significant association between age group and onset of labour.
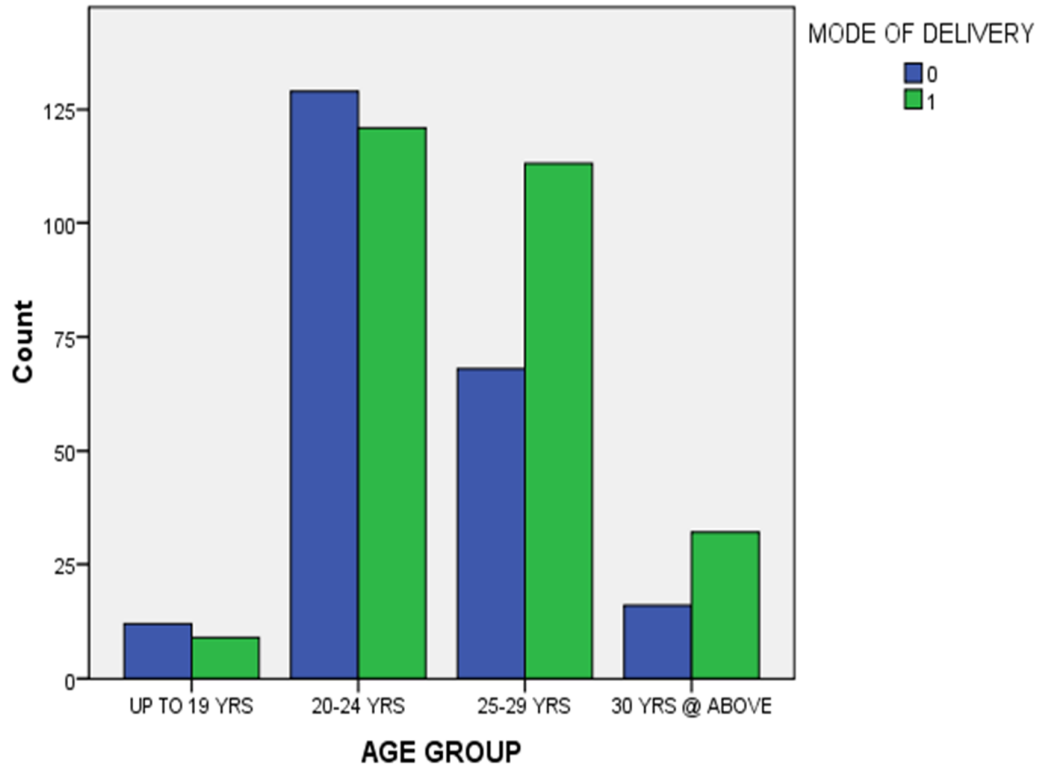
ASSOCIATION BETWEEN AGE GROUP AND MODE OF DELIVERY

Table 12

MODE OF DELIVERY		N	Mean	Std. Deviation	Std. Error Mean	T	P
AGE	CESAREAN	275	24.96	3.815	.230	3.981	0.690
	VAGINAL	225	23.63	3.608	.241		

Table 13

AGE GROUP	MODE OF DELIVERY		TOTAL
	VAGINAL	CESAREAN	
UPTO 19	12	9	21
	5.3%	3.3%	4.2%
20-24	129	121	250
	57.3%	44.0%	50.0%
25-29	68	113	181
	30.2%	41.1%	36.2%
MORE THAN 30	16	32	48
	7.1%	11.6%	9.6%

Bar Chart

CHI SQUARE=3.006

P =0.391

There is no significant association between age group and mode of delivery.
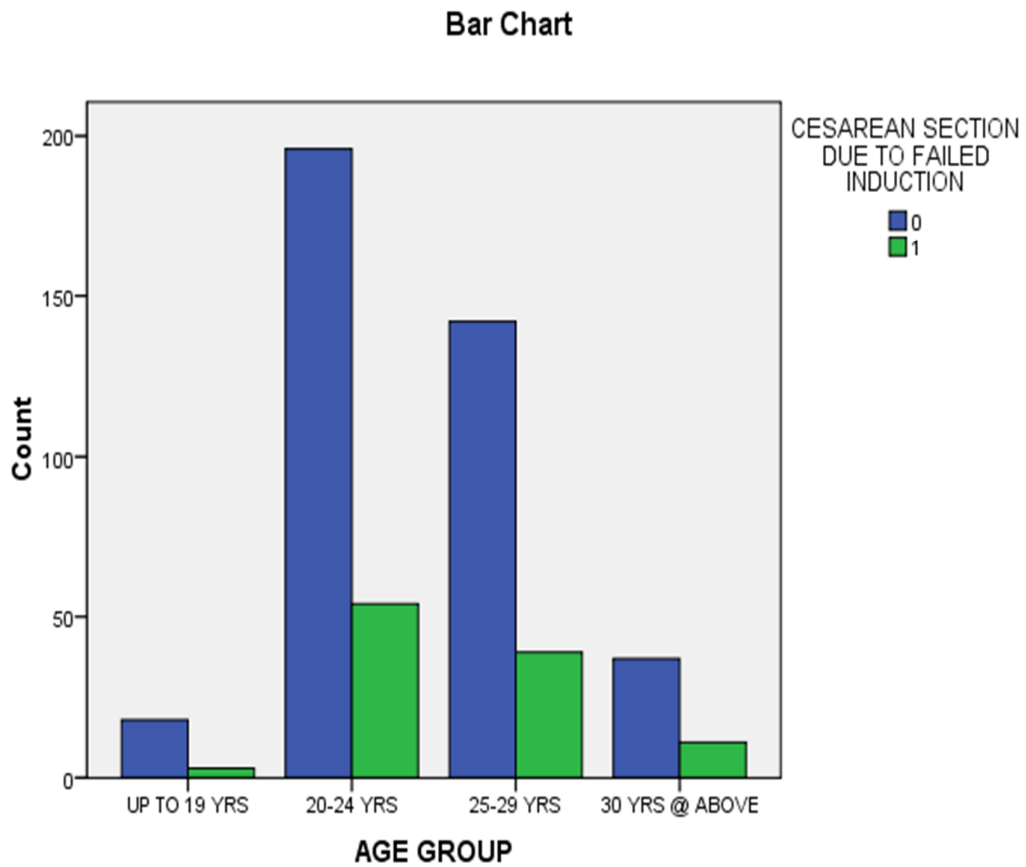
ASSOCIATION BETWEEN AGE GROUP AND CESAREAN SECTION DUE TO FAILED INDUCTION

Table 14

CESAREAN SECTION DUE TO FAILED INDUCTION		N	Mean	Std. Deviation	Std. Error Mean	t	P
AGE	YES	107	24.47	3.630	.351	.319	.750
	NO	393	24.34	3.822	.193		

Table 15

AGE GROUP	CESAREAN SECTION DUE TO FAILED INDUCTION		TOTAL
	YES	NO	
UPTO 19	18	3	21
	4.6%	2.8%	4.2%
20-24	196	54	250
	49.9%	50.5%	50%
25-29	142	39	181
	36.1%	36.4%	36.2%
MORE THAN 30	37	11	48
	9.4%	10.3%	9.6%

Bar Chart

CHI SQUARE=0.706

P =0.872

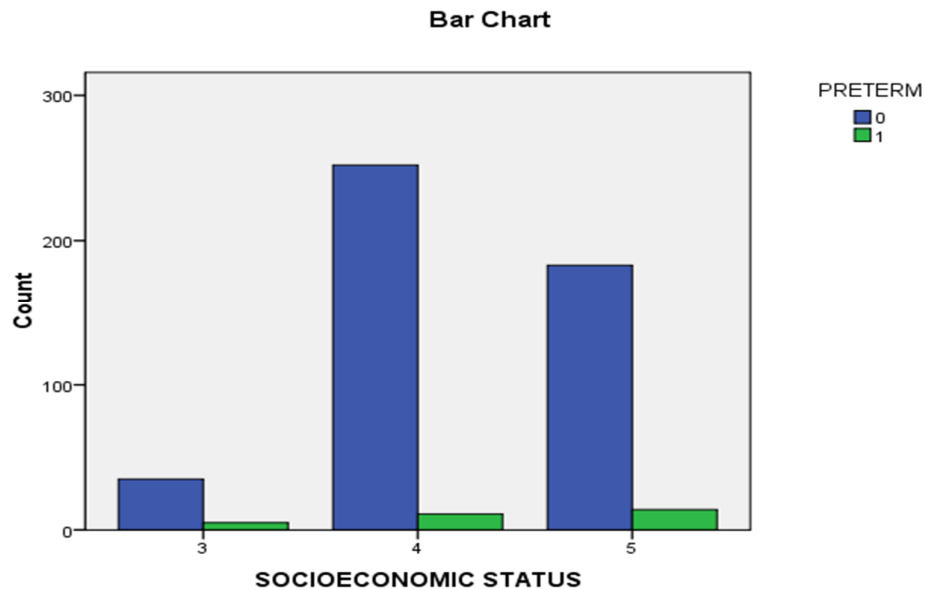There is no significant association between age group and caesarean section due to failed induction.

CONCLUSION

There is no statistically significant difference between age group and labour outcome.

ASSOCIATION BETWEEN SOCIOECONOMIC STATUS AND PRETERM LABOUR

Table 16

SOCIOECONOMIC STATUS	PRETERM		TOTAL
	YES	NO	
3	**35**	**5**	**40**
	7.4%	16.7%	8.0%
4	**252**	**11**	**263**
	53.6%	36.7%	52.6%
5	**183**	**14**	**197**
	38.9%	46.7%	39.4%

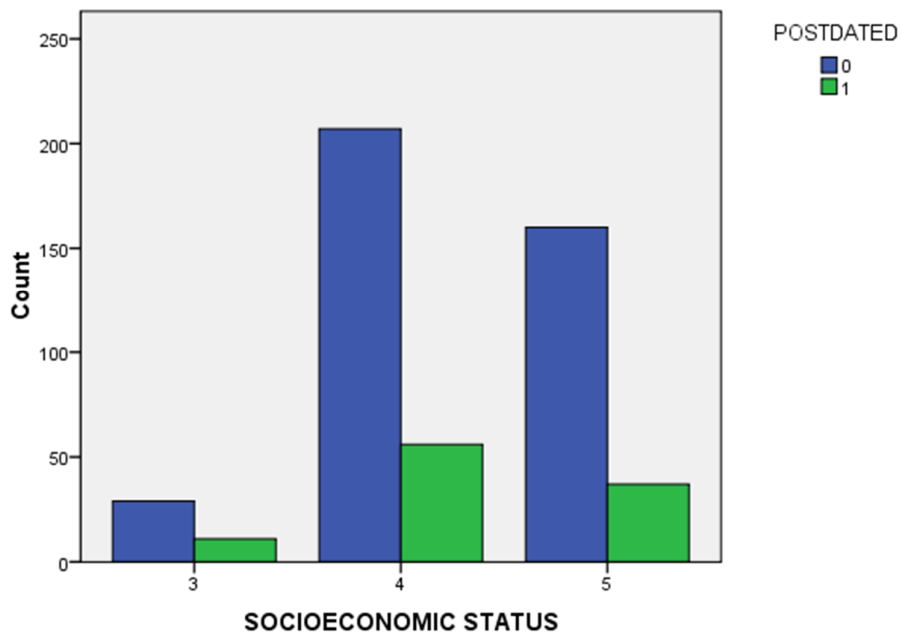Bar Chart

CHI SQUARE=4.965

P =0.084

There is no significant association between socioeconomic status and preterm labour.

ASSOCIATION BETWEEN SOCIOECONOMIC STATUS AND PROLONGED PREGNANCY

Table 17

| SOCIOECONOMIC STATUS	PROLONGED PREGNANCY		TOTAL
	YES	NO	
3	**29**	**11**	**40**
	7.3%	10.6%	8.0%
4	**207**	**56**	**263**
	52.3%	53.8%	52.6%
5	**160**	**37**	**197**
	40.4%	35.6%	39.4%

Bar Chart

CHI SQUARE=1.616

P =0.446

There is no significant association between socioeconomic status and prolonged pregnancy.

ASSOCIATION BETWEEN SOCIOECONOMIC STATUS AND ONSET OF LABOUR

Table 18

SOCIOECONOMIC STATUS	ONSET OF LABOUR		TOTAL
	SPONTANEOUS	INDUCED	
3	**25**	**15**	**40**
	7.2%	9.7%	8.0%
4	**181**	**82**	**263**
	52.3%	53.2%	52.6%
5	**140**	**57**	**197**
	40.5%	37.0%	39.4%
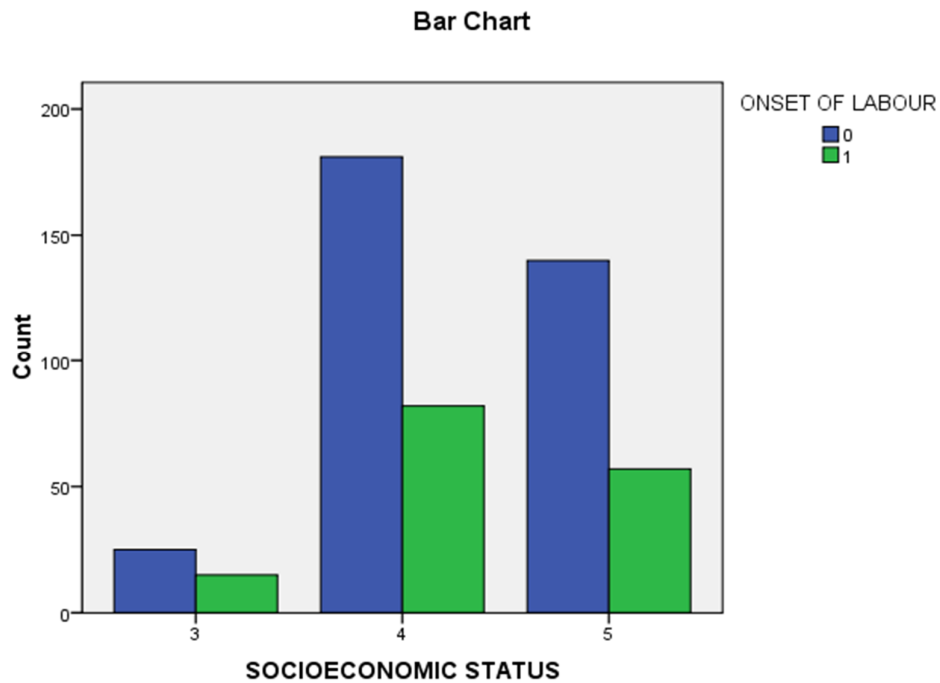
CHI SQUARE=1.182

P =0.554

There is no significant association between socioeconomic status and onset of labour

ASSOCIATION BETWEEN SOCIOECONOMIC STATUS AND MODE OF DELIVERY

Table 19

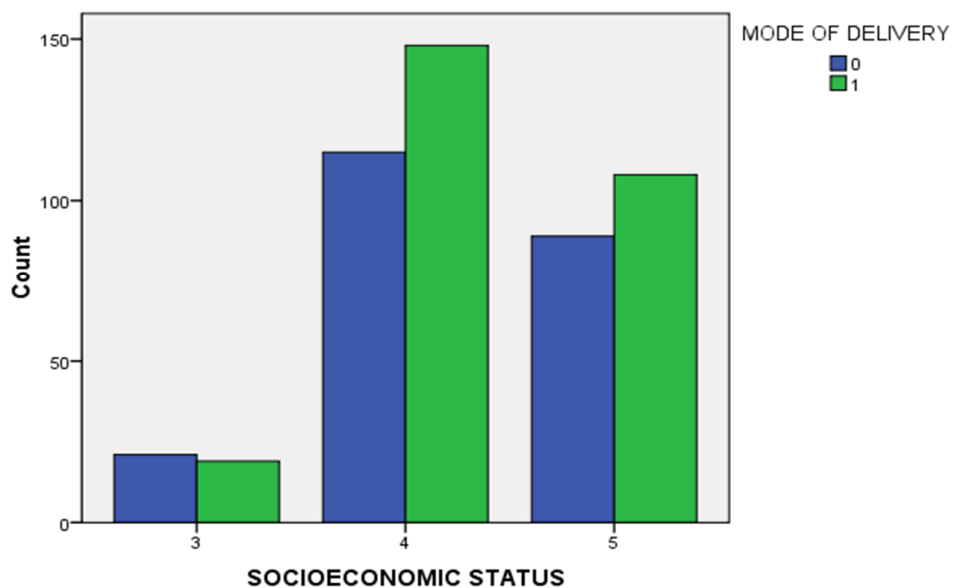| SOCIOECONOMIC STATUS	MODE OF DELIVERY		TOTAL
	VAGINAL	CESAREAN	
3	**21**	**19**	**40**
	9.3%	6.9%	8.0%
4	**115**	**148**	**263**
	51.1%	53.8%	52.6%
5	**89**	**108**	**197**
	39.6%	39.3%	39.4%

Bar Chart

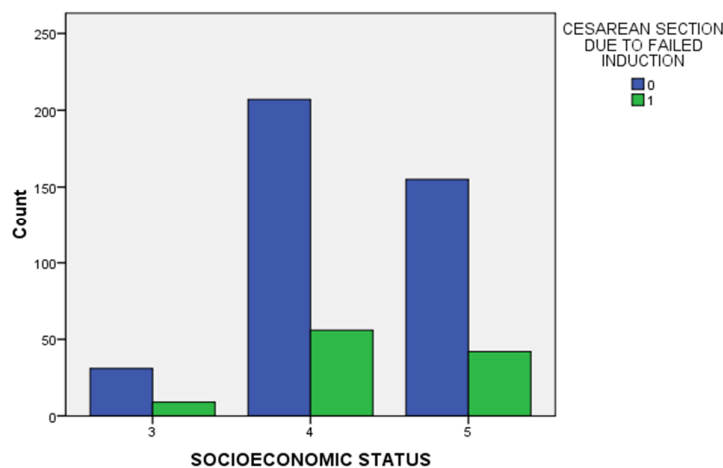
CHI SQUARE=1.084

P =0.582

There is no significant association between socioeconomic status and mode of delivery.

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ASSOCIATION BETWEEN SOCIOECONOMIC STATUS AND CESAREAN SECTION DUE TO FAILED INDUCTION

Table 20

SOCIOECONOMIC STATUS	CESAREAN SECTION DUE TO FAILED INDUCTION		TOTAL
	YES	NO	
3	**31**	**9**	**40**
	7.9%	8.4%	8.0%
4	**207**	**56**	**263**
	52.7%	52.3%	52.6%
5	155	42	197
	39.4%	39.3%	39.4%

Bar Chart

CHI SQUARE=0.031
P =0.982

There is no significant association between socioeconomic status and caesarean section due to failed induction.

CONCLUSION

There exists no statistically significant difference in labour outcome between different socioeconomic strata i.e., Socioeconomic status does not influence labour outcome.

ASSOCIATION BETWEEN BMI GROUP AND PRETERM LABOUR

Table 21

	PRETERM	N	Mean	Std. Deviation	Std. Error Mean	T	P
BMI	YES	30	22.200	2.5218	.4604	.484	.629
	NO	470	22.001	2.1609	.0997		

Table 22

BMI	PRETERM LABOUR		TOTAL
	NO	YES	
UPTO 22.9	**313**	**21**	**334**
	66.6%	70.0%	66.8%
23-27.99	**151**	**7**	**158**
	32.1%	23.3%	31.6%
28 AND ABOVE	**6**	**2**	**8**
	1.3%	6.7%	1.6%

Bar Chart
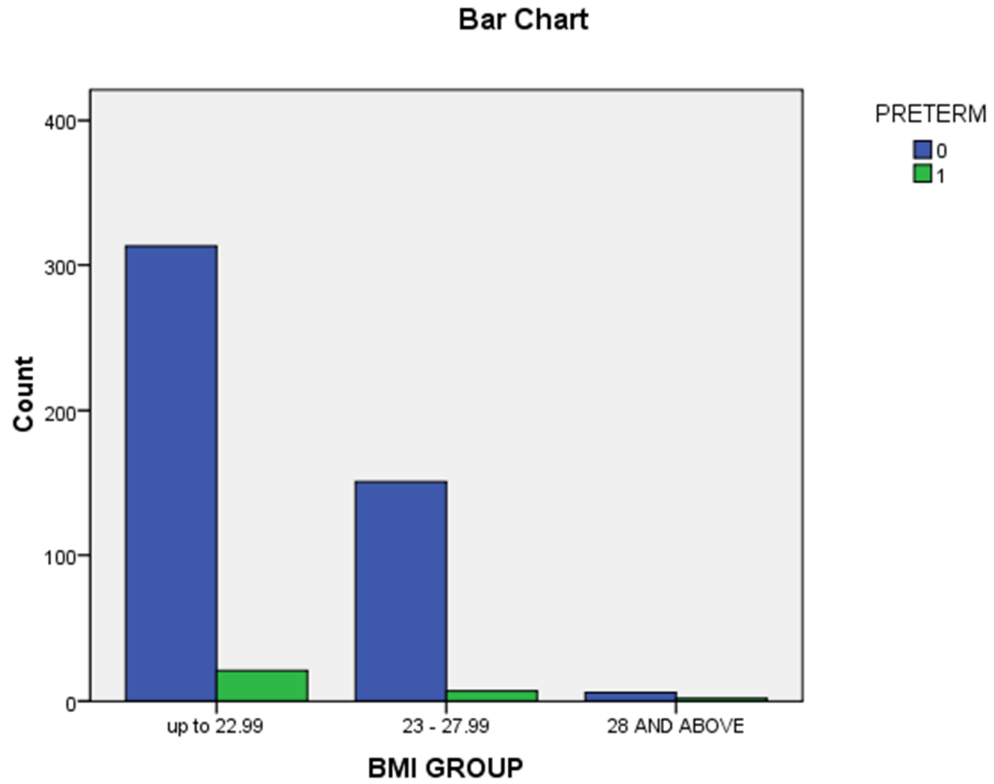
CHI SQUARE=5.860

P =0.063

There is no significant association between BMI and Preterm labour.

ASSOCIATION BETWEEN BMI GROUP AND PROLONGED PREGNANCY

Table 23

PROLONGED PREGNANCY		N	Mean	Std. Deviation	Std. Error Mean	T	P
BMI	YES	104	22.094	2.1640	.2122	.426	.670
	NO	396	21.992	2.1888	.1100		

Table 24

BMI	PROLONGED PREGNANCY		TOTAL
	NO	YES	
UPTO 22.9	267	67	334
	67.4%	64.4%	66.8%
23-27.99	121	37	158
	30.6%	35.6%	31.6%
28 AND ABOVE	8	0	8
	2.0%	.0%	1.6%

Bar Chart
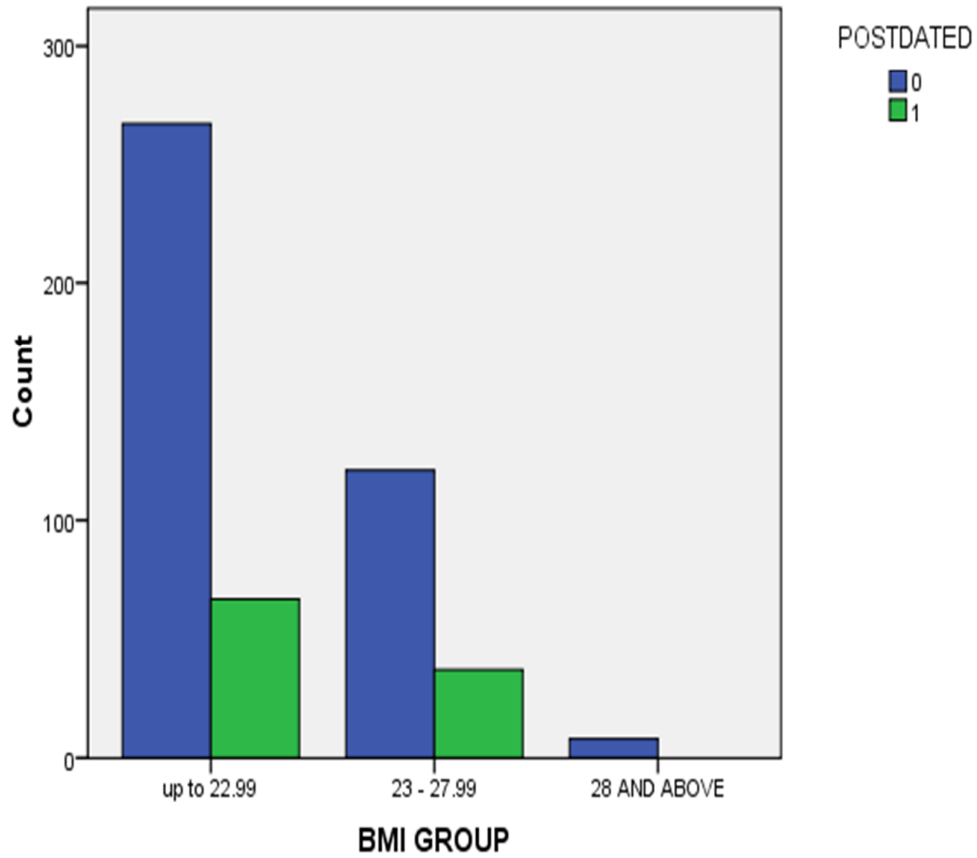
CHI SQUARE=2.869

P =0.238

There is no significant association between BMI and Prolonged pregnancy.

ASSOCIATION BETWEEN BMI GROUP AND ONSET OF LABOUR

Table 25

	ONSET OF LABOUR	N	Mean	Std. Deviation	Std. Error Mean	T	P
BMI	INDUCED	154	22.042	2.2624	.1823	.200	.842
	SPONTANEOUS	346	22.000	2.1483	.1155		

Table 26

BMI	ONSET OF LABOUR		TOTAL
	SPONTANEOUS	INDUCED	
UPTO 22.9	232	102	334
	67.1%	66.2%	66.8%
23-27.99	108	50	158
	31.2%	32.5%	31.6%
28 AND ABOVE	6	2	8
	1.7%	1.3%	1.6%

Bar Chart
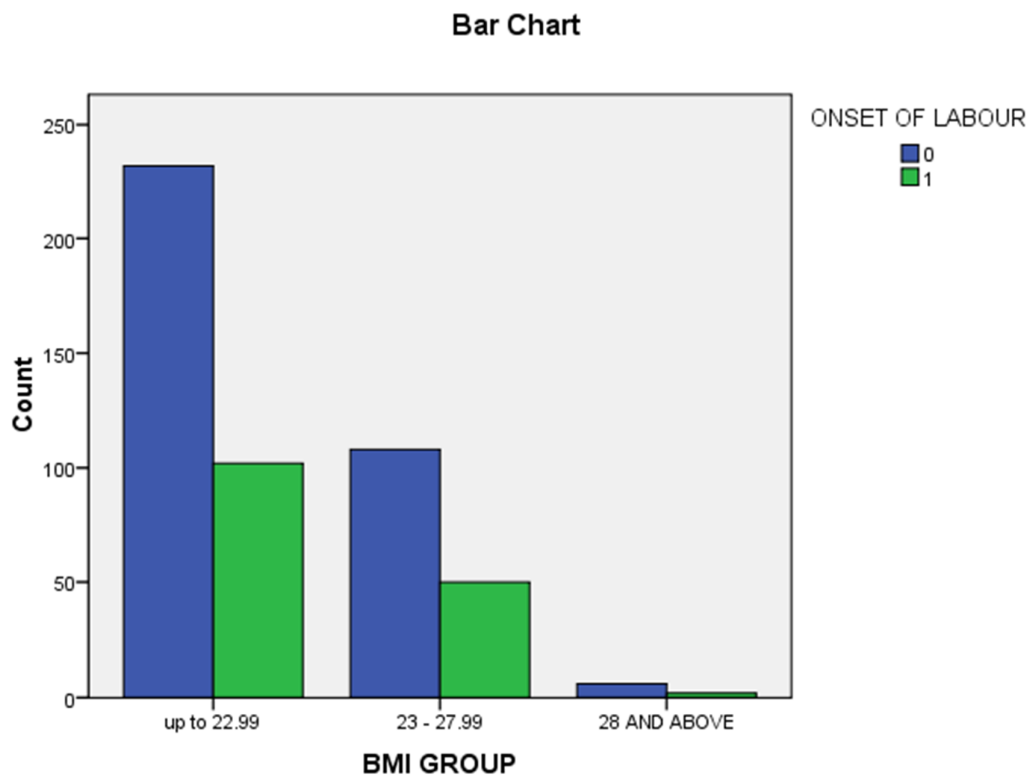
CHI SQUARE=0.190

P =0.909

There is no significant association between BMI and onset of labour.

ASSOCIATION BETWEEN BMI GROUP AND MODE OF DELIVERY

Table 27

MODE OF DELIVERY		N	Mean	Std. Deviation	Std. Error Mean	T	P
BMI	CESAREAN	275	21.890	2.1157	0.1276	-1.397	0.163
	VAGINAL	225	22.164	2.5517	0.1504		

Table 28

BMI	MODE OF DELIVERY		TOTAL
	VAGINAL	CESAREAN	
UPTO 22.9	146	188	334
	64.9%	68.4%	66.8%
23-27.99	74	84	158
	32.9%	30.5%	31.6%
28 AND ABOVE	5	3	8
	2.2%	1.1%	1.6%

Bar Chart
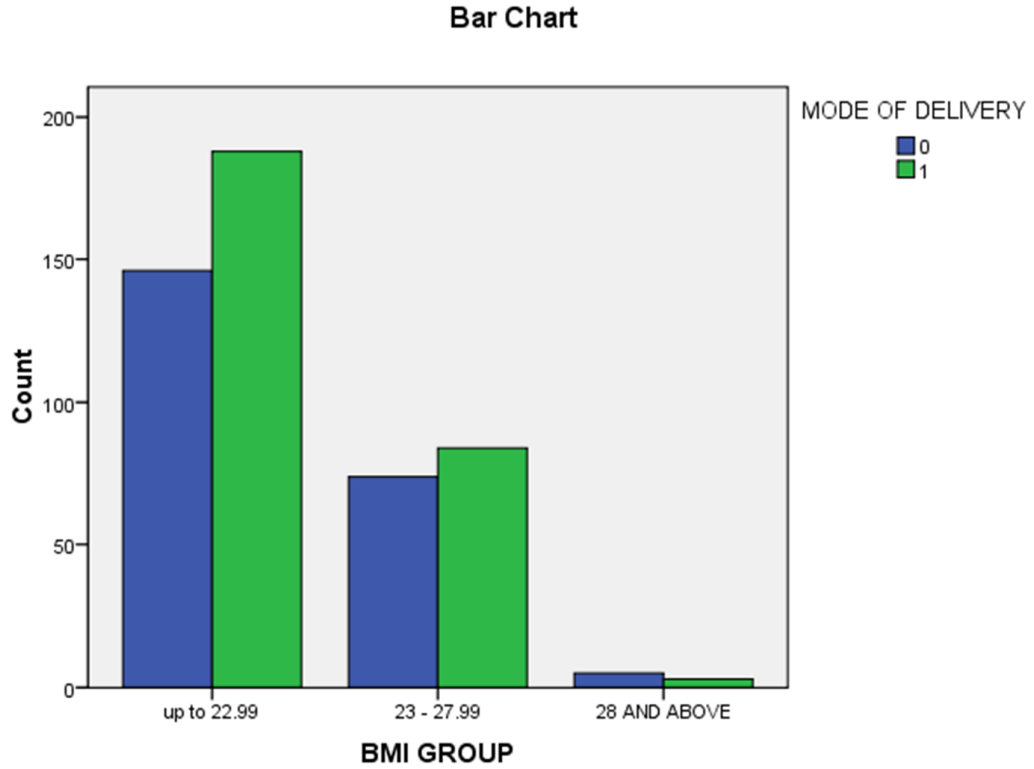
CHI SQUARE=1.429

P =0.490

There is no significant association between BMI and mode of delivery.

ASSOCIATION BETWEEN BMI GROUP AND CESAREAN SECTION DUE TO FAILED INDUCTION

Table 29

CESAREAN SECTION DUE TO FAILED INDUCTION		N	Mean	Std. Deviation	Std. Error Mean	t	P
BMI	YES	107	22.081	2.2882	0.2212	0.365	0.715
	NO	393	21.994	2.1546	0.1087		

Table 30

BMI	CESAREAN SECTION DUE TO FAILED INDUCTION		TOTAL
	NO	YES	
UPTO 22.9	266	68	334
	67.7%	63.6%	66.8%
23-27.99	120	38	158
	30.5%	35.5%	31.6%
28 AND ABOVE	7	1	8
	1.8%	.9%	1.6%

Bar Chart
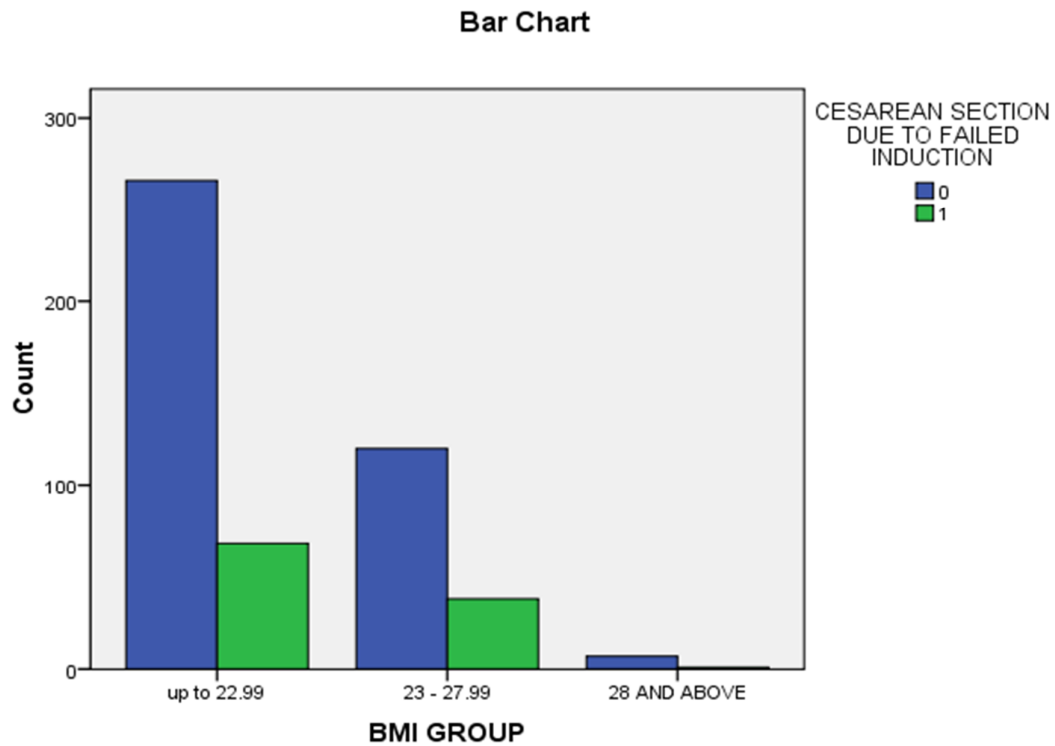
CHI SQUARE=1.252

P =0.535

There is no significant association between BMI and cesarean section due to failed induction.

CONCLUSION :

There is no statistically significant difference in labour outcome between different BMI groups

ASSOCIATION BETWEEN CERVICAL LENGTH AND PRETERM

Table 31

PRETERM		N	Mean	Std. Deviation	Std. Error Mean	T	P	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
CERVIX LENGTH AT 19 TO 24 WEEKS	YES	30	3.263	0.4189	0.0765	-4.514	0.000	0.0869	-.5630	-.2215
	NO	470	3.655	0.4640	0.0214		(<0.001)	0.0794	-.5537	-.2308

Variable	CERVIX LENGTH AT 19 TO 24 WEEKS
Classification variable	PRETERM

Sample size		500
Positive :	PRETERM	30
Negative :	NO PRETERM	470

Area under the ROC curve (AUC)

Area under the ROC curve (AUC)	0.740071
Standard Error[a]	0.0449
95% Confidence interval[b]	0.699278 to 0.777998
z statistic	5.347
Significance level P (Area=0.5)	<0.0001
Youden index J	0.3560
Criterion(optimum cut off value)	≤3.2

RECEIVER OPERATOR CHARACTERISTIC CURVE
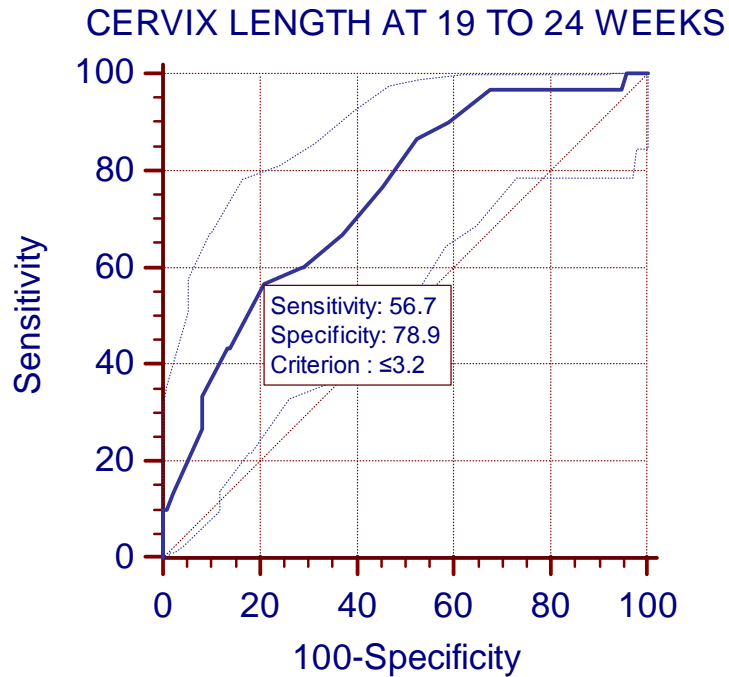
CERVIX LENGTH AT 19 TO 24 WEEKS

The mean cervical length for patients who went into preterm labour is 3.263. The mean cervical length for patients who did not go into preterm labour is 3.655. There exists a statistically significant association between the cervical length and preterm labour. By using Receiver Operator Characteristic curve, cervical length <3.2(optimum cut off criterion) predicts preterm labour with a sensitivity of 56.7% and specificity of 78.9%.

CERVICAL LENGTH AND PROLONGED PREGNANCY

Table 32

Prolonged Pregnancy		N	Mean	Std. Devi ation	Std. Error Mean	t	P	Std. Error Diff erence	95% Confidence Interval of the Difference	
									Lower	Upper
CERVIX LENGTH AT 19 TO 24 WEEKS	YES	104	3.836	0.5470	0.0536	5.112	0.003	.0506	.1592	.3579
	NO	396	3.578	0.4330	0.0218	4.466		.0579	.1441	.3730

Variable	CERVIX LENGTH AT 19 TO 24 WEEKS
Classification variable	PROLONGED PREGNANCY

Sample size		500
Positive :	PROLONGED PREGNANCY	104
Negative :	NO PROLONGED PREGNANCY	396

Area under the ROC curve (AUC)

Area under the ROC curve (AUC)	0.634336
Standard Error[a]	0.0321
95% Confidence interval[b]	0.590426 to 0.676648
z statistic	4.189
Significance level P (Area=0.5)	<0.0001

Youden index

Youden index J	0.2236
Criterion(optimum cut off value)	>3.9

RECEIVER OPERATOR CHARACTERISTIC CURVE
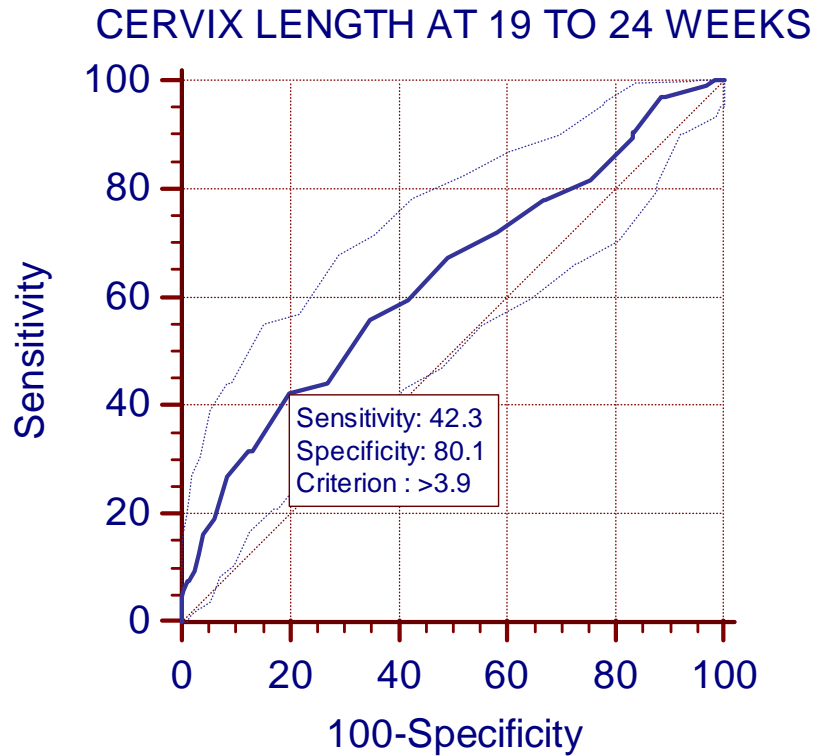
CERVIX LENGTH AT 19 TO 24 WEEKS

Sensitivity: 42.3
Specificity: 80.1
Criterion : >3.9

The mean cervical length for patients who had prolonged pregnancy is 3.836. The mean cervical length for patients who did not have prolonged pregnancy is 3.578. There exists a statistically significant association between the cervical length and prolonged pregnancy. By using Receiver Operator Characteristic curve, cervical length >3.9 (optimum cut off) predicts prolonged pregnancy with a sensitivity of 42.3% and specificity of 80.1%

ASSOCIATION BETWEEN CERVICAL LENGTH AND ONSET OF LABOUR

Table 33

Onset of labour		N	Mean	Std. Deviation	Std. Error Mean	t	P	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
CERVIX LENGTH AT 19 TO 24 WEEKS	1 (Induced)	154	3.817	.4662	.0376	6.102	.000	.0440	.1820	.3549
	0 (Spontaneous)	346	3.549	.4487	.0241		(<0.001)	.0446	.1806	.3563

Variable	CERVIX LENGTH AT 19 TO 24 WEEKS
Classification variable	ONSET OF LABOUR

Sample size		500
Positive group :	INDUCED LABOUR = 1	154
Negative group :	SPONTANEOUS LABOUR = 0	346

Disease prevalence (%)	Unknown

Area under the ROC curve (AUC)

Area under the ROC curve (AUC)	0.668371
Standard Error[a]	0.0260
95% Confidence interval[b]	0.625201 to 0.709537
z statistic	6.464
Significance level P (Area=0.5)	<0.0001

Youden index

Youden index J	0.2593
Criterion(optimum cut off value)	>3.7

RECEIVER OPERATOR CHARACTERISTIC CURVE
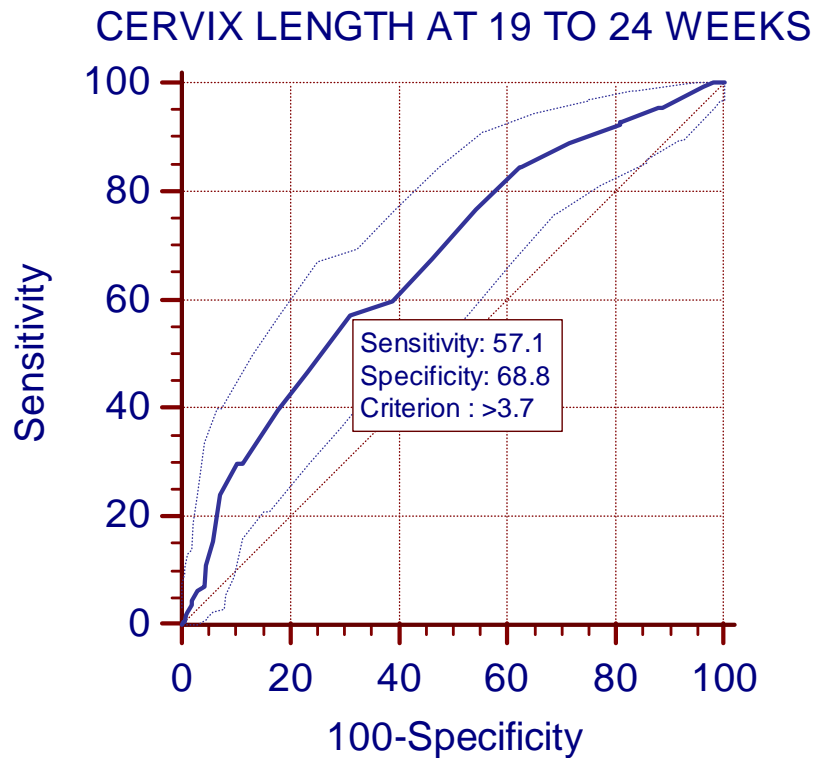
CERVIX LENGTH AT 19 TO 24 WEEKS

Sensitivity: 57.1
Specificity: 68.8
Criterion : >3.7

The mean cervical length for patients who had spontaneous onset of labour is 3.549. The mean cervical length for patients who did not have spontaneous onset of labour is 3.817. There exists a statistically significant association between the cervical length and onset of labour. By using Receiver Operator Characteristic curve, cervical length >3.7(optimum cut off) predicts failure of spontaneous onset of labour with a sensitivity of 57.1% and specificity of 68.8%

CERVICAL LENGTH AND MODE OF DELIVERY

Table 34

Onset of labour		N	Mean	Std. Deviation	Std. Error Mean	t	P	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
CERVIX LENGTH AT 19 TO 24 WEEKS	1 (Cesarean)	275	3.772	.4810	.0290	7.779	.000	.0400	.2324	.3894
	0 (Vaginal)	225	3.461	.3954	.0264		(<0.001)	.0392	.2339	.3879

Variable	CERVIX LENGTH AT 19 TO 24 WEEKS
Classification variable	MODE OF DELIVERY

Sample size		500
Positive group :	CAESARIAN DELIVERY = 1	275
Negative group :	VAGINAL DELIVERY = 0	225

Disease prevalence (%)	Unknown

Area under the ROC curve (AUC)

Area under the ROC curve (AUC)	0.683863
Standard Error[a]	0.0235
95% Confidence interval[b]	0.641108 to 0.724427
z statistic	7.816
Significance level P (Area=0.5)	<0.0001

Youden index

Youden index J	0.2723
Criterion(optimum cut off value)	>3.4

RECEIVER OPERATOR CHARACTERISTIC CURVE
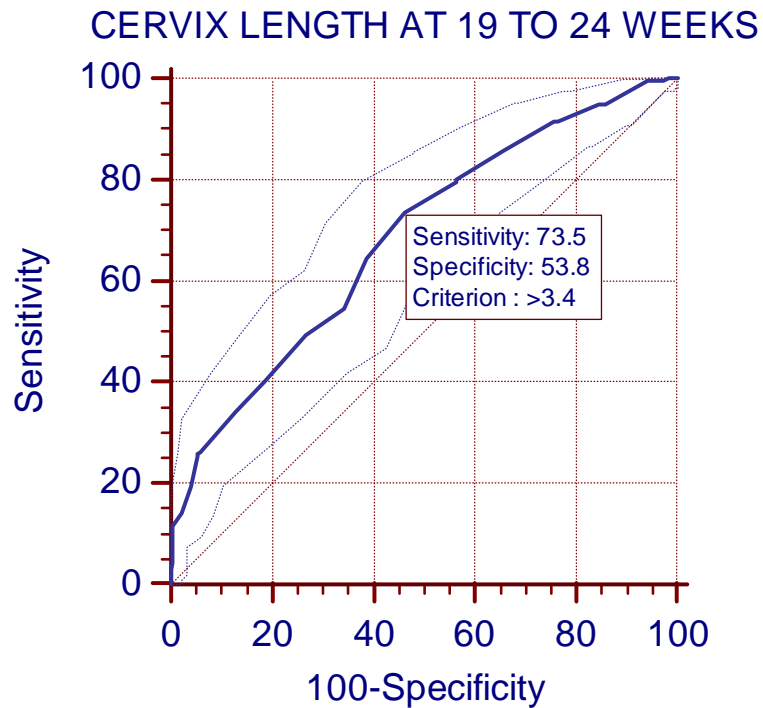
CERVIX LENGTH AT 19 TO 24 WEEKS

Sensitivity: 73.5
Specificity: 53.8
Criterion : >3.4

The mean cervical length for patients who had caesarean delivery is 3.772. The mean cervical length for patients who did not have caesarean delivery is 3.461. There exists a statistically significant association between the cervical length and caesarean delivery. By using Receiver Operator Characteristic curve, cervical length >3.4 predicts caesarean delivery with a sensitivity of 73.5% and specificity of 53.8%.

Logistic regression

Dependent Y	MODE OF DELIVERY

Method	Stepwise
Enter variable if P<	0.05
Remove variable if P>	0.1

Sample size	500
Cases with Y=0	225 (45.00%)
Cases with Y=1	275 (55.00%)

Overall Model Fit

Null model -2 Log Likelihood	688.139
Full model -2 Log Likelihood	620.425
Chi-square	67.714
DF	2
Significance level	P < 0.0001

Table 35 : Coefficients and Standard Errors

Variable	Coefficient	Std. Error	P
CERVIX LENGTH AT 19 TO 24 WEEKS	1.48175	0.23888	<0.0001
ONSET OF LABOUR	0.65873	0.21959	0.0027
Constant	-5.3356		

Logistic regression equation

LOG IT= -5.3356+1.48175(Cervical Length)+0.65873 (Onset of labour)

Odds Ratios and 95% Confidence Intervals

Variable	Odds ratio	95% CI
CERVIX LENGTH AT 19 TO 24 WEEKS	4.4006	2.7553 to 7.0284
ONSET OF LABOUR	1.9323	1.2565 to 2.9717

The probability of caesarean delivery increases 4 times with 1cm increase in cervical length and the probability increases nearly twice when the labour is induced.

Area under the ROC curve (AUC)

Area under the ROC curve (AUC)	0.701277
Standard Error[a]	0.0231
95% Confidence interval[b]	0.659052 to 0.741103
z statistic	8.719
Significance level P (Area=0.5)	<0.0001
Youden index J	0.2905
Associated criterion	>0.5732

RECEIVER OPERATOR CHARACTERISTIC CURVE
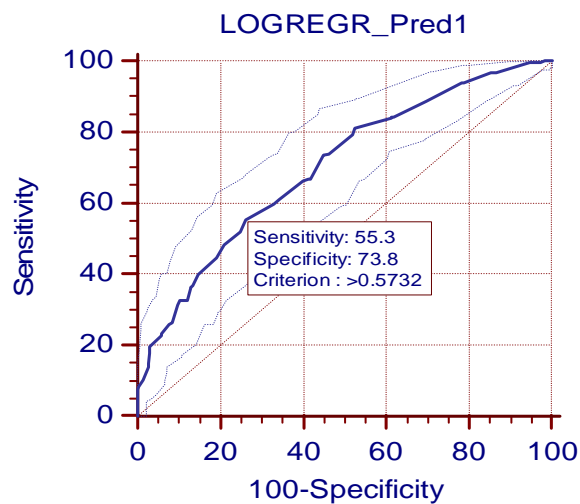
CERVICAL LENGTH AND CESAREAN SECTION DUE TO FAILED INDUCTION

Table 36

Cesarean Section due to Failed Induction		N	Mean	Std. Devi ation	Std. Error Mean	t	P	Std. Error Diff erence	95% Confidence Interval of the Difference	
									Lower	Upper
CERVIX LENGTH AT 19 TO 24 WEEKS	YES	107	3.897	.4818	.0466	6.886	.000	.0491	.2414	.4342
	NO	393	3.559	.4408	.0222		(<0.001)	.0516	.2358	.4397

Variable	CERVIX LENGTH AT 19 TO 24 WEEKS
Classification variable	CESAREAN SECTION DUE TO FAILED INDUCTION

Sample size		500
Positive group :	CESAREAN SECTION DUE TO FAILED INDUCTION = 1	107
Negative group :	CESAREAN SECTION DUE TO FAILED INDUCTION = 0	393

Area under the ROC curve (AUC)

Area under the ROC curve (AUC)	0.702932
Standard Error[a]	0.0285
95% Confidence interval[b]	0.660761 to 0.742684
z statistic	7.111
Significance level P (Area=0.5)	<0.0001

Youden index

Youden index J	0.3217
Associated criterion	>3.7

RECEIVER OPERATOR CHARACTERISTIC CURVE
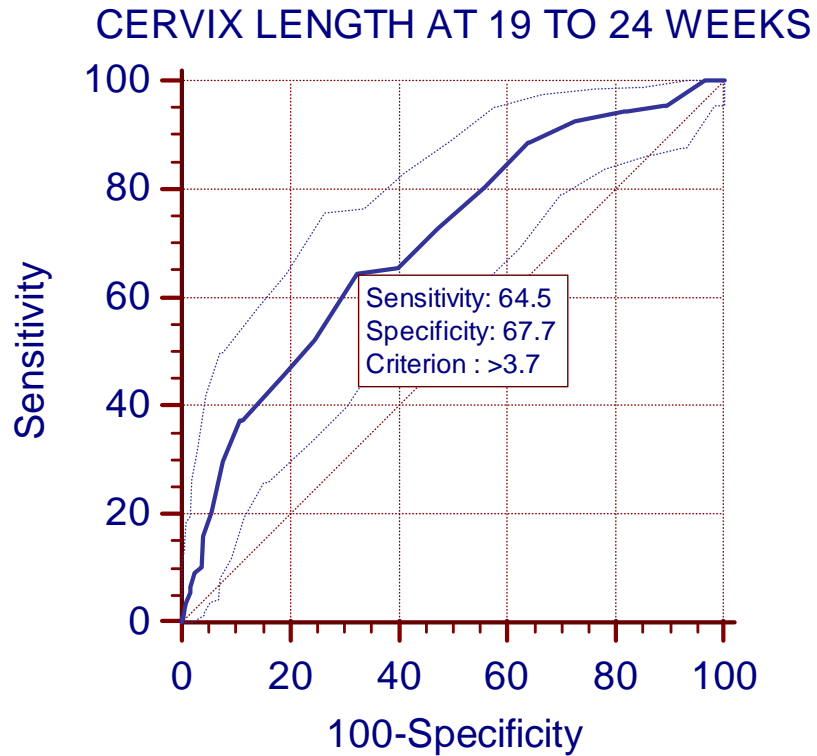
CERVIX LENGTH AT 19 TO 24 WEEKS

Sensitivity: 64.5
Specificity: 67.7
Criterion : >3.7

The mean cervical length for patients who had caesarean delivery due to failed induction is 3.897. The mean cervical length for patients who did not have caesarean delivery due to failed induction is 3.559. There exists a statistically significant association between the cervical length and caesarean delivery due to failed induction. By using Receiver Operator Characteristic Curve analysis, Cervical length >3.7(Optimum cut-off) predicts caesarean delivery due to failed induction with a sensitivity of 64.5% and specificity of 67.7%

Logistic regression

Dependent Y	CESAREAN SECTION DUE TO FAILED INDUCTION

Sample size	500
Cases with Y=0	393 (78.60%)
Cases with Y=1	107 (21.40%)

Table 37 : Coefficients and Standard Errors

Variable	Coefficient	Std. Error	P
CERVIX LENGTH AT 19 TO 24 WEEKS	1.38974	0.25418	<0.0001
PROLONGED PREGNANCY	0.76559	0.25871	0.0031
Constant	-6.6598		

Logistic regression equation

LOG IT= -6.6598+1.38974(Cervix length)+0.76559(Onset of labour)

Odds Ratios and 95% Confidence Intervals

Variable	Odds ratio	95% CI
CERVIX LENGTH AT 19 TO 24 WEEKS	4.0138	2.4389 to 6.6057
PROLONGED PREGNANCY	2.1503	1.2950 to 3.5703

ROC curve analysis

Area under the ROC curve (AUC)	0.712
Standard Error	0.0291
95% Confidence interval	0.670 to 0.751

The probability of caesarean section due to failed induction increases 4 fold with 1cm increase in cervical length and increases twice when the pregnancy is prolonged.

Discussion

DISCUSSION

This study analysed the cervical length of 500 antenatal women by transvaginal ultrasonography between 19 to 24 weeks and its association with labour outcome.

The maternal characteristics like age, body mass index and socioeconomic status were analysed for any confounding factors. Labour outcome analysed were the onset of labour whether spontaneous or induced, gestational age at delivery whether preterm or prolonged beyond 40 weeks, mode of delivery and the caesarean section due to failed induction.

MEAN CERVICAL LENGTH IN THE POPULATION:

The mean cervical length in our study population was 3.632 with a standard deviation of 0.4703. (Table 1)

MATERNAL AGE AND LABOUR OUTCOME:

The mean age in our study population was 24.364 with 4.2%(21) below 19 years, 50%(250) at 20-24 years, 36.2% (181) at 25-29 years and 9.6% (48) at more than 30 years. It was found that there was no statistically significant association between maternal age and labour outcome.

MATERNAL BODY MASS INDEX (BMI) AND LABOUR OUTCOME:

The mean body mass index in our study population was 22.013. BMI less than 22.99 was seen in 66.8% (334), 23-27.99 in 31.6% (158) and more than 28 in 1.6% (8). It was found that there was no statistically significant association between maternal body mass index and labour outcome.

MATERNAL SOCIOECONOMIC STATUS AND LABOUR OUTCOME:

Socio economic status was analysed by modified Kuppusamy's classification. 8% (40) were in socioeconomic class III, 52.6% (263) in class IV and 39.4% (197) in class V. It was found that there was no statistically significant association between maternal socioeconomic status and labour outcome.

CERVICAL LENGTH IN MIDPREGNANCY AND PRETERM LABOUR:

Of the 500 women in the study, 30(6%) went in for preterm labour (Table 2). There exists a statistically significant association between the cervical length and preterm labour with a P value <0.001. Lower the cervical length, higher is the risk of preterm labour.

The mean cervical length for patients who went into preterm labour is 3.263. The mean cervical length for patients who did not go into preterm

labour is 3.655 (Table 31). Area under Receiver Operator Characteristic curve is 0.740071. Cervical length <3.2cm predicts preterm labour with a sensitivity of 56.7% and specificity of 78.9%.

CERVICAL LENGTH IN MIDPREGNANCY AND PROLONGED PREGNANCY:

Of the 500 women in the study, 104 (20.8%) had prolonged pregnancy beyond 40 weeks. There exists a statistically significant association between the cervical length and prolonged pregnancy with P value <0.0001.

The mean cervical length for patients who had prolonged pregnancy is 3.836. The mean cervical length for patients who did not have prolonged pregnancy is 3.578 (Table 32). Area under Receiver Operator Characteristic curve is 0.634336.Cervical length >3.9 (optimum cut-off) predicts prolonged pregnancy with a sensitivity of 42.3% and specificity of 80.1% whereas the specificity increases to 90% at a cervical length of >4.08cm and 97% at a cervical length of >4.5cm.

This is similar to the study conducted in Towoomba hospital where the mean cervical length for patients who had prolonged pregnancy is 3.78cm whereas those who delivered before dates had a mean cervical length of 3.77cm.

CERVICAL LENGTH IN MIDPREGNANCY AND ONSET OF LABOUR:

Of the 500 women in the study, 346 (69.2%) had spontaneous onset of labour (Table 4). There exists a statistically significant association between the cervical length and onset of labour. Increasing cervical length is associated with a failure of spontaneous onset of labour. Cervical length >4cm is associated with 88.7%, >4.5cm with 97.1% and >5cm with 99.4% failure of spontaneous onset of labour.

The mean cervical length for patients who had spontaneous onset of labour is 3.549. The mean cervical length for patients who did not have spontaneous onset of labour is 3.817 (Table 33). Area under ROC curve is 0.668. Cervical length >3.7cm (optimum cut-off) predicts failure of spontaneous onset of labour with a sensitivity of 57.1% and specificity of 68.8%. This is similar to studies conducted in Towoomba Hospital and Tata Hospital.

STUDY	ONSET OF LABOUR	
	SPONTANEOUS	INDUCED
OUR STUDY	3.549cm	3.817cm
TOWOOMBA HOSPITAL	3.77cm	3.78cm
TATA HOSPITAL	3.11cm	4.36cm

CERVICAL LENGTH IN MIDPREGNANCY AND MODE OF DELIVERY:

Of the 500 women in the study, 275 (55%) had caesarean delivery (Table 5). There exists a statistically significant association between the cervical length and caesarean delivery. Increasing cervical length is associated with increase in incidence of caesarean delivery. Cervical length >4cm predicts caesarean delivery with a specificity of 94.22% and >4.8cm predicts caesarean delivery with a specificity of 100%

The mean cervical length for patients who had caesarean delivery is 3.772. The mean cervical length for patients who did not have caesarean delivery is 3.461 (Table 34). Area under ROC curve is 0.683. Cervical length >3.4cm (optimum cut off) predicts caesarean delivery with a sensitivity of 73.5% and specificity of 53.8%. This is similar to the studies conducted in Towoomba Hospital and Tata Hospital.

STUDY	MEAN CERVICAL LENGTH	
	VAGINAL DELIVERY	CESAREAN DELIVERY
OUR STUDY	3.461	3.772
TOWOOMBA HOSPITAL	3.74cm	3.87cm
TATA HOSPITAL	3.5cm	4cm

Multivariate analysis of mode of delivery with BMI, cervical length, gestational age at delivery, prolonged pregnancy, onset of labour was done. It was found that mode of delivery is not influenced by body mass index and gestational age at delivery. The probability of caesarean delivery increases 4 times with 1cm increase in cervical length (P<0.0001) and the probability increases twice when the labour is induced (P=0.0027) (Table 35).

CERVICAL LENGTH IN MIDPREGNANCY AND CESAREAN SECTION DUE TO FAILED INDUCTION:

Of the 500 women in the study, 107 (21.4%) had caesarean section due to failed induction (Table 6). Increasing cervical length is associated with statistically significant increase in the incidence of caesarean section. This association is more specific when the caesarean section is taken up for failed induction. The specificity increases from 88.5% when cervical length is >4cm to 97.46% at cervical length >4.5cm to 99.49% when the cervical length is >5cm.

The mean cervical length for patients who had caesarean delivery due to failed induction is 3.897. The mean cervical length for patients who did not have caesarean delivery due to failed induction is 3.559. Area under ROC curve is 0.702. Cervical length >3.7 predicts caesarean delivery due to failed induction with a sensitivity of 64.5% and specificity of 67.7%.

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Multivariate analysis was done between caesarean section due to failed induction and cervical length and prolonged pregnancy. The probability of caesarean section due to failed induction increases 4 fold with 1cm increase in cervical length (P<0.0001) and increases 2 fold when the pregnancy is prolonged (P=0.003) (Table 37).

Another study conducted by Gordon Smith et al showed 1.8 fold increase in the risk of cesarean section when the cervical length was greater than 4cm.

Summary

SUMMARY

It is a prospective study conducted in the Institute of Obstetrics and Gynecology, Madras medical college from January 2015 to March 2016. 500 antenatal women were included in the study. Transvaginal ultrasound was done between 19-24 weeks and cervical length was recorded. The women were subsequently managed according to the hospital protocol. The women were followed upto term and their labour outcome was recoded.

It was found that age, body mass index and socioeconomic status did not influence the duration of pregnancy, onset of labour or mode of delivery.

Preterm labour is significantly associated with cervical length. Lower the cervical length, higher is the risk of preterm labour.

The risk of prolonged pregnancy increases significantly with increase in cervical length and the risk is greater when the cervical length is more than 3.9cm.

The chances of failure of spontaneous onset of labour increases significantly with increase in cervical length and the risk is greater when the cervical length is more than 3.7cm.

The risk of caesarean delivery increases significantly with increase in cervical length. This association is more specific when the caesarean section is taken up for failed induction and the risk is greater when the cervical length is more than 3.7cm. Increase in cervical length by 1cm is associated with a fourfold increase in the incidence of caesarean delivery.

Conclusion

CONCLUSION

Measurement of cervical length by transvaginal ultrasound at mid trimester can be used as an easy predictive tool to determine the possible outcome of labour and risk of caesarean section. As ultrasound machines are widely available in almost every antenatal clinic, it could be easily implemented in clinical practice. The patients with risk of adverse labour outcome could be referred earlier to higher centres equipped to handle them.

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Annexures

PROFORMA

Name   :

Age   :

OP No   :

Address   :

Occupation   :

Socio economic status   :

Height   :

Weight   :

Body mass index   :

Obstetric code   :

Last menstrual period   :

Expected date of delivery   :

Menstrual History   :

Marital History   :

Obstetric History   :

Dating scan   :

Past History   :

EXAMINATION

Pallor

Edema

   Vitals

Temperature   :

Pulse rate   :

Blood pressure   :

Respiratory rate   :

Systemic Examination

Cardiovascular System   :

Respiratory System   :

Central Nervous System   :

Abdominal Examination   :

ULTRASOUND

Transvaginal cervical length measurement :

LABOUR DETAILS

Gestational age at onset of labour

Onset of labour – Spontaneous or induced

Mode of delivery – Labour Natural or Cesarean Delivery

Indication for Cesarean section

MASTER CHART

SL. NO.	NAME	AGE	SOCIO ECONOMIC STATUS	BMI	CERVIX LENGTH AT 19 TO 24 WEEKS	GESTATIONAL AGE AT DELIVERY	PRE TERM	POST DATED	ONSET OF LABOUR	MODE OF DELIVERY	CESAREAN SECTION DUE TO FAILED INDUCTION
1	Ganga	21	3	21.3	4	40	0	1	1	0	0
2	Chandrakala	30	4	19.7	3.3	39	0	0	0	0	0
3	Revathy	19	3	23.3	3.9	40	0	1	0	0	0
4	Sangeetha	27	4	19.5	3	38	0	0	0	0	0
5	Jabeena	20	3	26.1	3.8	39	0	0	1	0	0
6	Sridevi	30	4	21.9	4	37	0	0	1	0	0
7	ShanthiSree	29	4	18.6	3.7	37	0	0	0	0	0
8	Mahalakshmi	25	3	23.1	3.2	40	0	1	0	0	0
9	Ambika	25	4	22.4	3.8	37	0	0	1	0	0
10	Keerthika	23	5	20.6	3	37	0	0	0	0	0
11	Kavitha	20	4	23.2	3.7	40	0	0	0	0	0
12	Logeshwari	26	3	21.5	3.2	38	0	0	0	0	0
13	Anitha	25	4	19.7	3.1	39	0	0	0	0	0
14	Lakshmi	18	4	24.6	3.9	39	0	0	0	0	0
15	Gajalakshmi	20	5	24.3	3.1	37	0	0	0	0	0
16	Jayashree	19	5	21.8	3.3	39	0	0	0	0	0
17	Archana	22	4	24.7	3.2	37	0	0	0	0	0
18	Soniya	26	3	20.6	3.4	38	0	0	0	0	0
19	Varalaksmi	20	4	21.4	3.4	39	0	0	0	0	0
20	Vasanthi	19	3	23.8	2.4	35	1	0	0	0	0
21	Bhavani	24	4	24.5	3	36	1	0	0	0	0
22	Pavithra	24	4	23.3	3.1	39	0	0	1	0	0
23	Arulmozhi	31	4	20.5	3.2	28	1	0	0	0	0
24	Nithyanandhi	28	5	21.7	3.3	37	0	0	1	0	0
25	Sasikala	22	4	23.9	3.6	39	0	0	0	0	0
26	Kowsalya	20	3	21.2	3	36	1	0	1	0	0
27	Jeyanthi	20	5	19.1	4.1	38	0	0	1	1	1
28	Hemavathy	35	4	22.5	4.6	37	0	0	0	1	0
29	Renu	18	5	23.2	3.7	38	0	0	0	1	1
30	Rekha	20	4	18.2	4.07	37	0	0	0	1	0
31	Akhila	28	5	24.6	3.4	38	0	0	1	1	1
32	Rajalakshmi	23	4	21.8	3.8	40	0	1	0	1	0

33	Meena	19	4	22.2	3.4	39	0	0	0	0	0
34	Jeyalakshmi	23	4	19.7	3.2	39	0	0	0	1	0
35	Kowsalya	25	4	21.6	3	39	0	0	0	0	0
36	Rajeswari	30	5	22.1	4	40	0	1	1	1	1
37	Ragavi	20	4	24.9	4.1	39	0	0	1	1	1
38	Usha	32	4	19.8	3.3	38	0	0	0	1	0
39	Suganya	23	5	25.1	3.2	40	0	0	0	0	0
40	JamunaRani	25	5	19.2	4.2	40	0	1	0	1	0
41	Epsiba	24	5	22.9	3.2	38	0	0	0	1	0
42	Gomathy	24	4	23.9	3.4	39	0	0	1	1	1
43	Parimala	22	4	21.8	3.2	37	0	0	0	1	0
44	Poornima	20	3	19.3	3	38	0	0	1	1	1
45	Nagalakshmi	27	4	21.1	3.8	38	0	0	0	1	0
46	Dhanalakshmi	23	5	23.8	3.7	39	0	0	0	1	0
47	Ammu	22	4	26.3	4.2	38	0	0	1	1	1
48	Samundeswari	21	4	24.2	3.4	40	0	1	1	1	1
49	Kokila	29	5	19.7	3.6	40	0	1	0	1	0
50	Amala	25	5	22.4	4.2	41	0	1	0	1	0
51	Selvi	32	4	21.6	3.8	38	0	0	0	1	0
52	Sudha	29	4	19.3	3.1	37	0	0	0	0	0
53	Tamilvani	24	4	23.5	3.6	38	0	0	1	0	0
54	Swathi	20	4	25.1	4	37	0	0	1	0	0
55	Gayathri	23	5	22.8	3.3	39	0	0	0	0	0
56	Anitha	20	4	21.7	4	39	0	0	0	0	0
57	Suguna	21	5	21.4	3.3	37	0	0	0	0	0
58	Kowsalya	20	5	19.8	3.2	37	0	0	0	0	0
59	Baby	26	4	18.7	3.9	39	0	0	0	0	0
60	Manimegalai	20	5	23.1	3.8	40	0	1	0	0	0
61	Ashwini	21	3	22.1	3.7	39	0	0	1	0	0
62	Jeyashree	21	4	26.7	3.7	39	0	0	0	0	0
63	Gayathri	26	5	23.9	3.7	37	0	0	0	0	0
64	Kushbu	24	5	28.8	4.2	39	0	0	1	1	1
65	Praveena	25	4	22.5	4	38	0	0	1	1	1
66	Vidhya	21	5	23.2	4	39	0	0	0	1	0
67	Shanthi	22	4	21.5	4.6	37	0	0	0	1	0

68	Punitha	25	4	22.6	4.5	40	0	1	1	1	1
69	Priya	28	3	23.8	3.4	36	1	0	0	1	0
70	Sudha	20	5	24.9	3.1	37	0	0	0	0	0
71	Karpagam	20	4	19.3	3.2	40	0	1	1	0	0
72	Bhavani	28	5	18.6	4.8	39	0	0	0	0	0
73	Amla	26	5	23.4	3.4	40	0	1	0	0	0
74	Kavitha	25	4	22.7	2.9	38	0	0	0	0	0
75	Anjali	26	5	21.3	4.3	39	0	0	0	0	0
76	Dhanalakshmi	24	5	26.3	3.2	40	0	1	1	0	0
77	Suganya	21	4	19.4	4.3	39	0	0	0	0	0
78	Jagatheswari	26	4	23.6	3.4	39	0	0	0	0	0
79	Rekha	25	3	21.2	3.2	39	0	0	0	0	0
80	Revathy	25	4	24.7	3.8	39	0	0	0	0	0
81	Renuka	21	5	22.5	3.7	38	0	0	0	0	0
82	Jeevitha	20	4	22.1	3.2	39	0	0	0	0	0
83	Keerthana	21	3	25.6	3.4	39	0	0	0	0	0
84	Sumathi	23	5	23.4	3.7	38	0	0	0	1	0
85	Banu	24	4	26.6	4.1	40	0	1	1	1	1
86	Megala	22	4	21.3	4.5	38	0	0	0	1	0
87	Priya	23	5	19.7	3.6	39	0	0	0	1	0
88	Radhika	20	4	21.8	4.2	40	0	1	1	1	1
89	Vinodhini	23	5	22.5	3.6	40	0	1	1	1	1
90	Lakshmi	26	5	23.9	3.7	40	0	1	0	1	0
91	Gomathy	26	4	18.8	3.5	38	0	0	1	1	1
92	Ambiga	30	4	19.1	4	41	0	1	1	1	1
93	Sarala	27	4	22.9	3.6	39	0	0	0	1	0
94	Karpagavalli	24	4	21.6	4.1	38	0	0	0	1	0
95	Gayathri	24	4	24.3	4	41	0	1	1	1	1
96	Chithra	32	3	19.9	4.4	40	0	1	1	1	1
97	Rajam	24	5	30.4	3	38	0	0	0	1	0
98	Nirmala	22	4	23.1	3.6	38	0	0	1	1	1
99	Gayathri	22	4	24.9	3.9	37	0	0	0	1	0
100	Prashanthi	26	5	25.8	3.5	39	0	0	1	1	1
101	Poongodi	25	5	19.7	3.4	39	0	0	1	1	1
102	Usharani	19	4	23.1	4	40	0	1	0	1	0

103	Sivaranjani	23	5	21.4	3.4	38	0	0	1	1	1
104	Jaya	27	5	22.5	3.3	39	0	0	1	1	1
105	Neela	19	4	19.3	3.4	38	0	0	0	1	0
106	Hemavathy	23	5	21.1	3	37	0	0	0	0	0
107	Narmatha	24	5	23.5	3	40	0	1	0	0	0
108	Parimala	19	4	19.1	3.8	38	0	0	1	1	1
109	Radhika	28	4	18.8	3.4	38	0	0	0	1	0
110	Sandhiya	25	4	21.2	2.9	37	0	0	0	0	0
111	Kalaiselvi	23	4	22.7	3.2	41	0	1	0	0	0
112	Sangeetha	21	5	24.6	3.4	38	0	0	1	1	1
113	Anitha	27	5	23.9	4.8	40	0	1	1	1	1
114	Kalaiarasi	22	3	23.8	3.5	37	0	0	1	1	1
115	Revathy	25	4	19.9	4.2	38	0	0	1	1	1
116	Surya	27	3	21.3	3.1	38	0	0	0	1	0
117	Ramadevi	34	5	22.7	3.2	40	0	1	0	1	0
118	Datchayani	30	5	24.1	4.3	40	0	1	1	1	1
119	Radhika	20	4	19.6	3.2	40	0	1	0	1	0
120	Sharon	32	5	23.3	3.6	37	0	0	1	1	1
121	Bavani	20	5	23.3	3.1	37	0	0	0	0	0
122	Kalaimathi	24	5	21.2	3	38	0	0	0	0	0
123	Akshaya	25	4	19.4	3.1	40	0	1	0	0	0
124	Pavithra	24	5	20.4	3.5	40	0	1	1	0	0
125	Umamaheshwari	32	4	21.5	4.2	40	0	1	1	0	0
126	Snega	22	4	22.1	4.2	40	0	1	1	0	0
127	Nirmala	20	4	19.9	3.5	37	0	0	0	0	0
128	Suganya	21	5	22.8	4.3	40	0	1	1	0	0
129	Saranya	21	4	21.7	3.3	38	0	0	0	0	0
130	Jeyalakshmi	27	5	19.9	3.9	38	0	0	1	0	0
131	Senbagam	19	4	24.1	2.9	37	0	0	0	0	0
132	Sangeetha	18	5	23.1	4	40	0	1	1	0	0
133	Selvi	26	4	19.5	3.7	38	0	0	0	0	0
134	Preethi	20	4	22.7	3.5	37	0	0	1	0	0
135	Karpagam	26	4	18.6	3.7	37	0	0	0	0	0
136	Durga	26	5	21.4	3.9	38	0	0	0	0	0
137	Seethalakshmi	27	5	21.3	3.2	39	0	0	0	0	0

138	Surya	21	4	19.7	3.7	39	0	0	0	1	0
139	Nithya	23	5	24.1	3.5	37	0	0	0	1	0
140	Mohanapriya	36	5	21.6	4.2	39	0	0	1	1	1
141	Kudiyarasi	27	4	19.2	4.2	37	0	0	1	1	1
142	Sugura Banu	19	4	18.3	3.8	37	0	0	0	1	0
143	Bharathi	20	3	22.9	3.6	36	1	0	0	1	0
144	Suji	27	4	19.6	3.8	38	0	0	1	1	1
145	Parveen Banu	23	4	21.2	3.5	38	0	0	1	1	1
146	Buvaneshwari	26	4	22.7	3.6	39	0	0	0	1	0
147	Shanthi	30	4	21.3	3.5	37	0	0	0	1	0
148	Devi	29	5	19.8	4.1	40	0	1	1	1	1
149	Kavitha	25	5	24.2	3.8	40	0	1	1	1	1
150	Sivaranjani	25	5	23.5	3.4	37	0	0	0	1	0
151	JabeenaBegum	24	4	25.4	3.5	39	0	0	0	1	0
152	Malarvizhi	23	4	21.8	3	39	0	0	0	1	0
153	Jancy	20	3	19.1	4.3	41	0	1	1	1	1
154	Devi	22	4	19.4	3.1	40	0	1	0	1	0
155	Ranjani	26	4	21.7	5.3	41	0	1	1	1	1
156	Manjula	27	5	22.1	3.8	41	0	1	1	1	1
157	Meena	20	4	21.9	3.5	38	0	0	0	1	0
158	Kalaiselvi	27	4	22.8	4.1	39	0	0	0	1	0
159	Papitha	24	4	24.5	3.9	38	0	0	1	1	1
160	Amudha	25	5	23.9	3.3	40	0	1	0	0	0
161	Kalaiselvi	22	4	27.2	4.1	41	0	1	1	1	1
162	Nandhini	20	5	21.5	3.06	37	0	0	0	0	0
163	Kanchana	25	4	22.2	3.3	39	0	0	0	0	0
164	Vijayalakshmi	24	5	19.6	3.1	40	0	1	0	0	0
165	Sumithra	20	4	19.1	3.3	39	0	0	0	0	0
166	Malini	29	4	21.3	3.7	40	0	1	0	0	0
167	Durga	30	4	21.1	3.1	37	0	0	1	0	0
168	Geetha	20	5	24.4	3.7	39	0	0	1	0	0
169	Banupriya	25	5	23.9	3.4	36	1	0	0	0	0
170	Divya	24	4	19.8	3.4	40	0	1	0	0	0
171	Vidhya	26	5	21.1	3.4	38	0	0	1	0	0
172	Poongodi	20	4	22.7	3.6	39	0	0	0	0	0

173	Sugumari	30	5	21.3	3.3	39	0	0	0	0	0
174	Sangeetha	23	4	24.2	3.3	39	0	0	0	0	0
175	Jayasudha	27	3	22.9	3.4	40	0	1	1	0	0
176	Buvaneshwari	22	5	19.5	3.5	38	0	0	0	0	0
177	Gayathri	20	4	21.1	3.6	40	0	1	1	0	0
178	Kalaiselvi	26	4	22.6	3.1	40	0	1	1	1	1
179	Saranya	29	5	21.4	3.6	38	0	0	0	1	0
180	Kaviya	18	5	22.2	3	39	0	0	0	1	0
181	Durga	23	4	19.8	4	39	0	0	0	1	0
182	Sathya	24	4	19.3	4.8	40	0	1	1	1	1
183	Jayachithra	28	5	21.3	3.6	38	0	0	0	0	0
184	Kavitha	20	4	23.7	3.4	39	0	0	0	0	0
185	Rajeswari	26	5	21.1	3.8	39	0	0	0	0	0
186	Rabecca	28	4	24.9	3.8	38	0	0	1	1	1
187	Jeyashree	25	3	19.1	4.6	39	0	0	1	1	1
188	Thilagavathy	20	5	22.2	3.1	38	0	0	0	0	0
189	Ammu	22	4	21.8	3.8	39	0	0	0	1	0
190	Reena	26	5	22.1	4.1	39	0	0	0	1	0
191	Gayathri	26	5	19.7	4.3	37	0	0	1	1	1
192	Louisia	31	4	22.4	4.4	37	0	0	0	1	0
193	Banusri	27	4	21.4	3.2	39	0	0	0	0	0
194	Sasikala	28	4	23.1	3.3	39	0	0	0	1	0
195	Shanmuga Priyadarshini	24	5	22.3	4.2	38	0	0	1	1	1
196	Vimaladevi	33	4	21.2	3.9	37	0	0	0	1	0
197	Kamaleshwari	29	4	19.9	3.5	40	0	1	1	1	1
198	Jeeva	21	4	22.7	3.5	40	0	1	0	1	0
199	Chithra	27	4	23.7	3	39	0	0	1	1	1
200	Ramya	22	5	22.4	4	39	0	0	1	1	1
201	Asha	30	4	23.5	3.5	39	0	0	0	1	0
202	LurthuMary	28	5	24.6	3.3	39	0	0	0	1	0
203	Girija	25	4	19.3	3.4	37	0	0	0	0	0
204	Rekha	27	4	22.8	4	38	0	0	0	1	0
205	Saranya	26	3	21.1	4	39	0	0	0	1	0
206	Kavitha	20	4	18.9	3	39	0	0	1	1	1
207	Parameshwari	25	5	19.1	3.1	39	0	0	0	1	0

208	Prema	23	4	24.6	3.2	38	0	0	1	1	1
209	Vadhaneswari	25	4	21.9	4.2	40	0	1	1	1	1
210	Pushpalatha	25	4	24.6	4.2	38	0	0	1	1	1
211	Divya	26	4	25.2	3.4	39	0	0	0	1	0
212	Sathya	20	5	23.8	5.3	40	0	1	0	1	0
213	Gomathy	22	4	22.3	3.2	38	0	0	0	1	0
214	Durga	22	4	19.1	3.9	38	0	0	0	1	0
215	Chithra	21	3	21.8	3.5	38	0	0	0	1	0
216	Nandhini	20	5	23.4	2.5	36	1	0	0	0	0
217	Sivaranjani	21	4	22.7	3.6	39	0	0	1	1	1
218	Jenselin	28	4	23.3	3.2	39	0	0	0	1	0
219	Sharmila	21	5	23.5	3.5	37	0	0	1	1	1
220	Nagammai	23	4	22.7	4.2	39	0	0	0	1	0
221	Anjali	21	5	21.6	3.7	38	0	0	0	1	0
222	Nalini	28	5	19.7	3.7	38	0	0	0	1	0
223	Valarmathy	26	4	23.8	3.5	37	0	0	0	1	0
224	Dhanalakshmi	23	5	18.4	4.3	38	0	0	1	1	1
225	Latha	26	5	24.1	4.6	39	0	0	0	1	0
226	Shantha Mary	30	3	19.9	3.3	39	0	0	0	0	0
227	Kavitha	22	3	21.4	3	39	0	0	0	0	0
228	Nathiya	29	5	23.6	3.1	34	1	0	0	0	0
229	Lalithanjali	21	4	22.8	3.5	40	0	1	0	0	0
230	Vidhya	26	4	19.3	3.4	38	0	0	1	0	0
231	Bhavani	26	5	23.4	3.3	38	0	0	0	0	0
232	Nirosha	24	4	21.5	3.7	36	1	0	0	0	0
233	Amudha	20	5	19.2	3.8	38	0	0	0	0	0
234	Chithra	25	5	24.5	3.7	38	0	0	0	0	0
235	Sharmila	21	4	23.8	3.8	38	0	0	1	0	0
236	Dhanalakshmi	20	5	21.4	3	39	0	0	0	0	0
237	Sindhuja	23	4	23.9	3.1	39	0	0	0	0	0
238	Kala	24	5	19.5	3.6	39	0	0	0	1	0
239	DeviLakshmi	22	5	23.3	3.7	40	0	1	0	0	0
240	LisiPreethi	24	4	21.1	3.8	38	0	0	0	0	0
241	Gayathri	26	5	22.5	3.5	34	1	0	0	0	0
242	Revathy	21	4	28.1	2.9	30	1	0	0	0	0

243	Saraswathy	23	3	25.9	3.7	40	0	1	0	0	0
244	Surya	26	5	21.3	3.7	37	0	0	0	1	0
245	Thilagavathy	20	4	23.5	3	39	0	0	0	0	0
246	Pradeepa	21	5	19.7	3	38	0	0	0	0	0
247	Mamitha Sinha	20	5	21.2	4.2	40	0	1	0	0	0
248	Vanmathi	20	4	23.4	3.2	38	0	0	0	0	0
249	Dhanalakshmi	23	5	22.6	4.4	38	0	0	1	1	1
250	ShobaRani	32	4	19.5	4.1	39	0	0	1	1	1
251	Nadhiya	29	3	21.3	3.2	38	0	0	0	1	0
252	Anbukarasi	40	4	22.1	3.9	37	0	0	0	1	0
253	Selvi	27	5	23.9	3.04	31	1	0	0	0	0
254	Selvi	26	5	21.2	3.6	39	0	0	0	1	0
255	Lavanya	25	4	21.4	3	39	0	0	0	1	0
256	Dhanabackiyam	23	5	19.3	3.2	34	1	0	0	1	0
257	Rathidevi	26	5	23.3	3.3	39	0	0	0	1	0
258	Gayathri	26	4	23.6	4.3	37	0	0	1	1	1
259	Priya	29	3	22.9	4	39	0	0	0	1	0
260	Sathya	21	4	19.5	3.6	39	0	0	0	1	0
261	Prema	33	4	21.8	3.8	38	0	0	0	1	0
262	Kowsalya	26	4	19.7	3.4	40	0	1	0	1	0
263	Mariya	22	5	22.4	3.6	39	0	0	0	1	0
264	UmaParvathy	22	5	23.7	3.4	38	0	0	0	0	0
265	Archana	20	4	24.5	4.7	38	0	0	1	1	1
266	Pushpa	28	5	22.1	3.2	38	0	0	0	1	0
267	Minu	27	4	23.1	4.1	39	0	0	0	1	0
268	Andal	32	5	22.4	3.2	38	0	0	0	0	0
269	Navaneetham	32	5	22.8	3.1	38	0	0	0	1	0
270	Suganthi	29	4	19.2	4.1	37	0	0	1	0	0
271	Dhanalakshmi	24	4	19.9	3.8	37	0	0	1	1	1
272	Vijayalakshmi	27	4	21.6	3.4	39	0	0	0	0	0
273	Sangeetha	23	5	23.4	3.2	37	0	0	0	1	0
274	Thilagavathy	17	4	22.8	4	38	0	0	0	1	0
275	Radha	23	3	19.3	3.6	40	0	1	0	0	0
276	Abirami	22	4	24.1	3.8	39	0	0	0	0	0
277	Sharmila	25	5	22.9	4.1	38	0	0	1	1	1

278	Priya	22	4	19.4	4.3	37	0	0	0	1	0
279	Meena	20	5	23.8	3.8	39	0	0	1	1	1
280	Umamaheshwari	26	5	21.5	3.7	37	0	0	0	1	0
281	Gayathri	25	4	22.7	3.4	39	0	0	0	0	0
282	Selvi	24	5	18.7	3.4	39	0	0	0	0	0
283	Suganya	23	3	22.6	3.3	38	0	0	0	0	0
284	Devi	20	4	23.4	3.2	40	0	1	0	0	0
285	Yuvarani	26	4	19.1	3.6	37	0	0	0	0	0
286	Jeyalakshmi	24	4	24.7	3.8	40	0	1	0	0	0
287	Vasugi	25	5	22.6	4.06	39	0	0	0	0	0
288	Meenakshi	20	3	20.8	4.2	38	0	0	1	1	1
289	Nishanthi	23	4	22.2	3.6	40	0	1	0	1	0
290	Renukadevi	25	5	23.8	3.4	39	0	0	0	1	0
291	Deepa	20	5	19.8	4.8	39	0	0	0	1	0
292	Sharadha	31	4	20.8	4.4	40	0	1	1	1	1
293	Sathya	20	5	23.3	3.8	38	0	0	0	1	0
294	Sivaranjani	19	4	22.7	3.5	40	0	1	0	1	0
295	Muniyammal	30	4	18.9	3	38	0	0	0	1	0
296	Selvakumari	25	5	20.4	3.6	35	1	0	1	1	0
297	Savithri	25	3	23.6	3.2	38	0	0	0	1	0
298	Dhatchayani	24	4	22.1	3.3	38	0	0	0	1	0
299	Sangeetha	26	5	21.5	4	39	0	0	0	1	0
300	Lakshmi	26	4	19.5	3.7	39	0	0	0	1	0
301	Mariyammal	25	4	19.6	4.1	37	0	0	0	1	0
302	Selvanayagi	23	4	23.9	3.9	39	0	0	0	1	0
303	Kanchana	26	5	25.4	3.3	37	0	0	0	1	0
304	Divya	25	4	20.7	3.5	36	0	0	1	1	0
305	Saradha	23	5	24.2	2.8	39	0	0	0	0	0
306	Roja	23	5	22.3	3.6	38	0	0	0	1	0
307	Divya Priya	28	4	21.8	3.1	39	0	0	0	1	0
308	Sowmiya	25	5	19.1	3.5	39	0	0	0	1	0
309	Lavanya	24	3	20.2	3	39	0	0	0	1	0
310	Uma	25	4	23.9	3.9	39	0	0	0	1	0
311	Praseela	20	5	22.1	5	41	0	1	1	1	1
312	Soundarya	19	4	18.1	3.9	41	0	0	1	1	1

313	Jeyanthi	25	4	19.1	3.8	38	0	0	0	1	0
314	Vasanthi	25	4	19.9	3.2	38	0	0	0	1	0
315	Rajalakshmi	27	5	23.2	3.5	39	0	0	0	1	0
316	Kanaga	25	4	22.7	4	38	0	0	0	1	0
317	Jayasudha	25	5	21.8	3.3	40	0	1	0	1	0
318	Mohanapriya	24	3	20.4	4.9	40	0	1	1	1	1
319	Suriya	22	4	22.6	3.8	39	0	0	0	0	0
320	Pavithra	22	5	23.2	3.5	37	0	0	0	0	0
321	Ravina	20	5	22.5	3.1	37	0	0	1	0	0
322	LakshmiDevi	20	4	19.4	2.8	39	0	0	0	0	0
323	Tamilarasi	27	4	21.5	4.1	40	0	1	0	0	0
324	Nathiya	29	5	23.3	4	37	0	0	0	0	0
325	SeviPriya	23	5	20.3	3.9	40	0	1	1	0	0
326	Pushpa	21	4	21.6	3.2	28	1	0	0	0	0
327	Emimal	23	4	22.3	3	37	0	0	0	0	0
328	Shyamala	29	4	20.1	3	39	0	0	0	0	0
329	Prathiba	22	5	23.2	3.3	40	0	1	0	0	0
330	Gayathri	27	4	22.7	3.05	35	1	0	0	0	0
331	Saranya	22	5	21.1	3	39	0	0	0	1	0
332	Poongodi	31	5	20.2	3.5	39	0	0	0	0	0
333	Sangeetha	25	5	19.8	3.9	37	0	0	0	0	0
334	Amirthavalli	25	4	20.4	3.7	38	0	0	1	0	0
335	Tamilsevi	27	4	19.6	3.9	37	0	0	1	1	1
336	Sudarshini	22	3	20.7	3	37	0	0	0	0	0
337	Lalitha	24	4	23.8	3.5	38	0	0	0	0	0
338	Nandhini	24	4	24.5	3.2	39	0	0	0	0	0
339	Kowsalya	20	5	25.6	3.16	39	0	0	0	0	0
340	Revathy	21	4	19.7	4	40	0	1	1	0	0
341	Poornima	18	4	23.5	3.4	38	0	0	0	0	0
342	Sufaija	23	4	29.2	4.3	38	0	0	1	0	0
343	Usha	21	4	30.4	3.4	38	0	0	0	0	0
344	Kavitha	22	5	20.1	3.9	37	0	0	1	0	0
345	Sandhiya	22	5	26.3	4	37	0	0	0	0	0
346	Pandeswari	32	4	23.5	3.5	37	0	0	1	1	0
347	Nalini	26	4	20.2	3.8	40	0	1	0	1	0

348	Suganthi	20	5	23.7	3.9	38	0	0	0	1	0
349	Datchayani	22	5	19.9	4.1	38	0	0	0	1	0
350	Sangeetha	23	4	18.8	3.8	38	0	0	0	1	0
351	Jennifer	24	4	23.7	4	39	0	0	1	1	1
352	Valli	31	4	25.3	3.3	40	0	1	0	1	0
353	Radha	34	5	23.5	3.36	37	0	0	0	1	0
354	Selvi	28	5	20.6	3	38	0	0	1	1	1
355	Janani	25	4	22.4	3.8	40	0	1	1	1	1
356	Naveena	23	5	19.1	4.4	37	0	0	1	1	1
357	Asha	20	4	22.2	3.6	40	0	1	1	1	1
358	Ganga	32	4	19.8	4.1	38	0	0	0	1	0
359	Leema Rosi	31	5	20.4	3.1	35	1	0	0	0	0
360	Senthamarai	31	4	25.4	3.7	38	0	0	0	1	0
361	Sindhu	25	5	22.3	3.9	39	0	0	1	1	1
362	Jeyapradha	21	5	23.6	5	40	0	1	1	1	1
363	Parveen Begum	24	4	18.9	3.1	40	0	1	0	1	0
364	Hemavathy	22	4	19.1	3.4	40	0	1	1	1	1
365	Aruna	20	5	23.5	3.4	38	0	0	0	0	0
366	Mahalakshmi	30	4	22.2	3.9	39	0	0	0	0	0
367	Violet	22	5	20.5	4	39	0	0	0	0	0
368	Manohari	24	4	20.8	3.5	39	0	0	1	0	0
369	Devi	25	5	22.8	3.3	37	0	0	0	0	0
370	Anusuya	18	4	23.6	3.5	37	0	0	0	0	0
371	Prema	31	4	21.4	3.1	39	0	0	0	0	0
372	Ramya	23	5	20.6	3.9	39	0	0	1	1	1
373	Muthulakshmi	29	5	19.2	4	40	0	1	0	1	0
374	Dilsath	25	4	23.7	4	38	0	0	0	1	0
375	Vinodha	28	5	23.5	3.3	37	0	0	1	1	1
376	Chithra	23	4	19.3	5.1	40	0	1	0	1	0
377	Indumathi	21	5	25.9	4	40	0	1	1	1	1
378	Aruna	27	5	20.5	3.9	39	0	0	0	1	0
379	Suguna	27	3	19.1	4.6	41	0	1	1	1	1
380	Gomathy	22	4	23.7	2.8	37	0	0	0	1	0
381	Jeyakumari	24	4	22.9	4.5	40	0	1	0	1	0
382	Buvaneshwari	28	4	20.6	3.8	38	0	0	0	1	0

383	Selvi	24	5	18.6	3.3	38	0	0	0	0	0
384	Kommatha	23	4	19.3	3.4	37	0	0	0	0	0
385	Sandhiya	21	4	23.8	3	37	0	0	0	0	0
386	JeniferFlorence	28	4	20.5	3.5	39	0	0	1	0	0
387	Maragatham	23	5	25.2	4	39	0	0	0	0	0
388	Manju	22	4	22.8	3.8	37	0	0	0	0	0
389	Neeraja	21	4	19.4	3	38	0	0	0	0	0
390	Nivedha	20	4	23.7	2.9	39	0	0	0	0	0
391	Amsavalli	35	5	22.1	4	38	0	0	0	1	0
392	Josephine	21	4	24.9	3.6	40	0	1	1	1	1
393	Padmapriya	23	4	23.6	4.1	38	0	0	0	1	0
394	BabyShalini	29	5	19.3	3	38	0	0	0	1	0
395	Rathidevi	26	4	20.9	3.4	39	0	0	0	1	0
396	Kalaiselvi	23	5	20.8	3.5	39	0	0	0	1	0
397	Chithra	20	4	19.5	3.6	38	0	0	0	1	0
398	Kanchana	23	5	23.2	4.1	38	0	0	0	1	0
399	Nandhini	22	4	22.4	3.8	37	0	0	1	1	1
400	Revathy	21	4	23.1	4.2	40	0	1	1	0	0
401	Pachaimmal	23	4	20.7	3.3	37	0	0	1	0	0
402	Kamala	33	5	24.1	3.2	37	0	0	0	1	0
403	Maheswari	31	4	23.2	3.9	37	0	0	1	1	1
404	Pattamal	28	4	19.4	3.6	38	0	0	0	1	0
405	Sasirekha	30	4	23.5	3.4	37	0	0	1	1	1
406	Deepa	23	5	22.3	3.3	39	0	0	1	1	1
407	Radhika	25	4	20.8	4.06	39	0	0	0	1	0
408	Prabha	28	4	22.2	4.3	37	0	0	0	1	0
409	Parvathy	20	4	19.7	3.6	38	0	0	1	1	1
410	Princy	23	5	23.2	3.5	39	0	0	0	1	0
411	Sushma	20	5	19.5	4.5	35	1	0	0	1	0
412	Sharmila	19	4	20.8	4	38	0	0	0	0	0
413	Kommatha	23	3	23.1	3.4	37	0	0	0	0	0
414	Arulmozhi	20	4	19.9	3.9	38	0	0	0	0	0
415	Vasanthi	22	5	22.9	4	39	0	0	0	0	0
416	Sasirekha	27	4	23.6	3.3	40	0	0	0	1	0
417	Jagadha	27	5	19.3	3.8	37	0	0	1	1	1

418	Mahalakshmi	29	4	26.5	4.4	40	0	1	1	1	1
419	Shafurnisha	27	4	20.8	3.6	38	0	0	0	1	0
420	Buvaneshwari	26	5	29.4	3.8	39	0	0	0	1	0
421	Yasmin	22	5	23.4	3.6	39	0	0	0	1	0
422	Sathya	27	4	18.2	3.7	39	0	0	0	1	0
423	Revathy	29	5	24.2	3.9	39	0	0	0	1	0
424	Manimegalai	20	4	23.1	3.6	40	0	1	1	1	1
425	Jeyalakshmi	22	5	22.3	3.5	39	0	0	1	1	1
426	Malini	25	4	20.8	3.1	38	0	0	0	1	0
427	Swapna	29	3	23.7	4	39	0	0	1	1	1
428	Deepa	27	4	22.9	3.5	36	1	0	0	1	0
429	Lakshmi	35	5	19.5	3.6	37	0	0	0	1	0
430	Jeyalakshmi	26	5	22.1	3.5	39	0	0	0	1	0
431	Anitha	25	4	23.3	3.8	40	0	1	1	1	1
432	Uma	30	5	19.1	2.7	27	1	0	0	0	0
433	Banupriya	23	4	25.8	3.2	40	0	1	0	0	0
434	Shanmugavalli	27	5	18.2	3.3	38	0	0	1	0	0
435	Soundari	28	4	22.4	3.8	38	0	0	0	0	0
436	Kavitha	24	3	19.7	3.19	40	0	1	1	0	0
437	Tamilselvi	28	4	20.8	3.5	39	0	0	0	0	0
438	Ramya	23	5	23.3	3.6	39	0	0	1	0	0
439	Manju	23	4	19.5	3.7	38	0	0	0	0	0
440	BharkathNisha	20	4	25.8	4	40	0	1	0	0	0
441	Nadhiya	24	4	22.4	2.9	40	0	1	1	0	0
442	Kalyani	24	5	23.2	4.2	38	0	0	0	1	0
443	Jenifer	27	5	19.7	3.7	38	0	0	0	1	0
444	Saraswathy	30	4	20.1	3.1	40	0	1	0	1	0
445	Pramila	22	4	19.4	3.3	39	0	0	0	1	0
446	Menaka	29	4	23.8	4.8	37	0	0	0	1	0
447	Rajeswari	32	4	22.9	4	38	0	0	1	1	1
448	Mekala	21	5	19.2	3.3	34	1	0	0	1	0
449	Divya	23	5	20.5	3.9	39	0	0	0	0	0
450	StellaMary	25	4	23.7	3.9	37	0	0	1	0	0
451	Sulochana	28	4	19.6	3.4	39	0	0	1	1	1
452	Ramaja	26	4	26.5	4	40	0	1	1	0	0

453	Nalini	22	4	20.9	3.7	38	0	0	0	1	0
454	Nandhini	20	3	20.6	5	37	0	0	0	1	0
455	Rekha	20	5	23.7	4.6	40	0	1	1	1	1
456	Selvi	22	4	19.1	3.9	38	0	0	0	1	0
457	Mahalakshmi	22	4	22.9	3	36	1	0	1	1	1
458	SriPriya	20	5	24.2	3.3	38	0	0	0	1	0
459	Rekha	24	4	22.5	3.3	39	0	0	1	1	1
460	Mahalakshmi	29	5	18.8	4.4	40	0	1	1	1	1
461	Renuka	28	4	20.9	4	37	0	0	0	1	0
462	Sridevi	28	5	25.4	3	40	0	1	0	0	0
463	Hemalatha	26	5	19.1	3.7	38	0	0	1	0	0
464	Asma	17	4	22.9	3.5	35	1	0	0	0	0
465	Aruna	24	4	26.3	3.2	37	0	0	0	0	0
466	Manimegalai	22	4	22.2	3.5	38	0	0	0	0	0
467	Sangeetha	20	5	25.8	3.4	38	0	0	0	0	0
468	Radhika	21	4	30.1	3.1	39	0	0	0	0	0
469	Mariammal	28	4	23.1	4.9	37	0	0	0	1	0
470	Anandhi	22	4	20.5	3.5	37	0	0	1	1	1
471	Rekha	22	5	19.2	3.8	40	0	1	1	1	1
472	Indumathi	21	5	22.4	3.9	37	0	0	1	1	1
473	Vijayalakshmi	26	4	19.3	4.1	40	0	1	1	1	1
474	Mohana	25	4	19.5	4.5	40	0	1	0	1	0
475	Valarmathy	20	5	22.9	3.8	40	0	1	1	1	1
476	Rekha	25	5	20.6	4.5	39	0	0	0	1	0
477	Deepa	25	4	18.7	3.2	38	0	0	1	1	1
478	Hepsiba	24	5	22.1	3.6	38	0	0	0	1	0
479	Shaliya	19	5	20.2	3.5	37	0	0	0	0	0
480	Ronisha	23	4	19.9	3.8	40	0	1	0	0	0
481	MubinaBee	20	5	21.8	4	39	0	0	0	0	0
482	Nithya	20	4	20.4	3.1	40	0	1	0	0	0
483	Sakunthala	24	5	19.3	3.5	39	0	0	0	0	0
484	Anushiya	20	4	19.8	3.3	38	0	0	0	0	0
485	Saraswathy	32	4	22.2	3.8	37	0	0	0	0	0
486	Sandhya	26	5	19.7	3.3	38	0	0	0	0	0
487	Eswari	27	5	20.6	3.2	38	0	0	1	0	0

488	Devika	26	4	25.5	3.6	38	0	0	0	0	0
489	Daisy	20	5	22.5	2.9	38	0	0	0	0	0
490	Sindhubharathi	20	4	19.4	3.9	39	0	0	0	0	0
491	Senbagavalli	45	5	20.1	4	39	0	0	0	0	0
492	Meenakshi	25	5	29.6	3.1	34	1	0	0	0	0
493	Vayjayanthi	25	4	23.6	2.3	32	0	0	0	0	0
494	Buvaneshwari	20	5	20.2	3.6	35	1	0	0	0	0
495	Sowmiya	25	5	22.8	4.1	37	0	0	0	0	0
496	Fathima	23	4	18.5	3.8	31	1	0	0	0	0
497	Dhivya	22	5	23.3	3.8	41	0	1	0	0	0
498	Yasmin	30	3	20.8	3.8	29	1	0	0	0	0
499	Bakyalakshmi	22	5	22.9	3.2	36	1	0	0	0	0
500	Parameshwari	23	4	19.5	3	28	1	0	0	0	0

INSTITUTIONAL ETHICS COMMITTEE
MADRAS MEDICAL COLLEGE, CHENNAI-3

EC Reg No.ECR/270/Inst./TN/2013
Telephone No. 044 25305301
Fax : 044 25363970

CERTIFICATE OF APPROVAL

To
Dr.Aruna M
Postgraduate M.S.(Obstetrics and Gynaecology)
Madras Medical College
Chennai 600 003

Dear Dr.Aruna M,

The Institutional Ethics Committee has considered your request and approved your study titled **"Cervical length in mid pregnancy and labour outcome" No.38012015.**

The following members of Ethics Committee were present in the meeting held on 20.01.2015 conducted at Madras Medical College, Chennai-3.

1. Dr.C.Rajendran, M.D.,   : Chairperson
2. Dr.R.Vimala, M.D., Dean, MMC, Ch-3   : Deputy Chairperson
3. Dr.B.Kalaiselvi, M.D., Vice-Principal, MMC, Ch-3   : Member Secretary
4. Dr.R.Nandini, M.D., Inst.of Pharmacology, MMC   : Member
5. Dr.P.Ragumani, M.S., Professor, Inst.of Surgery, MMC   : Member
6. Dr.Md.Ali, M.D., D.M., Prof. & HOD of Medl.G.E., MMC   : Member
7. Dr.K.Ramadevi, Director, Inst.of Biochemistry, MMC : Member
8. Dr.Saraswathy, M.D., Director, Pathology, MMC, Ch-3   : Member
9. Thiru S.Rameshkumar   : Lay Person
10. Thiru S.Govindasamy, B.A., B.L.,   : Lawyer
11. Tmt.Arnold Saulina, M.A., MSW.,   : Social Scientist

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

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

Member Secretary, Ethics Committee

MEMBER SECRETARY
INSTITUTIONAL ETHICS COMMITTEE
MADRAS MEDICAL COLLEGE

INFORMATION TO PARTICIPANTS

Title :   CERVICAL LENGTH IN MIDPREGNANCY AND LABOUR OUTCOME

Principal Investigator :   Dr.M.Aruna

Name of Participant   :

**Site   :   INSTITUTE OF OBSTETRICS AND GYNAECOLOGY,
                            EGMORE, CHENNAI.**

You are invited to take part in this study. The information in this document is meant to help you decide whether or not to take part. Please feel free to ask if you have any queries or concerns.

What is the purpose of research?
The objective is to determine the relationship between cervical length in midpregnancy and
1) Gestational age at delivery
2) Onset of labour, whether spontaneous or induced
3) Mode of delivery
4) Cesarean section due to failed induction

We have obtained permission from the Institutional Ethics Committee.

The study design
All participating pregnant women will undergo transvaginal ultrasonography between 19 – 24 weeks.

Study Procedures
The study involves evaluation of cervical length by transvaginal ultrasonography between 19 – 24 weeks. You will subsequently be managed according to the hospital protocol. Your mode of delivery and labour outcome will be recorded.

Possible benefits to other people
The results of the research may provide benefits to the society in terms of advancement of medical knowledge and/or therapeutic benefit to future patients.

Confidentiality of the information obtained from you
You have the right to confidentiality regarding the privacy of your medical information (personal details, results of physical examinations, investigations, and your medical history). By signing this document, you will be allowing the research team investigators, other study personnel, sponsors, Institutional Ethics Committee and any person or agency required by law like the Drug Controller General of India to view your data, if required.
The information from this study, if published in scientific journals or presented at scientific meetings, will not reveal your identity.

How will your decision to not participate in the study affect you?
Your decision not to participate in this research study will not affect your medical care or your relationship with the investigator or the institution. You will be taken care of and you will not loose any benefits to which you are entitled.

Can you decide to stop participating in the study once you start?
The participation in this research is purely voluntary and you have the right to withdraw from this study at any time during the course of the study without giving any reasons. However, it is advisable that you talk to the research team prior to stopping the treatment/discontinuing of procedures etc.

Signature of Investigator   Signature of Participant
Date   Date

INFORMED CONSENT FORM

Title: CERVICAL LENGTH IN MIDPREGNANCY AND LABOUR OUTCOME

Name of the Investigator   **: Dr.M.Aruna**
Name of the Participant   :
Name of the Institution   :   **INSTITUTE OF OBSTETRICS AND GYNAECOLOGY, EGMORE, CHENNAI**

      I _____ have read the information in this form (or it has been read to me). I was free to ask any questions and they have been answered. I am over 18 years of age and, exercising my free power of choice, hereby give my consent to be included as a participant in this study.

1. I have read and understood this consent form and the information provided to me.
2. I have had the consent document explained to me.
3. I have been explained about the nature of the study.
4. I have been explained about my rights and responsibilities by the investigator.
5. I have informed the investigator of all the treatments I am taking or have taken in the past months/years   including any native (alternative) treatments.
6. I have been advised about the risks associated with my participation in the study.*
7. I agree to cooperate with the investigator and I will inform him /her immediately if I suffer unusual symptoms. *
8. I have not participated in any research study within the past. *
9. I am aware of the fact that I can opt out of the study at any time without having to give any reasoned this will not affect my future treatment in this hospital. *
10. I am also aware that the investigators may terminate my participation in the study at any time, for any reason, without my consent. *
11. I hereby give permission to the investigators to release the information obtained from me as result of participation in this study to the sponsors, regulatory authorities, Govt. agencies, and IEC if required.
12. I understand that my identity will be kept confidential if my data are publicly presented.
13. I have had my questions answered to my satisfaction.
14. I consent voluntarily to participate in the research/study.

      I am aware that if I have any question during this study, I should contact the investigator. By signing this consent form, I attest that the information given in this document has been clearly explained to me and understood by me. I will be given a copy of this consent document.

For adult participants
1. Name and signature / thumb impression of the participant (or legal representative if
    participant incompetent)

Name _____ Signature_____ Date_____

2. Name and Signature of impartial witness (required for illiterate patients):

Name _____ Signature_____ Date_____

Address and contact number of the impartial witness:

3. Name and Signature of the investigator or his representative obtaining consent:

Name _____ Signature_____ Date_____

தகவல் அறிக்கை

ஸ்கேன் மூலமாக, கர்ப்பப் பையின் வாயின் நீளத்தை அளந்து, ஒரு அன்னைக்கு சுகப்பிரசவம் ஆகுமா? நிறைமாதத்தில் ஆகுமா? எளிதில் ஆகுமா? போன்ற விவரங்களைக் கணிக்க முற்சித்து டெஸ்ட் செய்ய உள்ளோம்.

இந்த ஸ்கேன் 19 முதல் 24 வாரங்கள் வரையிலான கர்ப்ப காலத்தில் செய்யப்படும்

இந்தப் பரிசோதனை செய்து கொள்வதால் உங்களுக்கு வழக்கமாக அளிக்கப்படும் மருத்துவ சிகிச்சையில் எந்த மாற்றமும் ஏற்படாது.

உங்கள் பெயர், விலாசம் போன்ற தனிப்பட்ட அடையாளங்கள் இந்த ஆராய்ச்சியின் போதோ அல்லது முடிவுகளின் போதோ உபயோகப்படுத்த மாட்டோம்.

இந்த ஆராய்ச்சியின் முடிவு உங்களுக்கும் இறுதியில் தெரியப்படுத்தப்படும். ஆராய்ச்சியின் போது வேறெதுவும் பிரச்சனைகள் தெரியவந்தால் அதை உங்களுக்கும், உங்கள் மருத்துவருக்கும் உடனே தெரியப்படுத்தப்படும்.

ஆராய்ச்சியாளர் கையொப்பம்   கர்ப்பிணியின் கையொப்பம்

ஒப்புதல் படிவம்

ஸ்கேன் மூலமாக, கர்ப்பப் பையின் வாயின் நீளத்தை அளந்து, ஒரு அன்னைக்கு சுகப்பிரசவம் ஆகுமா? நிறைமாதத்தில் ஆகுமா? எளிதில் ஆகுமா? போன்ற விவரங்களைக் கணிக்க முற்சித்து டெஸ்ட் செய்ய உள்ளோம்.

இந்த ஸ்கேன் 19 முதல் 24 வாரங்கள் வரையிலான கர்ப்ப காலத்தில் செய்யப்படும்

இது ஸ்கேன் மூலம் செய்யப்படுவதால் உங்களுக்கு உடல் ரீதியான கஷ்டமோ அல்லது பிறக்கப் போகும் குழந்தைக்கு ஒரு பாதிப்போ ஏற்படாது.

இந்தப் பரிசோதனை செய்து கொள்வதால் உங்களுக்கு வழக்கமாக அளிக்கப்படும் மருத்துவ சிகிச்சையில் எந்த மாற்றமும் ஏற்படாது.

உங்கள் பெயர், விலாசம் போன்ற தனிப்பட்ட அடையாளங்கள் இந்த ஆராய்ச்சியின் போதோ அல்லது முடிவுகளின் போதோ உபயோகப்படுத்த மாட்டோம்.

இந்த ஆராய்ச்சியின் முடிவு உங்களுக்கும் இறுதியில் தெரியப்படுத்தப்படும். ஆராய்ச்சியின் போது வேறெதுவும் பிரச்சனைகள் தெரியவந்தால் அதை உங்களுக்கும், உங்கள் மருத்துவருக்கும் உடனே தெரியப்படுத்தப்படும்.

இந்த ஆராய்ச்சியில் உட்பட உங்களுக்கு முழுச் சம்மதம் எனக் கையொப்பமிட்டால் மட்டுமே நீங்கள் சேர்க்கப்படுவீர்கள்.

ஆராய்ச்சியாளர் கையொப்பம்   கர்ப்பிணியின் கையொப்பம்

INTRODUCTION

Normal parturition at term is dependent on the programmed development of the cervix early in pregnancy. The cervix undergoes preparative changes weeks before the onset of labour It is well known that a reduced midtrimester cervical length is associated with an increased risk of spontaneous preterm birth. By extrapolating this, an increased midtrimester cervical length would be associated with an increased risk of prolonged pregnancies, failure of spontaneous onset of labour and caesarean delivery during labour.

The caesarean section rates have risen exponentially all over the world in recent years. The major cause of primary caesarean delivery at term is poor progress in labour. More than 85% of primary caesarean deliveries are performed for three reasons – dystocia, fetal distress and abnormal fetal presentation. A number of factors that lead to poor progress in labour have been identified like increasing maternal age, increased body mass index and prolonged pregnancy. The biological mechanisms that are

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