“ASSOCIATION BETWEEN CERVICAL LENGTH AT 18-23 WEEKS OF GESTATION AND SPONTANEOUS PRETERM DELIVERY – A CROSS SECTIONAL STUDY”

REG.NO. BJ0111001

Dissertation

Submitted to the
KLE University, Belgaum, Karnataka

In Partial Fulfillment
of the requirements for the degree of

MASTER OF SURGERY
in
OBSTETRICS AND GYNAECOLOGY

**DEPARTMENT OF OBSTETRICS AND GYNAECOLOGY,
JAWAHARLAL NEHRU MEDICAL COLLEGE,
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ENDORSEMENT

This is to certify that the dissertation entitled **"ASSOCIATION BETWEEN CERVICAL LENGTH AT 18-23 WEEKS OF GESTATION AND SPONTANEOUS PRETERM DELIVERY – A CROSS SECTIONAL STUDY"** is a bonafide research work done by **THE CANDIDATE REG NO. BJ0111001.**

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LIST OF ABBREVIATIONS USED

ART	-	Assisted reproductive techniques
CI	-	Confidence interval
CL	-	Cervical length
i.e.	-	That is
Kg.	-	Kilogram
LR	-	Likelihood ratio
LSCS	-	Lower segment caesarean section
mg	-	Milligram
mm	-	Millimeter
n	-	Total number
NICU	-	Neonatal intensive care unit
p	-	probability value
PPROM	-	Premature rupture of membrane
PTL	-	Preterm labour
RR	-	Relative risk
SD	-	Standard deviation
TAU	-	Transabdominal ultrasound
TP	-	Transperineal
TV	-	Transvaginal
TVS	-	Transvaginal sonography
TVU	-	Transvaginal ultrasound
USA	-	United states of America
vs.	-	Versus
wk	-	Week

ABSTRACT

Background and objective

Cervical length, as measured by transvaginal ultrasonography, has been shown to predict preterm birth. This study was aimed to find the association between cervical length at 18 to 23 weeks of gestation, done during routine anomaly scan and spontaneous preterm delivery.

Methodology

This one year cross-sectional study was carried out in the Department of Obstetrics and Gynecology, KLE'S Dr. Prabhakar Kore Hospital and Medical Research Centre, Belgaum. A total of 205 women who fulfilled the selection criteria from January 2012 to December 2012 were studied. Cervical assessment with transvaginal ultrasound for the measurement of cervical length and diameter of internal os was performed using a Philips HD 11 ultrasound machine and a vaginal probe of 8 MHz.

Results

More than half (54.15%) of the women were aged between 21 to 25 years and the mean maternal age of the study population was 23.26 ± 3.49 years. Most of the women (52.20%) were primigravidas. Majority (76.59%) of the women were enrolled between 20 to 21 weeks gestation and the mean gestation at enrolment was 20.72 ± 1.00 weeks. 32.68% of the women had cervical length between 26 to 30 mm and cervical length of ≤ 25 was present in 4.88% of women. Majority that is, 89.27% were term babies while 10.73% were preterm babies. Of the 22 preterm babies, significantly higher number of babies (59.09%)

were born to mothers with cervical length ≤ 30 mm (p=0.027). Similarly the mean cervical length of women who had preterm labour was significantly less compared those who had term labour (29.64 ± 8.73 mm versus 34.16 ± 5.72 mm; p=0.002). Of the 10 women with cervical length ≤ 25 mm 50% had preterm labour (p=0.003).

Conclusion

The present study showed strong association between short cervical length and spontaneous preterm delivery.

Keywords:

Cervical length; Spontaneous preterm delivery; Transvaginal ultrasound;

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Chapter 1

Introduction

INTRODUCTION

Preterm birth is childbirth occurring at less than 37 completed weeks or 259 days of gestation, is a major determinant of neonatal mortality and morbidity and has long-term adverse consequences for health.[1-3]

If preterm labor leads to an early delivery, the premature newborn is at risk for problems related to incomplete development of its organ systems. Children who are born prematurely have higher rates of cerebral palsy, sensory deficits, learning disabilities and respiratory illnesses compared with children born at term. The morbidity associated with preterm birth often extends to later life, resulting in enormous physical, psychological and economic costs.[4,5]

Preterm delivery is the main cause of perinatal mortality and morbidity.[6] Spontaneous preterm birth occurs before 37 weeks' gestation in 7–11% of pregnancies, and before 34 weeks' gestation in 3–7% of pregnancies.[6,7] Delivery before 34 weeks' gestation, however, accounts for three-quarters of neonatal mortality and one half of long-term neurological impairment in children3. The incidence of preterm labour in our institute during 2006-07 was reported to be 10.2% and of these, 50% occurred spontaneously and preterm premature rupture of membrane (PPROM) and iatrogenic causes contributed 25% each.[8]

Clearly, different risk factors play a role in the high rates of preterm birth in different regions. In North America, the increasing age of women giving birth, which leads to more maternal complications and Caesarean sections, may partially explain the high rates. Increased rates of multiple pregnancies may be another explanation. In Africa, on the other hand, high levels of preterm birth are

probably due to intrauterine infection or lack of availability of drugs, such as tocolytic agents.[9] However, two main factors contribute to such disappointing figures: (1) the inadequacy of therapeutic arsenal; indeed, only tocolytics attempt to treat symptoms of preterm labor; (2) the absence of reliable criteria for the selection of a high-risk population for preterm delivery.[10]

Hence, identifying ways to address preventable causes of preterm birth should be a top priority in developing regions of the world. Despite the advances in the diagnosis and management of preterm labour, prediction of preterm labour is issue of debate as to large extent the preterm labour cannot be predicted and attempts such as risk factors, fetal fibronectin, bacterial vaginosis and cervical length assessment are questionable.

Different strategies have therefore been developed to refine the prediction of the risk of preterm delivery in symptomatic and asymptomatic patients; one branch of this strategy uses transvaginal sonography (TVS) to measure and examine the length and shape of the cervix.[10] Measurement of cervical length has been claimed to predict the risk of preterm birth, and increasingly in clinical practice transvaginal ultrasound is being utilized to assess such risk. Transvaginal ultrasound allows clear and consistently successful visualization of the cervix and the internal os, providing an advantage over transabdominal sonographic evaluation, which may be unreliable due to maternal habitus, position of the cervix, degree of bladder filling, and the obscuring effect of the fetus.[8] If shortened cervical length in asymptomatic women in the mid-trimester predicts spontaneous preterm birth, closer monitoring or entry into clinical intervention trials[11] may be targeted at this group. In symptomatic women, if shortened

cervical length could identify an impending spontaneous preterm birth before advanced cervical dilatation, antenatal steroids,[12] tocolytics and in-utero transfer may be used accordingly to avert adverse neonatal sequelae.

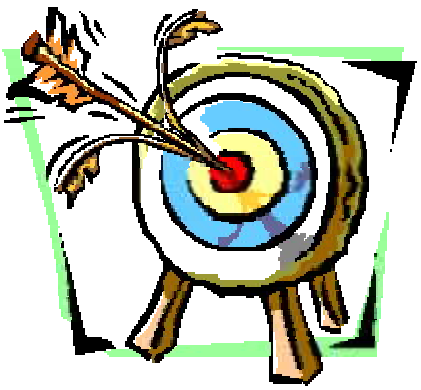
Many primary studies claim that shortened cervical length or presence of internal os funneling (dilatation) on transvaginal ultrasound predicts spontaneous preterm birth. However, due to variation in thresholds for abnormality and differences in gestational age defining preterm birth, there is heterogeneity in the estimates of accuracy.[8]

Overall, to date, the available evidence lacks the prediction of preterm labour based on cervical length. Also, so far, very few studies have commented on the role of short cervical length in prediction of preterm delivery especially in Indian context.

Considering the high rate of preterm delivery and its adverse consequences and with hypothesis that short cervical length may predict the preterm delivery, the present study was planned to find the association between cervical length at 18 to 23 weeks of gestation done as a routine during all second level scans and spontaneous preterm delivery.

Chapter 2

Objectives



OBJECTIVES

The objective of the present study was to find the association between cervical length at 18 to 23 weeks of gestation and spontaneous preterm delivery.

Chapter 3

Review of Literature

REVIEW OF LITERATURE

PRETERM LABOUR

The uterus is a muscular organ designed to hold and nurture the growing baby. During the first trimester of pregnancy the uterus begins to contract. These contractions continue throughout the pregnancy in a painless, irregular manner. Some women are aware of these contractions and others are not. In 1872, J. Braxton Hicks first described this phenomenon and so these contractions are now named after him. Braxton Hicks contractions normally do not lead to opening of the cervix to facilitate delivery.[13]

Preterm birth is childbirth occurring at less than 37 completed weeks or 259 days of gestation. It is a major determinant of neonatal mortality and morbidity and has long-term adverse consequences for health.[14]

Epidemiology

Preterm labor precedes almost half of preterm births and preterm birth occurs in approximately 12% of pregnancies and is the leading cause of neonatal mortality in the United States. In addition, preterm birth accounts for 70% of neonatal morbidity, mortality, and health care dollars spent on the neonate, largely due to the 2% of American women delivering very premature infants (< 32 wk).[15,16]

World Health Organization in 2005 estimated that 9.6% of all births were preterm, which translates to about 12.9 million births definable as preterm. Approximately 85% of this burden was concentrated in Africa and Asia, where

10.9 million births were preterm. About 0.5 million preterm births occurred in Europe and the same number in North America, while 0.9 million occurred in Latin America and the Caribbean. In India, the incidence of preterm birth has been reported to be 14.5%.[14]

Due to continued innovation in neonatal intensive care facilities and obstetric interventions, fetal survival is now possible even at 20 weeks gestation in developed countries. However, in even the best setups in developing countries, salvage is rare below 28 weeks of gestation. Incidence of preterm labor is 23.3% in India.[17]

Preterm labor and delivery are not rare. McPheeters et al[18] state that incidence of first time hospitalization for preterm labor is 9% with only 38% delivering in their first episode. According to annual vital statistics in USA percentage of infants delivering before 37 weeks is continuously rising from 11% in 1998 to 12.3% in 2003.[19] Incidence of preterm labor is showing an increasing trend due to assisted reproduction leading to an increase in multiple births, early and late procreation, and better obstetrical intervention.[17]

Etiology

Preterm birth is a heterogeneous condition; up to 30–40% of all cases of preterm birth are the result of elective delivery for a maternal or a fetal complication where it is judged that the baby is better delivered in the mother's interest or that of its own, e.g. hypertension, diabetes, intrauterine growth restriction. The remaining 60–70% of preterm births are probably the result of

covert or subclinical infective/inflammatory processes, cervical dysfunction, idiopathic (unknown causes), multiple gestations etc.[20]

Despite the recognition of the etiologic heterogeneity of preterm birth, it is usually classified into subtypes based on clinical presentations: spontaneous preterm birth (spontaneous onset of labor or following preterm premature rupture of membranes (PROM)) and medically indicated preterm birth.

Approximately half of twin pregnancies are delivered preterm (<37 weeks). Of these twin preterm births, the proportion of preterm PROM, spontaneous preterm labor, and medically indicated preterm birth ranged between 8.6% and 21.0%, 29.3% and 56.0%, and 22.0% and 62.1%, respectively. Data in the USA indicate that 44% and 56% of all preterm births among twin gestations are the result of spontaneous and medically indicated preterm births, respectively.[21]

Not only are the proportions in the three clinical subtypes of preterm birth varied, but differences in patient characteristics, populations studied, high-risk composition of the patient populations, and plurality are some of the chief factors that are likely to contribute to the heterogeneity in clinical presentations leading to preterm birth.

Trends in preterm birth, its clinical subtypes, and changes in perinatal mortality

Prevention of preterm birth remains a perinatal priority in the USA and other industrialized countries.[22-24] Despite continued efforts to reduce the rate,

local clinical and community-based preterm birth prevention programs have clearly fallen short of reducing preterm births.[22,23,25] In fact, the rate of preterm birth in the USA has been steadily increasing over the past two decades.[26-29] This temporal increase has occurred despite the increasing availability of nutrition supplementation programs, participation in adequate prenatal care, and use of tocolytic drugs to arrest contractions and impending labor at preterm gestations.[30,31] Given the current status on trends in preterm birth, the Healthy People 2010 objectives note a reduction of preterm births to 7.6% a figure that is perhaps unachievable in light of the prevailing preterm birth trends.[32]

Recently study showed that in the USA preterm birth rates among whites with singleton live births increased from 8.3% in 1989 to 9.4% in 2000, a relative increase of 14%.[27] Over the same period, the preterm birth rate among blacks declined from 18.5% in 1989 to 16.2% in 2000, a relative decline of 15%. The increase in preterm birth among white women was largely driven by a concurrent and impressive increase in medically indicated preterm birth by 55%. On the other hand, the decrease in the overall preterm birth rate among blacks was driven by a concurrent decline in preterm PROM (37%) and preterm birth following spontaneous onset of labor (27%). This pattern occurred despite the rate of medically indicated preterm births among blacks increasing by 32%.[27,32]

Medical interventions at preterm gestational ages are often performed in the scenario of impending serious fetal or maternal compromise. The changes in perinatal mortality (stillbirths at 20 weeks plus deaths within the first month) rates among singleton births between 1989 and 2000 in the USA within categories of preterm birth clinical subtypes given that the largest decline in

perinatal mortality occurred among medically indicated preterm births (relative to other subtypes). These data suggest a beneficial effect of medical interventions at preterm gestations in so far as mortality is concerned. However, caution that a decline in perinatal mortality may have inadvertently led to an increase in short- and long term morbidity in newborns.[33,34]

Due to continued innovation in neonatal intensive care facilities and obstetric interventions, fetal survival is now possible even at 20 weeks gestation in developed countries. However, in even the best setups in developing countries, salvage is rare below 28 weeks of gestation. Incidence of preterm labor is 23.3% and of preterm delivery 10-69% in India. It is rising world over because of increased frequency of multiple births due to assisted reproductive techniques (ART), more working mothers, increasing psychological stress and medically induced prematurity. Hence it is a time felt need to ascertain the causes and outcome of preterm labor and delivery and also the neonatal care resources available in most Indian neonatal units.

Consequences of preterm birth

Preterm delivery, particularly that before 34 weeks' gestation, accounts for three-quarters of neonatal mortality and one-half of long-term neurological impairment in children.[35-37] Many of the surviving infants also suffer from other serious short-term and long-term morbidity,[38,39] such as respiratory distress syndrome, bronchopulmonary dysplasia, intraventricular haemorrhage, retrolental fibroplasia and developmental problems. Even those premature infants that are classified as developmentally 'normal' or as having 'mild' developmental

problems, in the longer term have higher rates of multiple problems that affect their lives.[40] Although complications of prematurity are significantly reduced after 32–34 weeks' gestation, minor morbidities, which often lengthen hospitalisation, remain for neonates born between 34 and 37 weeks' gestation.[41,42]

Clinical burden of preterm birth

Spontaneous preterm birth before 37 weeks' gestation occurs in 7–12% of pregnancies[43] and it occurs in about 4% of pregnancies before 34 weeks' gestation.[18] Advances in perinatal health care have not reduced the rate of spontaneous preterm birth.[44] Extrapolation from live births data in England and Wales (2004),[18] shows that an estimated 76,000 and 26,000 spontaneous preterm births occur before 37 weeks' and 34 weeks' gestation, respectively.

Risk factors

The following are risk factors for spontaneous preterm birth:[47]

- Infection (chorioamnionitis, bacteruria, periodontal disease,[45] current bacterial vaginosis with a prior preterm birth)[46]
- Antepartum bleeding, rupture of membranes, cervical/uterine factors (cervical insufficiency, uterine anomalies,[47] fibroids, and excisional cervical treatment for cervical intraepithelial neoplasia)[49,50]
- Fetal/intrauterine factors (multifetal gestation, fetal anomaly, and polyhydramnios)

- Reproductive history (previous spontaneous preterm birth and use of assisted reproductive technologies)[47,51]

- Demographic factors (low socioeconomic status, single marital status, low level of education, First Nations ethnicity, or maternal age < 18 years or > 35 years)[47]

- Lifestyle issues (cigarette smoking, illicit drug use, stress, physical abuse)[52]

- Inadequate prenatal care, low pre-pregnancy weight and poor weight gain in pregnancy.[53]

However, many women who deliver preterm do not have any known risk factors.[51]

Prevention of preterm labour

It is a time felt need to ascertain the causes and outcome of preterm labor and delivery and also the neonatal care resources available in most Indian nurseries.[10]

Assessment of pregnant women's risk for preterm birth, based on a combination of patients' characteristics, symptoms, physical signs and investigations, is important. This is because without an accurate assessment, clinicians are handicapped in the management of women at risk of preterm birth regarding the institution of timely antenatal interventions. Wrong or delayed diagnosis can put mother and baby at risk of an adverse outcome whereas correct

prediction of preterm birth will provide an opportunity to institute effective interventions.[20]

Two target populations of pregnant women need to be tested for the risk of spontaneous preterm birth.[20]

The first is the population of antenatal asymptomatic women carrying a singleton gestation and receiving routine care. In this important, and by far the largest, epidemiological target pregnant population, women are generally in a healthy state, anticipating a normal course of pregnancy. They are usually regarded as 'low-risk' unless there are antecedent or current factors and history that might increase the risk of preterm birth. If screening or testing could predict the risk of spontaneous preterm birth among these women, preventative measures may be more appropriately targeted. For example, if ultrasonographic measurement of cervical length in these women identifies shortened cervical length,[8] then cervical cerclage may be deployed to prevent progression to spontaneous preterm birth.[54] For these women, the key outcome measure would be prevention of spontaneous preterm birth before 34 and 37 weeks' gestation.[20]

The second population of interest is that of symptomatic women with singleton gestation who present with threatened preterm labour. For these women, there is a need to identify those who will go on to deliver prematurely because the key clinical decisions following testing relate to immediate management and outcome. For example, if cervicovaginal fetal fibronectin testing could predict spontaneous preterm birth among these women before advanced cervical dilatation, then antenatal maternal intramuscular corticosteroid

injection may be administered to accelerate fetal lung maturity to prevent respiratory distress syndrome.[20]

In utero transfer to a tertiary intensive neonatal care unit able to care for the premature neonate may also be considered. Such a transfer, which may take some time to arrange (because of logistics, geography or lack of neonatal intensive care cots), would be inappropriate if birth were imminent because it would risk delivery en-route. In such cases, knowledge of a higher likelihood of imminent birth may allow rational use of tocolytic agents, which aim to suppress or diminish contractions allowing time for the administration of antenatal corticosteroids to exert its beneficial effects.[20]

Antenatal corticosteroids have maximal effectiveness in preventing neonatal complications of prematurity when delivery is within 2–7 days after administration. Given the duration of time required for corticosteroids to exert beneficial effects and the potential for in utero transfer and tocolytic administration, knowledge of impending birth within 48 hours to 7 days of testing would be a clinically meaningful outcome measure among women symptomatic of threatened preterm labour.[20]

The screening tests for the preterm labour include digital examination, cervicovaginal fetal fibronectin, cervicovaginal prolactin, serum α fetoprotein, serum relaxin. Other tests such as C-reactive protein, interleukin-6 and 8, matrix metalloprotease-9, asymptomatic bacteriuria assessment, bacterial vaginosis, uterine activity monitoring, rheobase, absence of fetal breathing movements on

ultrasound and cervical ultrasound assessment have also shown positive role in screening for preterm labour.[20]

Research has focused on combined risk scoring systems that use multiple serum markers, ultrasound, and maternal demographic factors, but these have not been fully validated in large scale studies. Other screening strategies that have been suggested include measuring biochemical markers such as fetal fibronectin and screening for infections.[20]

CERVICAL ULTRASOUND ASSESSMENT

Antenatal cervical shortening[55] and opening of the internal os[56] have been purported to increase the risk in asymptomatic women and the likelihood of spontaneous preterm birth in women who presented with threatened spontaneous preterm labour.

In the 1980s, an objective, ultrasound-based measurement was developed to identify women at increased risk of preterm birth. The risk of preterm birth was inversely correlated to the length of the cervix as measured by ultrasound. This observation has been confirmed in multiple studies using different techniques; however, the most widely accepted and used technique is transvaginal ultrasound.[47] A number of interventions based on this observation have been studied in randomized trials.[47]

A recent meta-analysis[57] has looked at its efficacy in preventing preterm birth. Since the publication of the 2001 SOGC guideline,[58] there have been numerous studies on imaging, natural history, and use of transvaginal ultrasound

in common clinical scenarios, as well as a number of randomized trials looking at interventions for a short cervix.

Ultrasonography compared with digital assessment of cervical length

Digital assessment of the cervix has been commonly used to diagnose premature labour or to evaluate women perceived to be at increased risk of preterm labour. Digital assessment of cervical length is subjective, varies between examiners, and underestimates true anatomic length.[47]

In one study, digital examinations before hysterectomy underestimated cervical length by approximately 14 mm, whereas ultrasonography measured length accurately.[60] Investigations using transvaginal ultrasound measurement as the standard confirmed that digital examination underestimates cervical length.[61,62] This underestimation may result from an inability to assess the cervix length digitally beyond the vaginal fornices unless there is 2 cm or more of dilatation and the entire intracervical canal is examined. The majority of studies have found that ultrasound assessment of cervical length is superior to clinical examination for the prediction of preterm birth.[63]

Therefore, ultrasound assessment of cervical length is more reliable and more clinically predictive of preterm birth than manual examination of the cervix.[47]

Comparison of transvaginal, transabdominal, and transperineal ultrasonographic cervical length assessment

Ultrasound assessment of the cervix was initially performed transabdominally, but specific disadvantages led to a preference for transvaginal ultrasound assessment. Both transperineal (TP) and transvaginal (TV) cervical assessments have been studied, with most studies evaluating TV assessment.[64,65]

The patient's bladder must be full for transabdominal ultrasonography to assess the cervix adequately, but this may spuriously lengthen the cervix by opposing the anterior and posterior lower uterine segments[64] and concealing cervical shortening or funnelling. In contrast, TV ultrasound is performed with the bladder empty.[66]

Transabdominal ultrasound is significantly less likely than the other two methods to provide adequate imaging and measurements.67 Visualization of the cervix by transabdominal ultrasonography is hampered significantly by maternal obesity, shadowing from fetal parts, and the need for lower frequency transducers.

Transabdominal ultrasonography should not be used for cervical length assessment to predict preterm birth.

TP ultrasonography has been found to be as accurate as transabdominal ultrasound for examining the cervix, and one study found it was more acceptable to women than TV scanning.[66] Other studies, however, have found both TV and TP techniques acceptable to women.[66-68] TP assessment is more accurate than

digital examination for predicting preterm birth, and, when adequate images can be obtained, TP ultrasonography can predict preterm birth as accurately as TV ultrasonography.[60,69] However, most authors suggest that adequate images can be obtained more frequently with TV than with TP technique,[66,70] that TV assessment is easier to obtain and more reproducible, and that TV correlates better with true cervical length than TP assessment.[71,72] Since the TV technique is more studied and more likely to be obtainable, TP ultrasonography should be reserved for women at increased risk of preterm birth for whom vaginal assessment is unavailable or unacceptably invasive or uncomfortable.

Transvaginal ultrasonography is the preferred route for cervical assessment to identify women at increased risk of spontaneous preterm birth and may be offered to women at increased risk of preterm birth.[47]

Normal cervical length

Cervical length is normally distributed and remains relatively constant in pregnancy until the third trimester.[73,74] If there is any statistically significant reduction in length, it is not clinically significant (< 0.5 mm /week).[73,75] Heath et al.[76] found a mean length of 38 mm at 23 weeks. Iams et al.[55] found a mean length of 35 mm at 24 weeks and of 34 mm at 28 weeks. If funnelling is present, measurement should exclude the funnel and be taken from the funnel tip to the external os.[47]

Cervical change in women who deliver preterm

In women who deliver preterm or require cerclage, the rate of cervical length change may be predictive of preterm birth. The rate of cervical shortening is faster in women who deliver preterm than in those who deliver at term; however, the difference can be quite small.[75,77] The range of cervical length decline in those who go on to preterm delivery or preterm labour, varies from 0.5 mm/week to 8 mm/week.[75,77] In a cross-sectional, longitudinal study, Yoshizato et al.[78] examined cervical change in women whose cervix became short (< 25 mm) in either the early (< 26 weeks) or the late preterm period (26 to 30 weeks). They found that "rapid cervical length (CL) shortening occurred between 16–20 and 21–25 weeks in the early group and between 21–25 and 26–30 weeks in the late group.[78]

Transvaginal sonographic cervical length assessment in asymptomatic women at low risk

Cervical length is inversely related to the risk of preterm birth in asymptomatic women. The largest study of this relationship noted that when compared with women who had values above the 75th percentile of cervical length, those with a shorter cervix at 24 weeks had the following relative risks: approximately 4 if length was < 30 mm (25th percentile), 6 if < 26 mm (10th percentile), 9 if < 22 mm (5th percentile), and 14 if < 13 mm (1st percentile). However, the positive predictive values (6 to 44%) and sensitivities (47%) were poor in this low-risk population.[47]

Davies et al.,[79] in a Canadian, prospective, blinded observational trial of 964 women (general obstetrical population), found a sensitivity of 57% and a specificity of 82% for preterm birth, using a 30 mm cut-off at 24 to 28 weeks. The positive predictive value for preterm birth (< 35 weeks) was only 4.5%, because preterm birth was infrequent. The authors concluded that using TV ultrasonographic cervical length to screen for preterm birth in a general obstetrical population was unwarranted.

Also, no studies have shown that cervical cerclage is beneficial in women at low risk who have a short cervix.[79,80] Because of the low incidence of preterm birth in this low-risk population routine screening of cervical length as a predictor of preterm birth in this population is not recommended.[47]

Because of poor positive predictive values and sensitivities and lack of proven effective interventions, routine transvaginal cervical length assessment is not recommended in women at low risk.[47]

Transvaginal sonographic cervical length assessment in asymptomatic women with a history of spontaneous preterm birth

Cervical length is a better predictor of preterm birth in women at increased risk, such as those with a history of spontaneous preterm birth, than in asymptomatic women at low risk.[47]

In studies of women with a history of preterm birth, using a cervical length cut-off of 25 to 30 mm to predict preterm birth < 37 weeks of gestation, sensitivity is 60% to 80%, positive predictive value is 55% to 70%, and negative

predictive value is 89% to 94%. Thus, a long cervix (at least 25 to 30 mm) is reassuring and can help to reduce unnecessary and costly interventions, such as activity restriction, maternal transfer, steroids, and tocolytics.[47]

Cervical length, as measured by transvaginal ultrasonography, has been shown to predict preterm birth in asymptomatic low-risk women as well as those presenting with threatened preterm labor.[81]

Some studies have evaluated the use of transvaginal ultrasonography in asymptomatic high-risk women[8,82] but differences among them exist regarding the cervical length cut-off defined as abnormal, gestational age at which transvaginal ultrasonography was performed and the gestational age at preterm birth.

Previous meta-analyses have addressed the use of transvaginal ultrasonography to predict preterm birth in asymptomatic women, including those with singleton and multiple gestations,[8,83]and those presenting with threatened preterm labor.[8,82,83]

None of these systematic reviews evaluated high-risk asymptomatic women (such as those with a history of spontaneous preterm birth) separately.[81]

A review[81] estimated the ability of cervical length measured by transvaginal ultrasonography in asymptomatic high-risk women to predict spontaneous preterm birth. MEDLINE, PubMed, EMBASE and the Cochrane Library were searched for articles published in any language between January 1980 and July 2006, using the keywords 'transvaginal ultrasonography' or

('cervix' and ('ultrasound' or 'ultrasonography' or 'sonography')); and ('preterm' or 'premature') and ('delivery' or 'labour/labor' or 'birth'), identifying cohort studies evaluating transvaginal ultrasonographic cervical length measurement in predicting preterm birth in asymptomatic women who were considered at increased risk (because of a history of spontaneous preterm birth, uterine anomalies or excisional cervical procedures), with intact membranes and singleton gestations. The primary analysis included all studies meeting the inclusion criteria. Secondary analyses were also performed specifically for (1) women with a history of spontaneous preterm birth; (2) those who had undergone an excisional cervical procedure; and (3) those with uterine anomalies. Fourteen of 322 articles identified (involving 2258 women) met the criteria for systematic review. Cervical length measured by transvaginal ultrasonography predicted spontaneous preterm birth. The shorter the cervical length cut-off the higher the positive likelihood ratio (LR). The most common cervical length cut-off was < 25 mm. Using this cut-off to predict spontaneous preterm birth at < 35 weeks, transvaginal ultrasonography at < 20 weeks' gestation revealed LR+ = 4.31 (95% CI, 3.08-6.01); at 20-24 weeks, LR+ = 2.78 (95% CI, 2.22-3.49); and at > 24 weeks, LR+ = 4.01 (95% CI, 2.53-6.34). In women with a history of spontaneous preterm birth (six studies involving 663 women) cervical length at < 20 weeks revealed LR+ = 11.30 (95% CI, 3.59-35.57) and at 20-24 weeks LR+ = 2.86 (95% CI, 2.12-3.87), but there were limited data on the use of cervical length of more than 24 weeks in this group (one study involving 42 women). In women who had had excisional cervical procedures, two studies presented data on cervical length (one at < 24 weeks and one at > 24 weeks), finding cervical length

at < 24 weeks to be predictive of spontaneous preterm birth at < 35 weeks (LR+ = 2.91, 95% CI, 1.69-5.01). One study (of 64 women) evaluated cervical length in women with uterine anomalies, finding it predictive of spontaneous preterm birth at < 35 weeks (LR+ = 8.14, 95% CI, 3.12-21.25). The authors concluded that, cervical length measured by transvaginal ultrasonography in asymptomatic high-risk women predicts spontaneous preterm birth at < 35 weeks. Further they observed the most common cervical length cut-off was less than 25 mm and the most common gestational age of preterm birth as less than 35 weeks' gestation.

A study published in 2009 found that the gestational age at which the prior preterm delivery occurred affects the frequency and rate of cervical shortening in the current pregnancy. A prior spontaneous early preterm birth (< 24 weeks) puts women at a higher risk of cervical shortening. Women in this group also have a higher rate of cervical decline that begins at an earlier gestational age than women with a history of a later preterm birth (24 to 32 weeks).[84]

Transvaginal sonography can be used to assess the risk of preterm birth in women with a history of spontaneous preterm birth and to differentiate those at higher and lower risk of preterm delivery. The gestational age of a prior preterm birth affects the cervical length in a future pregnancy.[47]

Transvaginal sonographic cervical length assessment in other asymptomatic women at high risk

Transvaginal cervical length assessment has been found to be effective in predicting preterm birth in asymptomatic high-risk groups, including those with

uterine anomalies,[85] excisional cervical treatment for cervical intraepithelial neoplasia (LEEP and cone biopsy),[86] and prior multiple dilatation and evacuation procedures (beyond 13 weeks of gestation). There is no evidence that cervical cerclage placement is beneficial in these women if they are found to have a short cervix on transvaginal ultrasound.[47]

Cervical length measurement can be used to identify increased risk of preterm birth in asymptomatic women at < 24 weeks who have other risk factors for preterm birth (previous excisional treatment for cervical dysplasia, uterine anomaly, or prior multiple dilatation and evacuation procedures beyond 13 weeks' gestation). However, there is insufficient evidence to recommend specific management strategies, such as cerclage, in these women.[47]

Ultrasonographic cervical length assessment in clinical management

Ultrasonographic Cervical Assessment in Women Suspected of Being in Preterm Labour

The use of cervical length measurement has been studied in women presenting with suspected preterm labour. The goal of these studies was to attempt to differentiate between women who were likely to deliver preterm and those who were not. This information may help women avoid unnecessary interventions of limited or unproven value, such as tocolysis, hospitalization, and activity restriction. Spontaneous preterm birth is unlikely if the cervical length is ≥ 30 mm.[47]

Fuchs et al.[87] showed that a cervical length of < 15 mm in a population presenting with painful contractions (< 32 weeks) had a 5.5-fold increased risk (44%) of delivery within a week, and those with a cervical length of ≥ 15 mm had a 2% risk.104 In other studies, delivery occurred within 7 days of presentation in 37% of 43 women with cervical length < 15 mm,102 and a cervical length of < 20 mm had a 93.7% and 87.5% positive predictive value for preterm birth in primiparous and multiparous women respectively.[88]

In all these studies, the cervical length was an independent predictor of preterm delivery.[88-90] In 2010, Sotiriadis et al.[91] published a meta-analysis on the use of cervical length measurements in patients presenting with symptoms of preterm labour. They included prospective cohort and/or case–control studies that evaluated transvaginal ultrasonographic assessment of cervical length for the prediction of preterm birth in women with a singleton pregnancy and intact membranes (studies with < 20% premature rupture of membranes and multiples were included, however). Studies involving the use of tocolytics and/or prophylactic steroid administration were also included. They used a weighted analysis to determine test performance. The cumulative data suggest that the cervical length measurement in symptomatic women can be used to discriminate between those at higher and those at lower risk of preterm delivery, which may help to rationalize their management; however, there was considerable heterogeneity across the studies.

On the basis of the weighted estimates, and using a pooled prevalence of 11.1% for birth within 1 week of presentation, Sotiriadis et al.[91] calculated that

the negative predictive values of 15 mm, 20 mm, and 25 mm would be 94.8%, 96.3%, and 95.8%, respectively.

Use of Transvaginal Ultrasound to Stratify Women Presenting With Preterm Labour

In a prospective cohort study among several hospitals using different protocols for threatened preterm labour, the use of ultrasound assessment of cervical length appeared to shorten hospital stay without compromising patient care.[92]

In a small (n=41) trial,[93] women with threatened preterm labour were randomized to a control group, who received tocolytics and steroids in keeping with the hospital's protocol, or to an assessment group who had cervical length measured by transvaginal ultrasound. Women in the assessment group who were found to have a cervical length of < 15 mm were given tocolytics and steroids. Those with cervical length of ≥15 mm were not given tocolytics and steroids. No babies in the group considered to be at low risk of preterm birth were born prematurely without a full course of antenatal corticosteroid therapy, and babies in this group had significantly lower rates of exposure to steroids and tocolytics.

The results suggest that it may be safe to use ultrasonographic cervical length assessment to prevent unnecessary use of tocolytics and steroids.[93] However, the small sample size of this study does not provide adequate power to assess uncommon outcomes such as preterm birth at < 34 weeks and to determine whether this approach could cause harm.

A meta-analysis by Berghella et al.[57] evaluated the efficacy of cervical length measurements to prevent preterm birth by asking whether the knowledge of ultrasonographic cervical length affected the rate of preterm birth. This was studied in 2 groups: those that presented in preterm labour and those with preterm rupture of membranes. Knowledge of TV ultrasonographic cervical length results was associated with a non-significant decrease in preterm birth at < 37 weeks (22.3% and 34.7%, respectively; RR 0.59; 95% CI 0.26 to 1.32). Delivery occurred at a later gestational age in the knowledge than in the no-knowledge group (mean difference 0.64 weeks; 95% CI 0.03 to 1.25). The authors concluded that there was insufficient evidence to recommend routine screening of asymptomatic or symptomatic pregnant women with transvaginal ultrasound. However, it should be noted that the total number of women in the study was small (total N = 290 in preterm labour, n = 92 in premature preterm rupture of membranes). Also, the study did not determine whether progesterone or cerclage was used, and it included clinical presentations in which neither of those interventions would likely be used.

In summary, it appears that TV ultrasonography can be used to stratify risk in women presenting with preterm labour, and there is some evidence that suggests this can be done safely and with some benefit.[47]

In women presenting with suspected preterm labour, transvaginal sonographic assessment of cervical length may be used to help in determining who is at high risk of preterm delivery and may be helpful in preventing unnecessary intervention. It is unclear whether this information results in a reduced risk of preterm birth.[47]

Ultrasonographic Cervical Assessment in Women with Suspected Preterm Premature Rupture of Membranes

Preterm premature rupture of membranes conveys an increased risk of chorioamnionitis and preterm birth. In such circumstances, uterine contractions causing cervical change are difficult to assess because the digital cervical examination is associated with an increased risk of infection and should be postponed until labour is established.[47]

Several cohort studies have shown that the cervical length measured by TV predicts latency to delivery in preterm premature rupture of membranes.[94,95]

In a much smaller study, cervical length measurements by TP ultrasound did not correlate with latency duration to delivery.[96]

Transvaginal cervical length measurement in a randomized trial was not found to increase the risk of infection in patients with preterm premature rupture of membranes. This study did not find that cervical length had predictive value for latency. This is not consistent with the findings of another study.[97]

Transvaginal ultrasound appears to be safe in preterm premature rupture of membranes, but its clinical predictive value is uncertain in this context.[47]

The Use of Progesterone in Women With a Short Cervical Length by Ultrasonographic Assessment

Recent studies have evaluated the use of progesterone in patients with a short cervix to prevent preterm delivery. In a study by Fonseca et al.,[98] 250

women (24 to 34 weeks' gestation) who were determined to have a cervical length of < 15 mm were randomized to either vaginal progesterone (200 mg each night) or placebo. The primary outcome was spontaneous delivery before 34 weeks. Delivery before 34 weeks of gestation was less frequent in the progesterone group than in the placebo group (19.2% vs. 34.4%; RR 0.56; 95% CI 0.36 to 0.86). However, there was no statistically significant reduction in neonatal morbidity (8.1% vs. 13.8%; RR 0.59; 95% CI 0.26 to 1.25; *P* = 0.17). There were no serious adverse events associated with the use of progesterone.

In a secondary analysis of a randomized, double-blind, placebo-controlled trial of progesterone to prevent preterm birth in patients with a history of preterm birth,[99] the use of progesterone when cervical length was < 28 mm was associated with a reduction in preterm birth prior to 32 weeks (0% vs. 29.6%, *P* = 0.014), fewer NICU admissions (15.8% vs. 51.9%, *P* = 0.016), and shorter NICU stays (1.1 vs. 16.5 days, *P* = 0.013).

A recent randomized trial compared cerclage and 17 α-hydroxyprogesterone for short cervix (< 25 mm) in a high-risk population and showed no difference in rates of preterm birth; however, this study was small (N = 79) and underpowered, because recruitment was halted at the midpoint of the study. In a sub-analysis of that data set, it was shown that cerclage may be better if the cervix is < 15 mm.[100]

In 2009, the United States Food and Drug Administration declined approval of this use of progesterone, because of concerns about possible adverse

effects, but in February 2011, intramuscular progesterone was approved for the prevention of preterm birth.[101]

Although progesterone supplementation in women with a previous preterm birth and a short cervix appears promising, more data are needed to better demonstrate benefit and a number of studies are in progress. A committee consensus could not be reached to recommend its use in this population.[47]

Ultrasonographic Cervical Length Assessment and Cervical Cerclage

Several studies have evaluated the value of cervical cerclage in women with ultrasonographically diagnosed short cervix. A prospective cohort study was the first to show benefits in those who had a cerclage versus those who had usual care, with significantly lower rates of prematurity and no fetal losses.84 Subsequently, 3 randomized trials had disparate findings, although their patient populations were different.[80,79,102]

A meta-analysis of patient level data of those 3 studies showed that in women with a history of spontaneous preterm birth and a cervical length < 25 mm before 24 weeks' gestation, placement of a cervical cerclage was associated with a significant decrease in preterm birth < 35 weeks of gestation (from 39% to 23%).[103]

A recent National Institutes of Health-sponsored multicentre trial confirmed these findings, noting a significant reduction in preterm birth < 35 weeks and/or previable delivery in women with a prior spontaneous preterm birth

and midtrimester transvaginal cervical length < 25 mm, with findings most pronounced when cervical length was < 15mm.[104]

In patients with membrane prolapse at or beyond the external os of the cervix, there may be benefit to emergency cerclage compared with conservative management.[47]

Several retrospective studies[105,106] suggest that pregnancy outcomes are better with emergency cerclage, and a small randomized trial[107] also showed significant prolongation of pregnancy and reduced preterm delivery rates.

In asymptomatic women with a history of spontaneous preterm birth and an ultrasonographically diagnosed short cervical length (< 25 mm) prior to 24 weeks of gestation, cervical cerclage should be considered to reduce the risk of preterm birth.[47]

In all asymptomatic women who present with membranes at or protruding past the external cervical os, an emergency cerclage should be considered to reduce the risk of preterm delivery.[47]

Ultrasonographic cervical length combined with fetal fibronectin in the prediction of preterm birth

Association between ultrasonographic assessment of cervical length and the presence of fetal fibronectin appears to independently associated with an increased risk of preterm birth although there is some overlap.[47]

Direct comparison of these tests can be difficult. Depending on the threshold of cervical length or fetal fibronectin concentration used, the sensitivities and specificities will vary. The definitions of preterm birth and/or the outcome of interest (delivery within a certain interval of time) differ from study to study. These tests have a low sensitivity in a low-risk population and should be used in women at high risk rather than for general screening.[108]

It is unclear whether one is more predictive than the other. The combination of both (sequentially or in tandem) may be more effective than using one alone, but again conflicting results have been found. Whether these screening strategies result in reduced interventions and use of resources remains uncertain.[47]

Ultrasonographic cervical length assessment and fetal fibronectin appear to be similar in predictive ability, and the combination of both in a high-risk population may be of value. However, further research is needed in this area.[47]

Assessment of the length of the cervix by transvaginal ultrasound examination is the second most extensively studied predictor of spontaneous preterm birth. Cervical length measurement has traditionally been used to assess high-risk patients for cervical insufficiency, as manifested by some degree of cervical shortening, plus/minus funneling of the membranes into the internal os. Although in traditional obstetric theory, preterm labor and cervical insufficiency were believed to represent independent and mutually exclusive pathways to spontaneous preterm birth, cervical sufficiency is now thought to be a continuous variable. The cervix may vary in its ability to remain closed and long in the face

of uterine contractions and bacteriologic stimuli, and preterm birth may represent the final common pathway.[109]

The optimal gestational age for cervical length assessment is at 16 to 20 weeks gestation. Before this time, the normal cervical length varies widely, and the upper cervix and lower uterine segment are difficult to distinguish sonographically.[110]

Most studies of efficacy of cervical length measurement have been conducted in the late second trimester or early third trimester. The test characteristics of this test vary according to the gestational age of testing and the frequency of cervical length measurement.

One large multicenter study[111] conducted at 9 university centers evaluated early cervical length measurements among 183 women with singleton gestations and prior preterm births at < 32 weeks' gestation. An initial cervical length measurement was obtained between 16 weeks and 0 days' and 18 weeks and 6 days' gestation. Cervical length measurements were then obtained every 2 weeks up to 23 weeks and 6 days' gestational age. The outcome of interest was preterm birth at < 35 weeks' gestation.

Twenty-five millimeters was the optimal threshold value for prediction of preterm birth. The shortest value over serial examination after dynamic changes had a sensitivity of 69%, specificity of 80%, positive predictive value of 55%, and negative predictive value of 88% for the prediction of preterm birth at < 35 weeks.

In another recent study, Guzman and colleagues[112] compared the predictive characteristics of cervical length at ≤ 25 mm with other sonographic parameters. These parameters included funnel width and length, percent funneling, and cervical index (1 + funnel length/cervical length). The study population included 469 asymptomatic women deemed to be at high risk for spontaneous preterm birth. Cervical length and other sonographic parameters were assessed serially between 15 and 24 weeks' gestation. Outcomes of interest included spontaneous preterm birth at < 28, < 30, < 32, and < 34 weeks' gestation. The authors found that a cervical length measurement of ≤ 25 mm was the optimal cutoff for predicting preterm delivery at all gestational ages. This parameter was better at predicting early preterm delivery (< 28 and < 30 weeks' gestation) than late preterm delivery (< 32 and < 34 weeks' gestation). Although the negative predictive value of this test was excellent, in the 95% to 100% range, the positive predictive value of this test was quite low (6% to 23%). The authors found that funnel width and length, percent funneling, and cervical index did not improve predictive accuracy.

A recent meta-analysis[8] has attempted to compute pooled estimates for the predictive accuracy of cervical length measurements at < 20 weeks' gestation, 20 to 24 weeks' gestation, and > 24 weeks' gestation. The primary outcome of interest was preterm birth at < 34 weeks' gestation. Test characteristics for cervical length for the prediction of preterm birth at < 32 and < 37 weeks' gestation were also computed. Data were pooled separately for asymptomatic singleton pregnancies and symptomatic singleton pregnancies. Multiple gestations were separately assessed. The authors pooled data from 33 studies on

asymptomatic women; 18 of these studies were conducted exclusively among singleton gestations and 11 were conducted exclusively with twin gestations. Four studies involved mixed populations. They also reviewed 15 studies conducted among symptomatic women; 9 of these involved singleton gestations, 3 involved twin gestations, and 3 studies involved mixed populations. The included studies used a variety of different testing thresholds; the most commonly used threshold was 25 mm. Data were pooled separately according to threshold value, and positive and negative likelihood ratios were computed for each subgroup. Among asymptomatic women undergoing transvaginal sonography, using a threshold value of 25 mm, positive likelihood ratios for preterm birth at < 34 weeks' gestation ranged from 4.07 to 6.29 depending on the gestational age at which the test was obtained. Negative likelihood ratios ranged from 0.62 to 0.79.

The authors also evaluated the use of cervical length measurements to assess risk for preterm birth in symptomatic and asymptomatic twin gestations.[8] They pooled the results of 4 studies that evaluated the efficacy of testing at 20 to 24 weeks using a threshold figure of 25 mm. This analysis yielded positive and negative likelihood ratios for preterm birth at < 34 weeks of 5.02 and 0.75, respectively. Because the pretest probability of preterm birth at < 34 weeks is 18.5%, a positive test yields a post-test probability of preterm birth of 47.6% and a negative test yields a post-test probability of 14.2%. The authors found insufficient evidence to assess the efficacy of cervical length measurement in predicting preterm birth among symptomatic twin pregnancies. The measurement of cervical length requires the availability of providers who are skilled in the sonographic measurement of the cervix. Like the fetal fibronectin test, cervical

length measurement is better at identifying women who are unlikely to deliver prematurely than at identifying women with a high probability of delivering preterm.[113] As Iams[55] has noted, there is no cervical length below which all women deliver preterm and no length above which all women have term deliveries.

Because of the predictive ability of cervical length measurements at 18 to 24 weeks' gestation among asymptomatic women, transvaginal cervical length measurement has been used to identify a group of women who might benefit from cervical cerclage. To date, there have been 3 randomized controlled trials[80,102,114] evaluating the therapeutic effectiveness of cervical cerclage among asymptomatic women with short cervices diagnosed by ultrasound. Disappointingly, two of these studies (one of these a large multicenter effort) showed no benefit to cervical cerclage.

Chapter 4

Methodology

METHODOLOGY

The present study was conducted in the Department of Obstetrics and Gynecology, KLE'S Dr. Prabhakar Kore Hospital and Medical Research Centre, Belgaum.

Study design

The study design was a cross sectional study.

Study duration and period

This one year study was conducted during the period from January 2012 to December 2012.

Place

The present study was conducted at Department of Obstetrics and Gynaecology, KLES Dr. Prabhakar Kore Hospital and Medical Research Centre, Belgaum a teaching hospital attached to Jawaharlal Nehru Medical College, Belgaum.

Source of data

Women presenting with singleton pregnancies between 18-23 weeks of gestations, coming for routine anomaly scan during the study period were included in the study.

Sample size

A total of 205 women were studied.

Sampling procedure

The sample size was calculated considering the prevalence based on the formula as below.

$n = 4 p q / d^2$

Where,

n = Sample size

p = Prevalence of preterm deliveries (which considered as 15%)

q = Percentage of women with term deliveries = (100 – p i.e., 85%)

d = Absolute error (which was considered as 5%) at 95% confidence interval

Therefore,

$n = 4 \times 15 \times 85 / 5^2$

n = 204

Hence the sample size of 205 was planned.

Selection criteria

Inclusion

- Singleton pregnancy.
- 18 to 23 weeks of gestation.

Exclusion

- Multiple gestations.
- Patient not willing to provide informed consent

Ethical clearance

Prior to the commencement of the study ethical clearance was obtained from the Institutional Ethical committee, Jawaharlal Nehru Medical College, Belgaum.

Informed Consent

Women presenting with singleton pregnancies between 18-23 weeks of gestation were screened for eligibility. Women fulfilling selection criteria were explained about the nature of the study and interventions and a written informed consent was obtained (Annexure I).

Method of collection of data

After the enrollment demographic data, obstetric history and current pregnancy details were obtained. Further these women were subjected to thorough clinical examination. These findings were recorded on a predesigned and proforma (Annexure II).

Procedure

Cervical assessment with transvaginal ultrasound for the measurement of cervical length was performed using a Philips HD 11 ultrasound machine and a vaginal probe of 8 MHz. based on the standard technique suggested by To et al.[65]

The woman were examined with an empty bladder in dorsal position. The cervical length was measured using the transvaginal probe. The probe was placed in the anterior fornix of the vagina without exerting undue pressure on the cervix,

which may artificially elongate the cervix. The image was magnified. A sagittal view of the cervix was obtained. The calipers were used to measure the linear distance between the triangular area of echodensity at the external os and the V shaped notch at the internal os. Three measurements were taken over a period of 3 minutes to observe any dynamic changes in cervix, and the least of the three measurements was considered. All the patients were followed up till delivery, to assess the outcome of the pregnancy.

Photograph 1. PHILIPS HD 11 ultrasound machine

Statistical analysis

The data obtained was coded and entered into Microsoft Excel Worksheet (Annexure III). The categorical data was expressed as rates, ratios and proportions and continuous data was expressed as mean ± standard deviation (SD). The data was analysed using chi-square test and unpaired two sample 't' test with unequal variance. A probability value ('p' value) of less than or equal to 0.05 was considered as statistically significant.

Chapter 5

Results

RESULTS

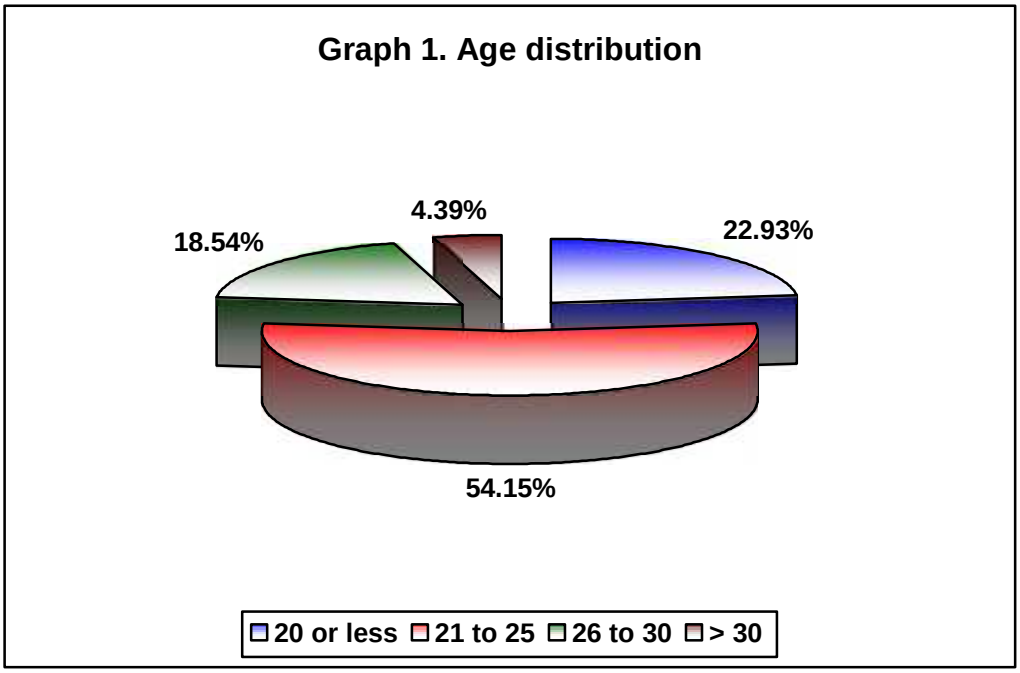
The present one year cross-sectional study was conducted in the Department of Obstetrics and Gynecology, KLE'S Dr. Prabhakar Kore Hospital and Medical Research Centre, Belgaum.

A total of 242 women presenting with singleton pregnancies between 18 to 23 weeks of gestations, coming for routine anomaly scan during the study period from January 2012 to December 2012 were included in the study. Of these, 17 women were excluded as they underwent induction of labour due to obstetric indications, 14 women were lost to follow up and 6 underwent an intervention for short cervical length. Hence the outcome data was available in 205 women.

The data obtained was coded and entered into Microsoft Excel Worksheet (Annexure III). The data was analysed and the final observations and results were tabulated as below.

Table 1. Age distribution

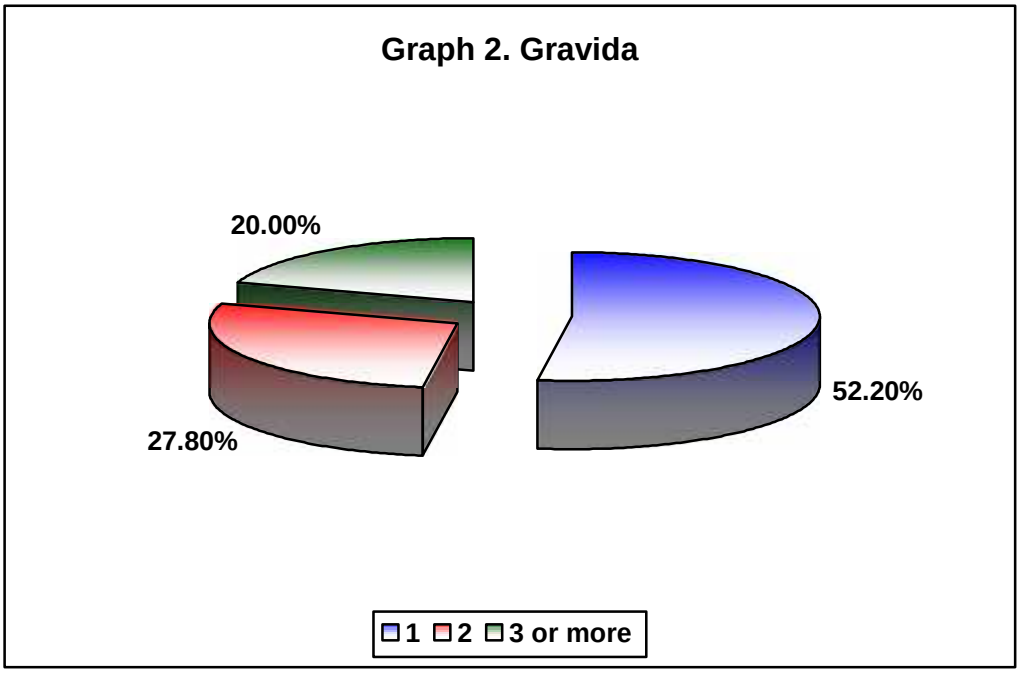
Age group (Years)	Distribution (n=205)	
	Number	**Percent**
20 or less	47	22.93
21 to 25	111	54.15
26 to 30	38	18.54
> 30	9	4.39
Total	**205**	**100.00**



In the present study 54.15% of the women were aged between 21 to 25 years and 22.93% had age less than 20 years. The mean age of the study population was 23.26 ± 3.49 years.

Table 2. Gravida

Gravida	Distribution (n=205)	
	Number	**Percent**
1	107	52.20
2	57	27.80
3 or more	41	20.00
Total	**205**	**100.00**

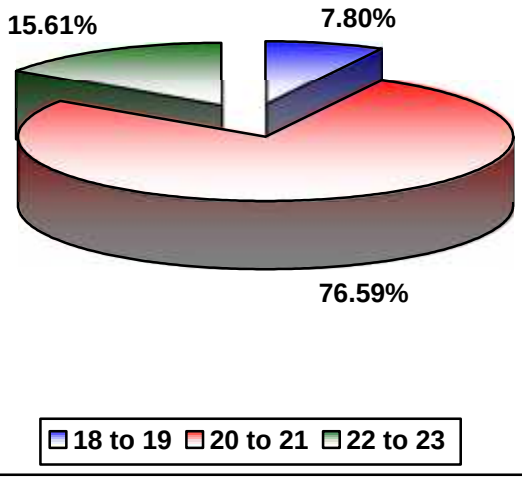


In this study 52.2% of the women were primigravida while 27.8% and 20% were gravida 2 and 3 or more respectively.

Table 3. Period of gestation at enrollment

Period of gestation (Weeks)	Distribution (n=205)	
	Number	**Percent**
18 to 19	16	7.80
20 to 21	157	76.59
22 to 23	32	15.61
Total	**205**	**100.00**

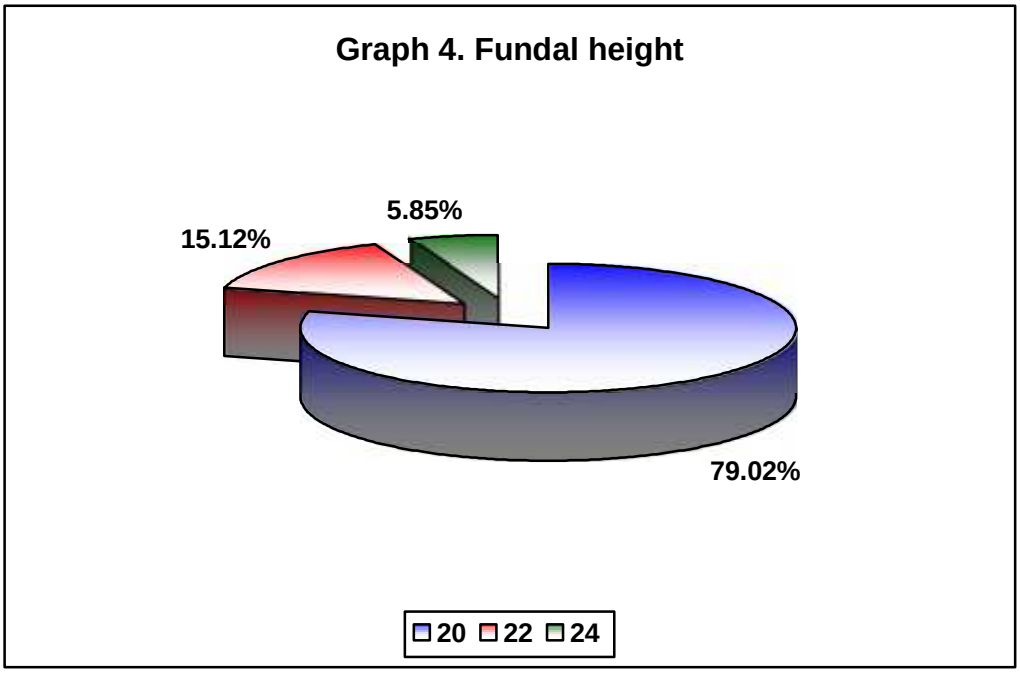
Graph 3. Period of gestation at enrollment



In the present study majority (76.59%) of the women were enrolled between 20 to 21 weeks gestation. The mean gestation at enrollment was 20.72 ± 1.00 weeks.

Table 4. Fundal height

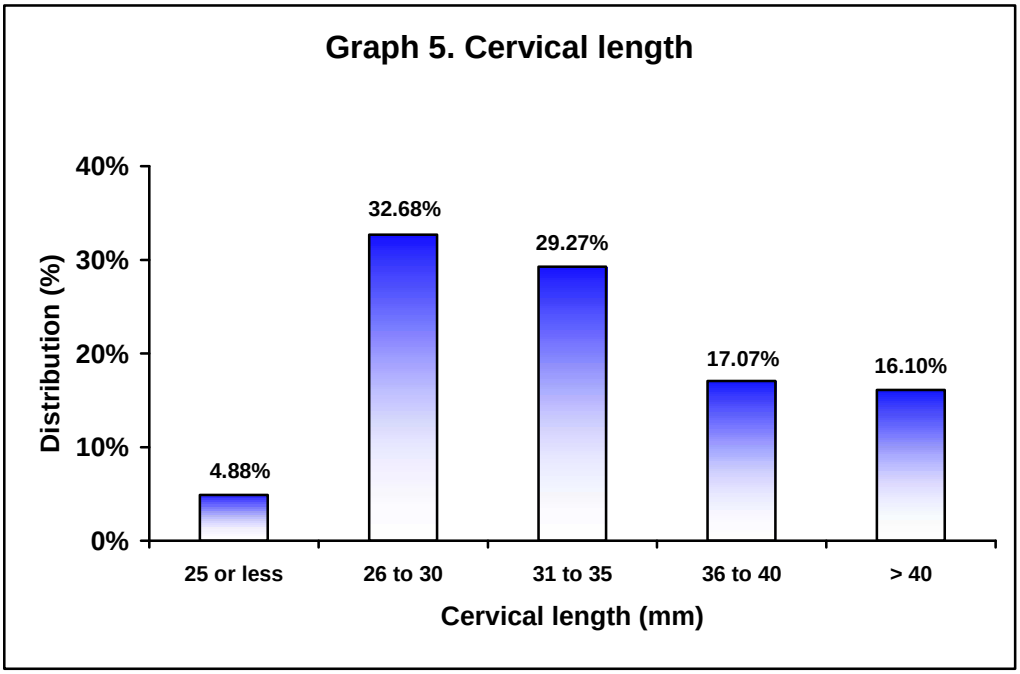
Fundal height (Weeks)	Distribution (n=205)	
	Number	**Percent**
20	162	79.02
22	31	15.12
24	12	5.85
Total	**205**	**100.00**



In this study the fundal height at enrollment corresponded to 20 weeks in 79.02% of women and to 22 weeks and 24 weeks in 15.12% and 5.85% respectively. The mean fundal height was noted as 20.41 ± 1.02 weeks.

Table 5. Cervical length

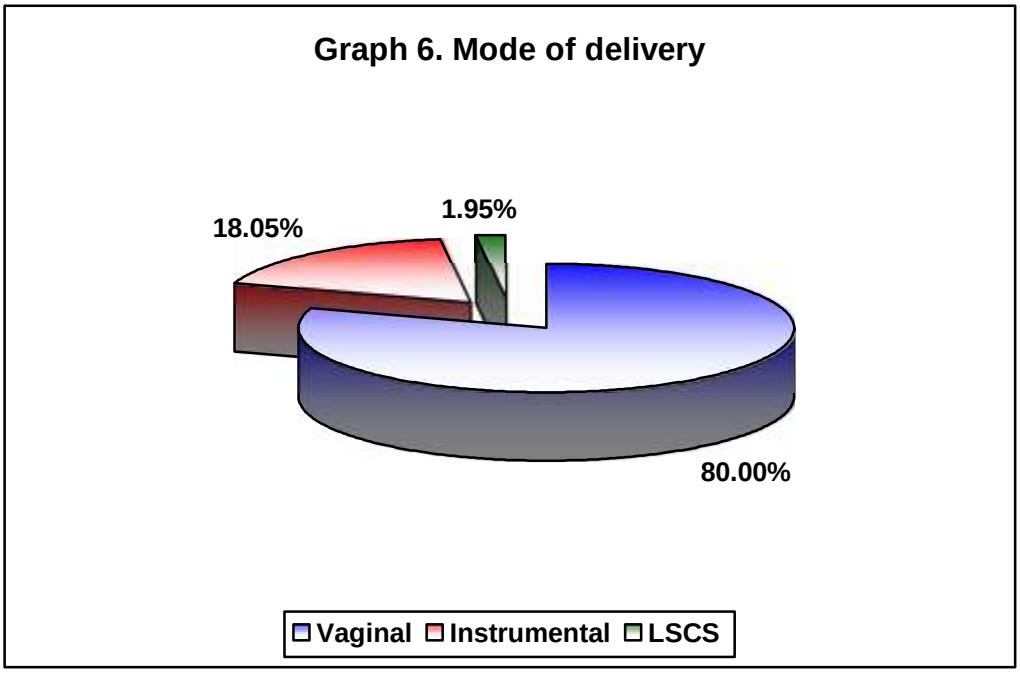
Cervical length (mm)	Distribution (n=205)	
	Number	**Percent**
≤ 25	10	4.88
26 to 30	67	32.68
31 to 35	60	29.27
36 to 40	35	17.07
> 40	33	16.10
Total	**205**	**100.00**



In the present study 32.68% of the women had cervical length between 26 to 30 mm while 29.27% had same between 31 to 35 mm. However, cervical length of ≤ 25 mm was noted in 4.88% of women and the mean cervical length was 33.67 ± 6.24 mm.

Table 6. Mode of delivery

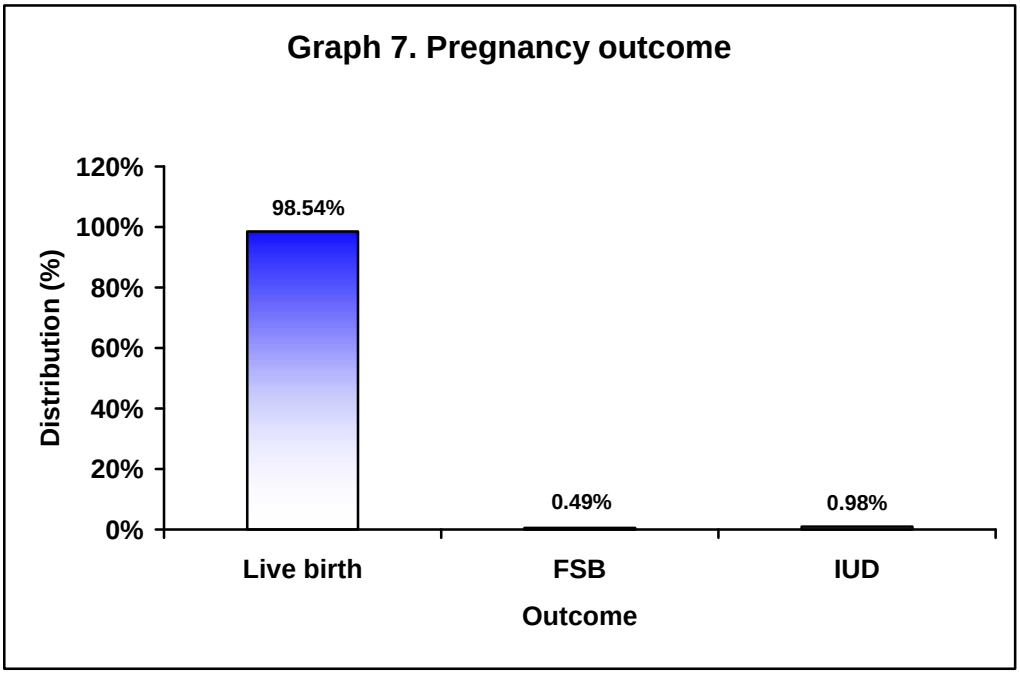
Mode	Distribution (n=205)	
	Number	**Percent**
Vaginal	164	80.00
Instrumental	37	18.05
LSCS	4	1.95
Total	**205**	**100.00**



In this study 80% of the women had vaginal delivery while 18.05% had instrumental delivery. However, LSCS delivery was noted in 1.95% of women.

Table 7. Pregnancy outcome

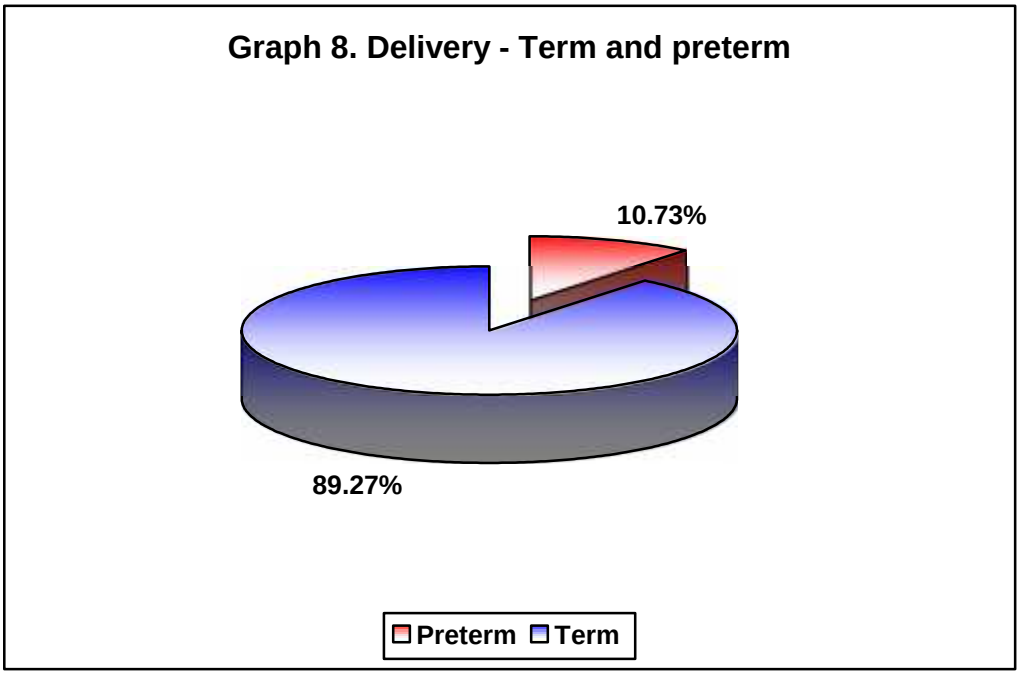
Outcome	Distribution (n=205)	
	Number	**Percent**
Live birth	202	98.54
Fresh stillbirth	1	0.49
Intrauterine death	2	0.98
Total	**205**	**100.00**



In this study among 98.54% of women the pregnancy outcome was live birth. However, 0.98% of the women had IUD and 0.49% of women had fresh stillbirth.

Table 8. Delivery – Term and preterm

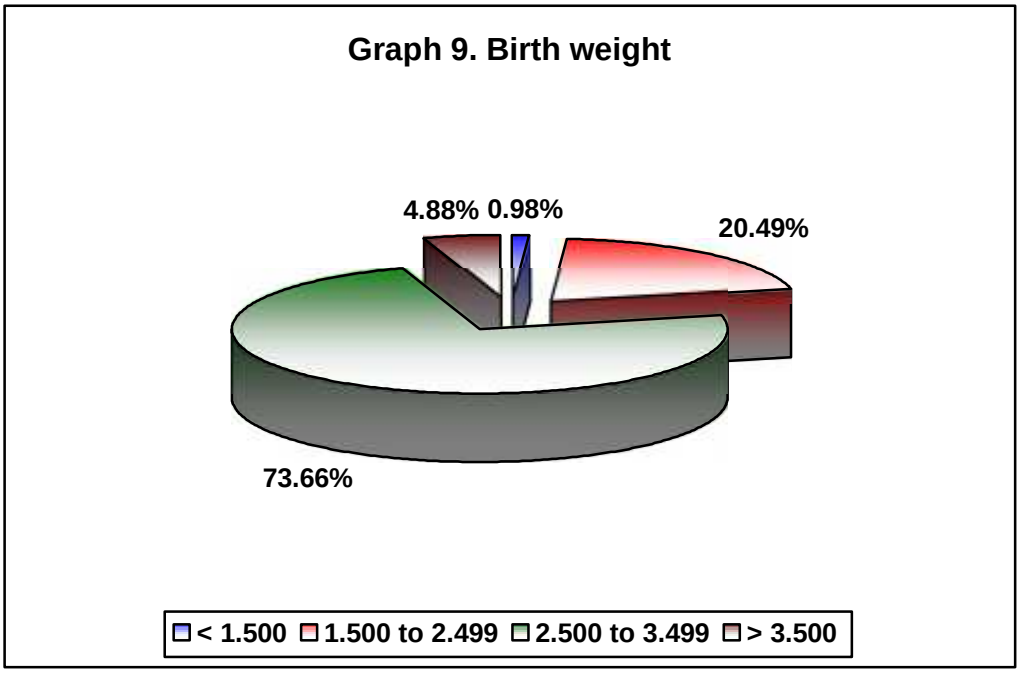
Gestation	Distribution (n=205)	
	Number	**Percent**
Preterm	22	10.73
Term	183	89.27
Total	**205**	**100.00**



In this study majority (89.27%) were term babies while 10.73% were preterm babies.

Table 9. Birth weight

Birth weight (Kgs)	Distribution (n=205)	
	Number	Percent
< 1.500	2	0.98
1.500 to 2.499	42	20.49
2.500 to 3.499	151	73.66
> 3.500	10	4.88
Total	**205**	**100.00**



In the present study 73.66% of babies weighed between 2.50 to 3.49 Kgs. In the remaining, 20.49% had birth weight between 1.50 to 2.49 Kgs while 4.88% of babies weighed > 3.50 Kgs. The mean birth weight was 2.75 ± 0.45 Kgs.

Table 10. Cervical length and delivery outcome

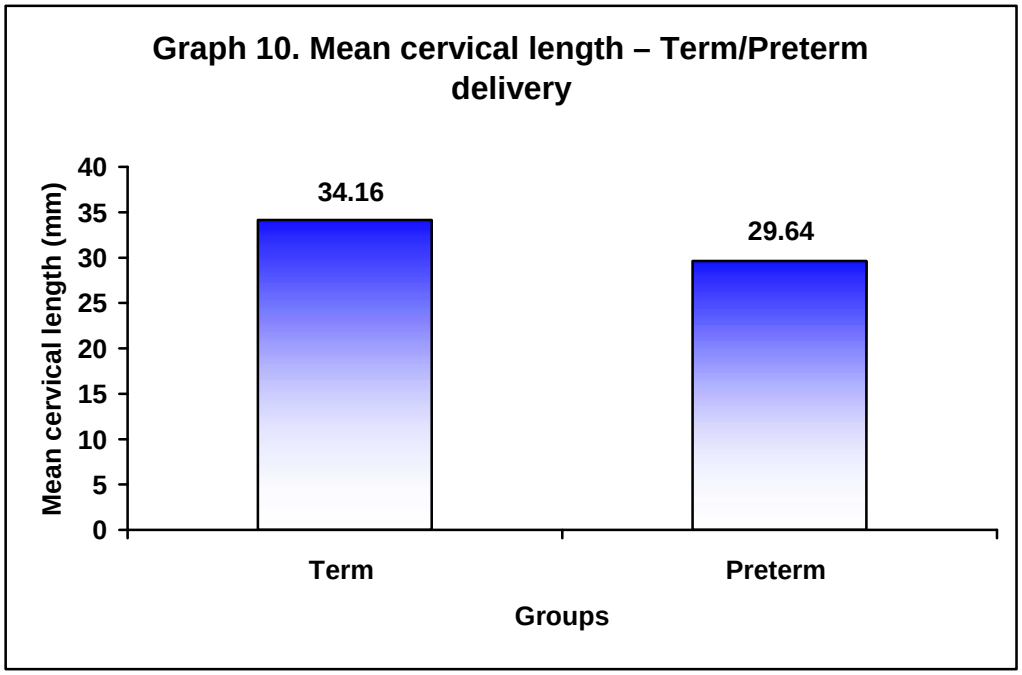
Term	Cervical length (mm)				Total (n=205)	
	≤ 30 (n=77)		> 30 (n=128)			
	No	%	No	%	No	%
Term	64	34.97	119	65.03	183	100.00
Preterm	13	59.09	9	40.91	22	100.00

p = 0.027

In the present study of the 22 preterm babies, 59.09% were born to mothers with cervical length ≤ 30 mm compared to 40.91% babies which were born to mothers with cervical length > 30 mm. This difference was statistically significant (p=0.027).

Table 11. Mean Cervical length – Term/Preterm delivery

	Mean cervical length (mm)				p value
	Term (n=183)		Preterm (n=22)		
	Mean	SD	Mean	SD	
Mean cervical length	34.16	5.72	29.64	8.73	0.002



In this study the mean cervical length of the mothers who gave birth to preterm babies was significantly less (29.64 ± 8.73 mm) compared those who delivered term babies (34.16 ± 5.72 mm) (p=0.002).

Table 12. Cervical length and period of gestation at delivery

Cervical length (mm)	Cervical length				Total (n=205)	
	Term (n=183)		Preterm (n=22)			
	No	%	No	%	No	%
≤ 25	5	50.00	5	50.00	10	100.00
26 to 30	63	88.73	8	11.27	71	100.00
31 to 35	53	94.64	3	5.36	56	100.00
36 to 40	30	85.71	5	14.29	35	100.00
> 40	32	96.97	1	3.03	33	100.00

p = 0.003

In the present study of the 10 babies delivered by the mothers with cervical length ≤ 25 mm 50% were preterm compared to 11.27% with cervical length 26 to 30 mm, 5.36% with 31 to 35 mm, 14.29% with 36 to 40 mm and 3.03% with cervical length of > 40 mm. This difference was statistically significant (p=0.003).

Chapter 6

Discussion

DISCUSSION

Preterm birth is a major cause of perinatal morbidity and mortality1–8, and despite improvements in perinatal management over the last two decades, the rate of preterm birth has not declined.[81]

A number of risk factors of preterm birth have been identified, one of the most important being a history of spontaneous preterm birth.[81]

Cervical length, as measured by transvaginal ultrasonography, has been shown to predict preterm birth in asymptomatic low-risk women as well as those presenting with threatened preterm labor.[81]

The present study was undertaken to find the association between cervical length at 18 to 23 weeks of gestation done as a routine during all second level scans and spontaneous preterm delivery.

This one year cross-sectional study was conducted in the Department of Obstetrics and Gynecology, KLE'S Dr. Prabhakar Kore Hospital and Medical Research Centre, Belgaum. A total of 242 women fulfilling the selection criteria attending routine anomaly scan during the period from January 2012 to December 2012 were studied. Of these, 17 women were excluded due to induction of labour for obstetric indications, 14 women were lost to follow up and a total of 6 patients were excluded from the study as an intervention in the form of a cervical encirclage was undertaken, summing up the study population to 205 women.

In the present study more than half (54.15%) of the women were aged between 21 to 25 years followed by less than 20 years (22.93%). The mean age of the study population was 23.26 ± 3.49 years. Similar profile of maternal age was reported in a study from Kolkata where the mean maternal age was 22.9 ± 3.05 years.[115] In contrast, a similar study by Gramelini et al[116] in Italy reported median age as 32 years in their study population. The disparity in the mean age between the present study and study by Gramelini et al[116] could be attributed to the socio-cultural practices of early marriages in India.

In this study 52.2% of the women were primigravida. These findings were consistent with a study from Italy where 37.9% of women were primigravidas. Majority (76.59%) of the women were enrolled between 20 to 21 weeks gestation with mean gestation at enrolment being 20.72±1.00 weeks. At enrolment majority (79.02%) of women had the fundal height as 20 weeks with mean fundal height as 20.41 ± 1.02 weeks.

In the present study 32.68% of the women had cervical length between 26 to 30 mm while 29.27% had cervical length between 31 to 35 mm and cervical length of ≤ 25 was present in 4.88% of women. The mean cervical length was found to be 33.67 ± 6.24 mm. Similar findings were reported in a study[117] from Manipal, Karnataka where the mean length of cervix at 20-24 weeks of pregnancy was 3.87 cm by TVS and another study[116] from Italy reported the median cervical length to be 34 mm. Iams et al[55] found also that, the length of the cervix at 24 wk were 35.2 ± 8.3 mm.

In this study 80% of the women had vaginal delivery while 18.05% had instrumental delivery. Among 98.54% of women the pregnancy outcome was live birth. In our study, majority that is, 89.27% were term babies while 10.73% were preterm babies. The birth weight in 73.66% of babies was between 2.50 to 3.49 Kgs and in 20.49% babies it was between 1.50 to 2.49 Kgs. The mean birth weight was found to be 2.75 ± 0.45 Kgs.

Cervical length is a better predictor of preterm birth in women at increased risk, such as those with a history of spontaneous preterm birth, than in asymptomatic women at low risk.[47] In the present study of the 22 preterm babies, significantly higher number of babies (59.09%) were born to the mothers with cervical length ≤ 30 mm compared to mother with cervical length > 30 mm (40.91%) (p=0.027). Similarly on qualitative analysis the mean cervical length of the mothers who gave birth to preterm babies was significantly less compared those who delivered term babies (29.64 ± 8.73 mm versus 34.16 ± 5.72 mm; p=0.002). These findings suggest that a reduced cervical length is significant risk factor for the preterm delivery. Further, of the 10 babies delivered by the mothers with cervical length ≤ 25 mm 50% were preterm compared to 11.27% with cervical length 26 to 30 mm, 5.36% with 31 to 35 mm, 14.29% with 36 to 40 mm and 3.03% with cervical length of > 40 mm. This difference was statistically significant (p=0.003). These findings implicate a trend towards higher chances of preterm as the cervical length decreases.

Andersen et al[61] were the first to note the use of TVU in the prediction of preterm birth. They reported a cervix of less than 39 mm before 30 weeks of gestation as a risk factor for early delivery. Interestingly, in several studies[118-120]

evaluation of the cervix was performed by TAU with an empty or nearly empty bladder, and the mean cervical lengths were similar to those detected by TVU.

Tsoi et al.[89] reported that among 216 patients with threatened PTL, 37% of those with cervical length <15 mm delivered within 7 days, indicating an odds ratio for delivery of 101 (95% CI: 12-800; p <0.0001). The same authors found that the 25mm cut-off was the most effective in discriminating between true and false labor in twin pregnancies.[121]

Another study[122] from Jordan to determine whether transvaginal ultrasound assessment of the cervix is superior to transabdominal ultrasonography in evaluating the cervical canal in the second trimester and to see which one is more accurate in predicting preterm labor concluded that, a short cervix in the second trimester detected by ultrasound is a strong predictor of spontaneous preterm labour at all gestational age. TVU seems to be superior to TAU in assessing the cervical length in the second trimester and for screening for spontaneous preterm delivery.

In studies of women with a history of preterm birth, using a cervical length cut-off of 25 to 30 mm to predict preterm birth < 37 weeks of gestation, sensitivity is 60% to 80%, positive predictive value is 55% to 70%, and negative predictive value is 89% to 94%. Thus, a long cervix (at least 25 to 30 mm) is reassuring and can help to reduce unnecessary and costly interventions, such as activity restriction, maternal transfer, steroids, and tocolytics.[47]

A study[116] from Manipal to compare the difference in the cervical length measured digitally or by transabdominal and transvaginal sonogram examination

for prediction of preterm labour reported statistically significant difference in the mean length of whole cervix between control and case (those who had symptoms of premature contraction) ie 3.70 cm Vs 2.34cm, Similar differences were observed between control and those who had preterm labour (3.62cm vs 2.30 cm). The study concluded that, TVS is a simple tool for prediction of preterm labour as decrease in cervical length was observed in women with threatened preterm labor (2.34 cm) and this decrease was statistically significant compared to that of the control (3.7 cm).

A Randomized Trial by Fonseca et al reported a 15% absolute risk reduction of early preterm delivery for patients supplemented with vaginal progesterone, after the detection of a sonographic short cervix,[98] these findings support a future strategy of routine cervical length screening and progesterone supplementation.

In the Future, when definite interventions for prevention of preterm birth are expected to be available, it would be perhaps ethically unacceptable to withhold treatment if data suggests a substantial risk.

Overall, sonographic cervical length measurement proves to be a simple, effective method for screening patients at routine anomaly scan. However, as the cut of 25 mm and 30 mm both were effective in determining the preterm in this study, the further studies on large sample with standardized maternal age, period of gestation, risk factors are warranted.

Chapter 7

Conclusion

CONCLUSION

The present study showed that a significantly higher number of women with cervical length ≤ 30 mm (assessed at 18 to 23 weeks of gestation) had preterm labour compared to a women with cervical length > 30 mm. Further the mean cervical length of women who had preterm labour was significantly less compared to women who reached term. Also, 50% of women with cervical length ≤ 25 mm delivered preterm babies. Based on these results, it may be concluded that, there is an association between short cervical length (≤ 30 mm) and spontaneous preterm delivery.

Chapter 8

Summary

SUMMARY

Cervical length, as measured by transvaginal ultrasonography, has been shown to predict preterm birth. This study was aimed to find the association between cervical length at 18 to 23 weeks of gestation, done during routine anomaly scan and spontaneous preterm delivery.

This one year cross-sectional study was carried out in the Department of Obstetrics and Gynecology, KLE'S Dr. Prabhakar Kore Hospital and Medical Research Centre, Belgaum. A total of 205 women who fulfilled the selection criteria from January 2012 to December 2012 were studied.

More than half (54.15%) of the women were aged between 21 to 25 years and the mean maternal age of the study population was 23.26 ± 3.49 years. Most of the women (52.20%) were primigravidas. Majority (76.59%) of the women were enrolled between 20 to 21 weeks gestation and the mean gestation at enrolment was 20.72 ± 1.00 weeks. 32.68% of the women had cervical length between 26 to 30 mm and cervical length of ≤ 25 was present in 4.88% of women. Majority that is, 89.27% were term babies while 10.73% were preterm babies. Of the 22 preterm babies, significantly higher number of babies (59.09%) were born to the women with cervical length ≤ 30 mm (p=0.027). Similarly the mean cervical length of the women who had preterm labour was significantly less compared those who had term labour (29.64 ± 8.73 mm versus 34.16 ± 5.72 mm; p=0.002). Of the 10 women with cervical length ≤ 25 mm 50% had preterm labour (p=0.003).

Overall the present study showed an association between short cervical length and spontaneous preterm delivery.

Chapter 9

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Annexures

Annexure I

ANNEXURE I

INFORMED CONSENT FORM FOR PARTICIPATION IN THE RESEARCH STUDY

TITLE: Association between cervical length at 18-23 weeks of gestation and pregnancy outcome – A cross sectional study

Objective/ Purpose of the study: We request you to participate in a study conducted by Dr **** ****** Mob no: ***** ******, Postgraduate in the Department of Obstetrics and Gynaecology, KLE University Belgaum, under the direct supervision and guidance of Dr. **** *****, Professor, Department of Obstetrics and Gynaecology, KLE University. The aim of the study is to find an association between the length of the cervix between 18 to 23 weeks of gestation and pregnancy outcome. Patients who fulfil the eligibility criteria will be included in the study. Your participation in the study will help us to derive a conclusion which will be beneficial to the larger population.

Procedures: You will be asked to provide some personal identification information and obstetric history relevant to the study. You will then undergo a Transvaginal sonography to measure the length of your cervix along with your routine second trimester anomaly scan. You will be then followed up till delivery to ascertain the outcome of your pregnancy.

Risks and benefits: There are no additional risks involved in the procedure. There will be no financial incentives for being a part of the

study. Your participation in the study is purely voluntary. Your decision will not affect your relationship with the institute or in the standard of care provided to you. You are free to withdraw at any time during the study.

Privacy and confidentiality: Every effort will be made to protect the confidentiality of the information provided by you. Results of the study may be published for scientific purposes, but your name will not be used.

If you have any questions about the study, you can contact Dr. **** *****, Professor, Department of Obstetrics and Gynaecology. In case you need any further information regarding your rights as a study participant, you may please contact Dr. **** ******, Principal and Chairman of J.N.M.C, Institutional Ethics Committee, Mob no: **** *****.

I, volunteer and consent to participate in the study. I have read the consent or it has been read to me. The study has been fully explained to me and I was given an opportunity to ask questions and receive answers.

Signature/ thumb impression of participant :

Signature/ thumb impression of witness :

Signature of the investigator :

Date:

Annexures

Annexure II

ANNEXURE II

DATA COLLECTION INSTRUMENT

TITLE: Association between cervical length at 18-23 weeks of gestation and spontaneous preterm delivery – A Cross sectional study

SLNO: _____ DATE: | | | | | | | | |

OPD NO: _____

IPDNO: | | | | | | | UNIT: _____

PATIENT'S NAME: _____

AGE: _____

ADDRESS _____

CONTACT NO (RESIDENCE/MOBILE): _____

OBSTETRIC INDEX: G _P_ L_ A _ D_

OBSTETRIC HISTORY:

L.M.P: | | | | | | | | |

E.D.D: | | | | | | | | |

CORRECTED E.D.D | | | | | | | | |

PERIOD OF GESTATION: _____

EXAMINATION FINDINGS:

PR: _____ BP: _____ PALLOR: present/Absent

FUNDAL HEIGHT: _____ wks.

WAS THE CONSENT GIVEN?

YES: ☐ NO: ☐

ULTRASOUND FINDINGS:

Transabdominal ultrasound

Period of gestation :	

Transvaginal Ultrasound

CERVICAL LENGTH (mm)	

PERINATAL OUTCOME:

LIVE BIRTH/ FSB/ MSB/ EARLY NEONATAL DEATH

GESTATIONAL AGE AT DELIVERY: ——— ☐

PRETERM DELIVERY **YES** **NO** ☐

BIRTHWEIGHT: _____

MODE OF DELIVERY

APGAR SCORE: 1MIN: ☐ VAGINAL: ☐

5 MIN: ☐ VENTOUSE: ☐

FORCEPS: ☐

NICU ADMISSION : ☐ C-SECTION: ☐

ELECTIVE/EMERGENCY

INDICATION: _____ INDICATION: _____

ANNEXURE III - MASTER CHART

Serial Number	OPD Number	Age (Years)	Obstetric history					LMP	EDD	Corrected EDD	POG		Fundal height (Weeks)	Cor POG		Cervical length (mm)	Pregnancy Outcome										
			Gravida	Para	Abortion	Living	Died				Weeks	Days		Weeks	Days		Outcome	Term	Term		Birth weight (Kg)	APGAR Score	Mode of delivery	Indication	NICU admission	Height (Cms)
																			Weeks	Days						
1	1787113	31	1	P	-	-	-	25-Jul-2011	1-May-2012	-	22	5	24	22	1	30.0	LB	YES	36	-	2.4	7	Vaginal	-	NO	140
2	1908094	20	1	P	-	-	-	26-Jul-2011	2-May-2012	-	23	-	24	22	5	26.5	LB	YES	35	2	1.6	6	LSCS	FOETAL DISTRESS	NO	148
3	1845263	20	1	P	-	-	-	13-Aug-2011	20-May-2012	-	21	3	20	21	2	37.7	LB	NO	40	2	2.5	7	Ventouse	POOR EFFORTS	NO	152
4	832287	22	3	2	-	2	-	15-Aug-2011	22-May-2012	16TH MAY	21	2	20	22	-	41.0	LB	NO	38	-	2.8	6	Vaginal	-	NO	154
5	1873181	21	1	P	-	-	-	18-Aug-2011	25-May-2012	-	20	5	21	20	-	34.0	LB	NO	41	2	3.3	8	Vaginal	-	NO	156
6	1806597	22	1	P	-	-	-	8-Aug-2011	15-May-2012	-	22	5	24	21	6	30.0	LB	NO	40	4	2.7	8	Ventouse	POOR EFFORTS	NO	153
7	1816281	25	2	1	-	1	-	14-Aug-2011	25-May-2012	-	21	4	21	19	4	37.0	MSB	YES	26	-	0.5	0	Vaginal	-	NO	154
8	1920516	25	2	1	1	-	-	25-Aug-2011	1-Jun-2012	-	20	1	20	20	3	36.0	LB	NO	39	5	2.9	8	Vaginal	-	NO	156
9	1816868	26	2	1	-	1	-	14-Aug-2011	21-May-2012	-	21	5	22	21	3	41.0	LB	NO	40	1	3.5	8	LSCS	ELECTIVE	NO	153
10	846573	18	2	1	-	1	-	19-Aug-2011	26-May-2012	-	21	4	20	22	4	42.0	LB	NO	39	2	3.2	9	LSCS	PREV LSCS	NO	145
11	1903436	20	1	P	-	-	-	22-Aug-2011	29-May-2012	-	20	3	20	20	1	32.0	LB	NO	39	-	2.8	8	Vaginal	-	NO	149
12	1888458	22	3	2	-	2	-	1-Sep-2011	8-Jun-2012	-	19	1	20	19	1	41.0	LB	NO	37	-	2.6	8	Vaginal	-	NO	150
13	1888430	26	2	1	-	1	-	3-Sep-2011	10-Jun-2012	-	20	-	20	19	3	43.0	LB	NO	44	5	2.5	8	LSCS	POOR EFFORTS	NO	152
14	1906426	21	1	P	-	-	-	27-Aug-2011	2-Jun-2012	-	21	-	20	21	1	30.0	LB	NO	39	6	2.6	8	Vaginal	-	NO	154
15	1811095	19	1	P	-	-	-	18-Aug-2011	22-May-2012	-	23	-	22	22	5	42.0	LB	NO	40	5	2.5	8	LSCS	FOETAL DISTRESS	NO	152
16	1906575	25	3	2	-	2	-	3-Sep-2011	10-Jun-2012	-	20	-	20	21	4	30.0	LB	NO	40	1	3.3	9	Vaginal	-	NO	150
17	1835348	27	2	1	-	1	-	28-Aug-2011	4-Jun-2012	6/15/2012	20	3	20	20	-	45.0	LB	NO	41	1	3.4	8	LSCS	NOT WILLLIN	NO	153
18	1810088	18	1	P	-	-	-	10-Aug-2011	17-May-2012	5/7/2012	23	-	24	20	-	36.0	LB	NO	38	-	3.0	8	Vaginal	-	NO	154
19	1906525	18	1	P	-	-	-	23-Dec-2011	30-Sep-2011	-	22	-	20	22	1	36.0	LB	NO	37	5	2.4	8	Ventouse	POOR EFFORTS	NO	154
20	1889901	23	1	P	-	-	-	5-Oct-2011	12-Jul-2012	-	20	6	23	21	-	43.7	LB	YES	28	2	2.3	9	Vaginal	-	NO	152
21	1906477	22	3	3	-	1	1	6-Oct-2011	13-Jul-2012	7/19/2012	21	4	20	21	4	34.0	LB	NO	40	-	2.3	8	LSCS	PREV 2 LSCS	NO	150
22	1933012	20	1	P	-	-	-	29-Jun-2012	2/4/2013	7/19/2012	20	4	20	22	1	37.5	LB	NO	40	6	2.7	8	Vaginal	-	NO	156
23	1941063	21	2	1	-	1	-	18-Oct-2011	25-Jul-2012	-	19	6	20	19	5	41.0	LB	NO	37	-	2.6	9	Vaginal	-	NO	153
24	192572	19	1	P	-	-	-	21-Oct-2011	28-Jul-2012	-	20	4	20	20	4	43.0	LB	NO	37	6	1.9	8	LSCS	BREECH	NO	152
25	1961341	18	1	P	-	-	-	1-Nov-2011	2-Aug-2012	-	19	2	20	19	2	30.0	LB	NO	38	3	2.4	9	Vaginal	-	NO	155
26	1942318	24	3	2	2	-	-	16/912	10-Jun-2012	-	20	-	20	21	-	30.0	LB	YES	35	-	2.9	7	Vaginal	-	NO	150
27	1879620	20	1	P	-	-	-	16-Oct-2011	23-Jul-2012	-	21	4	20	19	4	35.0	LB	NO	39	3	2.6	9	Vaginal	-	NO	148
28	1961611	26	1	P	-	-	-	NOT KNOWN	22-Jul-2012	-	20	4	20	20	4	31.0	LB	NO	37	2	2.0	9	Vaginal	-	NO	149

ANNEXURE III - MASTER CHART

Serial Number	OPD Number	Age (Years)	Obstetric history					LMP	EDD	Corrected EDD	POG		Fundal height (Weeks)	Cor POG		Cervical length (mm)	Pregnancy Outcome										
			Gravida	Para	Abortion	Living	Died				Weeks	Days		Weeks	Days		Outcome	Term	Term		Birth weight (Kg)	APGAR Score	Mode of delivery	Indication	NICU admission	Height (Cms)
																			Weeks	Days						
29	1892715	27	1	P	-	-	-	7-Oct-2011	19-Jul-2012	-	18	5	20	22	5	29.0	LB	NO	40	4	2.5	8	LSCS	FOETAL DISTRESS	NO	153
30	1967050	20	1	P	-	-	-	22-Oct-2011	29-Jul-2012	-	22	3	20	22	3	40.0	LB	NO	39	-	2.6	8	Vaginal	-	NO	154
31	1951907	33	6	5	-	1	5	12-Oct-2011	19-Jul-2012	-	23	-	24	23	-	38.0	LB	NO	38	-	2.8	8	Vaginal	-	NO	156
32	1967360	20	1	P	-	-	-	23-Oct-2011	30-Jul-2012	-	22	5	24	22	5	34.0	LB	NO	41	-	3.5	8	Ventouse	POOR EFFORTS	NO	157
33	1996056	23	1	P	-	-	-	21-Oct-2011	30-Jul-2012	-	23	-	24	23	-	41.0	LB	NO	38	-	2.9	8	Vaginal	-	NO	153
34	2015824	23	1	P	-	-	-	1-Nov-2011	7-Aug-2012	8/11/2012	21	6	20	21	6	42.0	LB	NO	38	3	2.7	9	LSCS	FOETAL DISTRESS	NO	150
35	1948157	21	1	P	-	-	-	19-Nov-2011	26-Aug-2012	-	19	1	20	21	-	34.0	LB	NO	39	-	2.8	8	Vaginal	-	NO	149
36	2017526	26	3	2	-	1	-	13-Nov-2011	19-Aug-2012	8/18/2012	20	2	20	19	5	42.0	LB	NO	39	6	2.8	9	Vaginal	-	NO	153
37	1829450	24	2	1	-	1	-	14-Nov-2011	21-Aug-2012	-	20	1	20	20	-	33.0	LB	NO	40	1	2.4	8	Vaginal	-	NO	150
38	1942393	21	1	P	-	-	-	10-Nov-2011	17-Aug-2012	-	21	-	20	21	-	30.0	LB	NO	38	4	3.9	8	Vaginal	-	NO	154
39	1969237	23	2	1	-	1	-	24-Oct-2011	31-Jul-2012	-	21	-	21	23	-	33.0	LB	NO	38	-	2.8	9	Vaginal	-	NO	153
40	1936685	24	3	2	-	1	-	11-Nov-2011	18-Aug-2012	-	20	3	19	18	3	30.0	LB	NO	38	4	2.3	9	LSCS	NOT WILLLIN	NO	148
41	1159503	22	2	1	-	1	-	14-Nov-2012	21-Sep-2012	-	20	1	20	10	1	45.0	LB	NO	38	1	2.7	9	Vaginal	-	NO	154
42	2000637	19	1	P	-	-	-	23-Nov-2011	29-Aug-2012	9/3/2012	20	4	20	19	4	37.0	LB	NO	37	5	2.6	8	Vaginal	-	NO	156
43	2017693	21	1	P	-	-	-	23-Nov-2011	29-Aug-2012	9/3/2012	20	3	20	20	3	41.0	LB	NO	37	5	2.2	8	Vaginal	-	NO	145
44	2039993	19	2	1	1	-	-	19-Nov-2011	26-Aug-2012	-	21	-	20	21	-	38.0	LB	NO	38	4	2.6	8	Vaginal	-	NO	150
45	2037760	24	2	1	-	1	-	14-Nov-2011	21-Aug-2012	-	21	3	20	21	3	35.0	LB	NO	39	6	2.6	9	LSCS	NOT WILLLIN	NO	154
46	1962799	26	2	1	-	1	-	8-Nov-2011	15-Aug-2012	8/25/2012	20	5	20	20	1	44.0	LB	NO	41	-	2.8	8	Vaginal	-	NO	152
47	1961382	28	2	1	-	1	-	29-Nov-2011	6-Sep-2012	-	19	3	20	18	6	31.0	LB	NO	40	2	2.8	8	Vaginal	-	NO	150
48	1598328	21	2	1	1	-	-	15-Nov-2011	22-Aug-2012	-	22	-	20	22	6	37.0	LB	YES	35	-	3.0	8	Vaginal	-	NO	154
49	2027566	22	1	P	-	-	-	27-Nov-2011	4-Sep-2012	-	20	-	20	21	3	42.8	LB	NO	40	-	3.0	9	Vaginal	-	NO	154
50	2036088	25	2	1	-	1	-	8-Nov-2011	15-Aug-2012	-	22	-	20	23	1	48.0	LB	NO	38	-	2.8	8	Vaginal	-	NO	152
51	1261988	21	3	2	-	1	-	7-Nov-2011	19-Aug-2012	-	22	-	20	22	-	19.0	LB	NO	38	2	2.6	8	LSCS	NOT WILLLIN	NO	150
52	1979734	18	1	P	-	-	-	10-Nov-2011	17-Aug-2012	9/10/2012	20	3	20	19	4	32.0	LB	NO	40	-	2.8	9	Vaginal	-	NO	153
53	2037872	24	3	2	-	1	-	20-Dec-2011	27-Sep-2012	-	18	-	18	18	-	38.0	LB	NO	38	6	3.0	9	Vaginal	-	NO	152
54	1928527	24	3	2	-	2	-	12-Nov-2011	19-Aug-2012	-	23	-	24	23	-	34.3	LB	NO	39	-	2.8	8	Vaginal	-	NO	155
55	1929579	22	2	1	1	-	-	1-Nov-2011	8-Aug-2012	-	23	-	24	23	-	40.2	LB	NO	39	4	2.1	8	Vaginal	-	NO	150
56	1921514	25	3	1	-	1	-	28-Nov-2011	5-Aug-2012	-	21	4	20	21	4	46.0	LB	NO	39	4	2.9	9	Vaginal	-	NO	148

ANNEXURE III - MASTER CHART

Serial Number	OPD Number	Age (Years)	Obstetric history					LMP	EDD	Corrected EDD	POG		Fundal height (Weeks)	Cor POG		Cervical length (mm)	Pregnancy Outcome									
			Gravida	Para	Abortion	Living	Died				Weeks	Days		Weeks	Days		Outcome	Term	Term		Birth weight (Kg)	APGAR Score	Mode of delivery	Indication	NICU admission	Height (Cms)
																			Weeks	Days						
57	2001952	22	2	1	-	1	-	24-Nov-2011	31-Aug-2012	-	22	6	20	23	-	40.0	LB	NO	37	1	3.2	8	LSCS	GEST HTN	NO	156
58	2054086	18	1	P	-	-	-	7-Dec-2011	14-Sep-2012	-	21	1	20	21	1	47.3	LB	NO	40	1	2.6	9	Vaginal	-	NO	153
59	2059121	30	3	2	-	2	-	17-Dec-2011	24-Sep-2012	-	19	6	20	19	6	39.5	LB	NO	37	-	3.1	8	LSCS	FOETAL DISTRESS	NO	150
60	1965835	27	2	1	-	1	-	10-Dec-2011	17-Sep-2012	-	20	-	20	20	6	36.0	LB	NO	40	3	3.3	8	LSCS	TMSL	NO	149
61	1846058	24	1	P	-	-	-	10-Dec-2011	12-Sep-2012	-	20	1	20	21	-	34.0	LB	NO	38	-	4.0	8	LSCS	MACROSOMIA	NO	150
62	2000649	22	2	1	-	1	-	13-Dec-2011	20-Sep-2012	-	20	-	20	20	2	33.0	LB	NO	40	3	2.8	8	Vaginal	-	NO	140
63	1993156	24	2	1	-	1	-	11-Dec-2011	18-Sep-2012	-	20	2	20	21	1	42.0	LB	NO	38	5	2.7	9	Vaginal	-	NO	148
64	1946506	34	3	1	1	1	-	16-Dec-2011	23-Sep-2012	-	20	-	20	20	3	29.0	LB	NO	39	-	3.2	8	Vaginal	-	NO	152
65	602371	28	4	3	2	1	-	19-Dec-2011	26-Sep-2012	-	20	1	20	20	-	40.0	LB	NO	37	-	2.9	8	LSCS	NOT WILLLIN	NO	153
66	1617857	22	1	P	-	-	-	18-Dec-2011	25-Sep-2012	-	20	-	22	20	2	36.0	LB	NO	38	-	3.2	8	LSCS	GEST HTN	NO	153
67	2069893	28	3	2	-	2	-	24-Dec-2011	31-Sep-2012	-	20	2	20	20	6	30.8	LB	NO	38	-	2.5	8	Vaginal	-	NO	149
68	1991779	21	2	1	-	1	-	15-Dec-2011	22-Sep-2011	-	21	1	20	22	-	43.0	LB	NO	39	1	3.2	8	Vaginal	-	NO	152
69	2026795	27	3	2	-	2	-	26-Dec-2011	30-Oct-2012	10/8/2012	21	-	20	20	1	39.0	LB	NO	39	-	2.8	8	LSCS	NOT WILLLIN	NO	154
70	2044242	24	1	P	-	-	-	11-Jan-2012	18-Oct-2012	-	19	2	20	19	1	39.0	LB	NO	39	6	3.6	8	LSCS	FOETAL DISTRESS	NO	150
71	1119553	21	2	1	-	1	-	4-Jan-2012	11-Oct-2012	-	20	3	20	19	5	40.0	LB	NO	40	-	3.4	8	Vaginal	-	NO	153
72	1194655	20	2	1	-	1	-	13-Jan-2012	20-Oct-2012	-	18	3	20	19	4	43.0	LB	NO	40	-	3.1	8	LSCS	FOETAL DISTRESS	NO	154
73	1680026	32	1	P	-	-	-	12-Jan-2012	19-Oct-2012	-	19	1	20	19	2	50.0	LB	NO	40	4	3.6	8	LSCS	FOETAL DISTRESS	NO	154
74	2078823	20	1	P	-	-	-	21-Dec-2011	28-Sep-2012	-	21	1	20	22	4	35.0	LB	NO	38	3	2.8	8	Vaginal	-	NO	150
75	1999207	22	2	1	-	1	-	15-Jan-2012	22-Oct-2012	11/2/2012	19	4	20	18	6	32.0	LB	NO	40	-	3.3	8	Vaginal	-	NO	156
76	2033556	25	1	P	-	-	-	23-Dec-2011	30-Sep-2011	-	22	-	20	22	1	36.0	LB	NO	40	1	2.8	8	LSCS	FOETAL DISTRESS	NO	153
77	2043226	23	2	1	1	-	-	28-Dec-2011	4-Oct-2012	-	22	2	20	21	3	41.0	LB	NO	40	-	2.4	8	Vaginal	-	NO	150
78	2076277	20	1	P	-	-	-	2-Jan-2012	9-Oct-2012	10/19/2012	19	1	20	20	3	37.0	LB	NO	39	2	2.1	8	Vaginal	-	NO	148
79	2027631	26	2	1	-	-	1	20-Feb-2011	27-Sep-2012	-	20	1	20	19	2	49.0	LB	NO	38	4	2.6	8	Vaginal	-	NO	149
80	2009493	22	2	1	-	1	-	1-Jan-2012	8-Oct-2012	-	22	2	20	22	4	42.0	LB	NO	39	-	3.5	8	Vaginal	-	NO	153
81	1997119	26	1	P	-	-	-	13-Jan-2012	20-Oct-2012	-	20	6	20	20	6	43.0	LB	NO	40	-	2.4	8	Vaginal	-	NO	140
82	2088703	17	1	P	-	-	-	27-Dec-2011	3-Oct-2012	-	23	-	24	23	-	40.0	LB	NO	37	-	2.0	8	LSCS	BREECH	NO	148
83	2095638	26	4	3	-	2	1	13-Jan-2012	20-Oct-2012	-	20	2	20	20	2	44.0	LB	NO	40	-	2.9	8	Vaginal	-	NO	152
84	2011157	36	5	3	1	2	1	19-Jan-2012	26-Oct-2012	-	20	6	20	20	6	0.0	LB	YES	28	-	1.2	6	Vaginal	-	YES	154

ANNEXURE III - MASTER CHART

Serial Number	OPD Number	Age (Years)	Obstetric history					LMP	EDD	Corrected EDD	POG		Fundal height (Weeks)	Cor POG		Cervical length (mm)	Pregnancy Outcome										
			Gravida	Para	Abortion	Living	Died				Weeks	Days		Weeks	Days		Outcome	Term	Term		Birth weight (Kg)	APGAR Score	Mode of delivery	Indication	NICU admission	Height (Cms)
																			Weeks	Days						
85	1033062	22	3	1	1	1	-	10-Jan-2012	17-Oct-2012	-	23	-	20	23	-	36.0	LB	NO	39	2	2.5	8	LSCS	NOT WILLLIN	NO	153
86	1995829	20	1	P	-	-	-	5-Jan-2012	12-Oct-2012	-	22	-	20	22	4	36.0	LB	NO	40	-	2.4	8	Vaginal	-	NO	145
87	2114186	27	6	1	4	1	-	28-Jan-2012	4-Nov-2012	11/1/2012	20	-	20	21	3	43.0	LB	NO	40	6	3.0	8	Vaginal	-	NO	149
88	1184856	24	3	2	-	2	-	22-Oct-2012	29-Oct-2012	-	20	-	20	19	4	33.0	LB	NO	41	-	2.9	8	LSCS	OLIGO	NO	152
89	500977	22	1	P	-	-	-	6-Feb-2012	13-Nov-2012	-	20	2	20	20	3	26.0	LB	NO	40	-	2.7	8	Vaginal	-	NO	153
90	2117443	29	2	1	-	1	-	20-Jan-2012	26-Oct-2012	-	22	5	20	22	3	29.0	LB	NO	38	-	2.7	8	LSCS	SEVERE PIH	NO	154
91	2161385	22	3	2	-	-	-	17-Feb-2012	23-Nov-2012	-	19	1	20	19	2	29.0	LB	NO	39	-	2.9	8	LSCS	BOH	NO	154
92	2222653	24	3	2	-	2	-	4/17/2012	24-Dec-2012	-	22	-	20	22	-	38.0	LB	NO	40	1	3.5	8	Vaginal	-	NO	156
93	2162767	23	2	1	-	1	-	14-Apr-2012	21-Jan-2013	-	21	-	20	20	-	35.0	LB	NO	38	5	2.5	8	Vaginal	-	NO	155
94	2204761	32	2	1	-	1	-	22-Mar-2012	29-Dec-2012	12/20/2012	23	-	23	20	-	28.0	LB	NO	38	1	2.5	8	LSCS	NOT WILLLIN	NO	153
95	2241988	29	3	2	-	1	-	19-Feb-2012	20-Sep-2012	-	18	-	20	20	-	34.0	LB	NO	39	-	2.4	8	Vaginal	-	NO	154
96	2230679	31	3	2	-	2	-	23-Feb-2012	30-Nov-2012	-	20	-	20	20	-	44.0	LB	NO	39	6	2.9	8	Vaginal	-	NO	153
97	2154873	21	1	P	-	-	-	23-Mar-2012	30-Dec-2012	12/25/2012	22	-	20	20	-	31.6	LB	NO	39	5	3.4	8	Vaginal	-	NO	140
98	2108176	22	2	1	-	1	-	10-Mar-2012	17-Dec-2012	-	21	-	20	21	-	30.0	LB	NO	38	3	3.2	8	LSCS	NOT WILLLIN	NO	148
99	2037429	26	1	P	-	-	-	20-Mar-2012	27-Dec-2012	-	21	-	20	20	-	40.0	LB	YES	36	4	2.4	7	LSCS	PPROM	NO	152
100	2020301	17	1	P	-	-	-	14-Feb-2012	21-Nov-2012	-	22	-	20	21	-	28.0	LB	NO	40	-	2.8	8	Vaginal	-	NO	154
101	1175367	29	3	1	1	1	-	17-Mar-2012	24-Dec-2012	-	21	-	20	21	-	35.0	LB	NO	37	-	3S	8	LSCS	NOT WILLLIN	NO	153
102	2250026	22	1	P	-	-	-	15-Feb-2012	21-Nov-2012	-	22	-	20	21	-	34.0	LB	NO	39	6	2.5	8	Vaginal	-	NO	154
103	2126551	29	3	2	-	2	-	7-Apr-2012	14-Dec-2012	-	22	-	20	21	-	25.8	LB	YES	36	6	2.3	7	Vaginal	-	NO	150
104	1888639	23	1	P	-	-	-	5-Apr-2012	15-Dec-2012	-	21	-	20	20	-	26.7	LB	NO	38	3	3.1	8	Vaginal	-	NO	154
105	1203575	21	2	1	-	1	-	15-Mar-2012	24-Feb-2012	-	21	-	20	21	-	32.0	LB	NO	40	1	3.1	8	Vaginal	-	NO	153
106	2121372	22	3	2	-	2	-	20-Apr-2012	27-Jan-2012	-	21	-	20	21	-	35.0	LB	NO	40	-	2.4	8	LSCS	FOETAL DISTRESS	NO	156
107	2216004	19	1	P	-	-	-	7-Mar-2012	17-Dec-2012	-	21	-	20	21	-	34.0	LB	NO	40	-	3.0	8	Vaginal	-	NO	156
108	1427053	24	2	1	-	1	-	8-Apr-2012	15-Dec-2012	-	22	-	20	21	-	28.0	LB	YES	34	-	2.4	8	Vaginal	-	NO	154
109	1059850	26	2	1	-	1	-	5-Apr-2012	15-Dec-2012	-	21	-	20	21	-	39.0	LB	NO	40	-	2.4	9	Vaginal	-	NO	153
110	2188648	23	2	1	-	1	-	14-Apr-2012	21-Jan-2013	-	21	-	20	21	-	30.0	LB	NO	40	-	3.2	8	Vaginal	-	NO	156
111	501153	22	1	P	-	-	-	3-Feb-2012	10-Nov-2012	-	20	-	20	19	1	30.0	LB	NO	40	-	3.0	8	Vaginal	-	NO	152
112	2213641	28	2	1	-	1	-	12-Jun-2012	2-Mar-2013	-	21	-	22	21	-	34.0	LB	NO	39	-	2.8	8	Vaginal	-	NO	156

ANNEXURE III - MASTER CHART

Serial Number	OPD Number	Age (Years)	Obstetric history					LMP	EDD	Corrected EDD	POG		Fundal height (Weeks)	Cor POG		Cervical length (mm)	Pregnancy Outcome										
			Gravida	Para	Abortion	Living	Died				Weeks	Days		Weeks	Days		Outcome	Term	Term		Birth weight (Kg)	APGAR Score	Mode of delivery	Indication	NICU admission	Height (Cms)
																			Weeks	Days						
113	2325802	27	5	3	-	-	-	10-Apr-2012	17-Jan-2013	-	21	-	20	20	-	35.0	LB	NO	38	3	2.1	7	Vaginal	-	NO	149
114	2317708	20	1	P	-	-	-	7-Apr-2012	13-Jan-2013	-	20	-	21	21	-	30.0	LB	NO	39	-	2.0	7	Vaginal	-	NO	150
115	2107770	24	2	1	-	1	-	21-Mar-2012	28-Dec-2012	-	21	-	20	21	-	29.0	LB	NO	40	5	3.0	8	Vaginal	-	NO	152
116	2300539	27	3	2	-	1	-	3-Apr-2012	10-Jan-2013	-	20	-	21	20	-	29.0	LB	NO	39	3	2.7	8	Vaginal	-	NO	154
117	2142558	31	4	2	1	2	-	5-Apr-2012	13-Jan-2013	-	21	-	20	21	-	21.0	LB	NO	39	2	3.4	8	Vaginal	-	NO	152
118	2118262	19	1	P	-	-	-	10-Mar-2012	17-Dec-2012	-	20	-	21	20	-	21.0	LB	NO	41	-	2.7	8	Vaginal	-	NO	150
119	2095383	24	3	2	-	1	-	26-Mar-2012	2-Jan-2012	-	21	-	20	21	-	30.0	LB	NO	40	3	3.0	8	Vaginal	-	NO	153
120	2325802	23	4	3	-	3	-	10-Apr-2012	24-Jan-2013	-	22	-	21	21	-	35.0	LB	NO	38	-	2.1	8	Vaginal	-	NO	154
121	2317708	22	1	P	-	-	-	7-Apr-2012	13-Jan-2013	-	20	-	21	21	-	30.0	LB	NO	38	-	2.4	8	Vaginal	-	NO	154
122	267920	21	2	1	-	1	-	21-Apr-2012	9-Jan-2013	-	21	-	20	21	-	30.0	LB	NO	39	3	2.8	7	Vaginal	-	NO	152
123	2209928	22	1	P	-	-	-	20-Apr-2012	27-Nov-2013	-	21	-	20	20	-	31.0	LB	NO	38	-	2.4	8	Vaginal	-	NO	150
124	2149481	27	1	P	-	-	-	30-Apr-2012	7-Jan-2013	-	21	-	22	21	-	32.0	LB	NO	38	-	2.6	9	Vaginal	-	NO	156
125	2363542	30	1	P	-	-	-	6-Apr-2012	13-Jan-2013	-	21	-	20	21	-	30.0	LB	NO	39	-	2.7	9	Vaginal	-	NO	154
126	2363483	29	1	P	-	-	-	28-Mar-2012	2-Jan-2013	-	20	-	21	20	-	28.0	LB	NO	38	-	2.8	8	Vaginal	-	NO	153
127	2147043	20	1	P	-	-	-	29-Mar-2012	5-Jan-2013	-	21	-	20	21	-	30.0	LB	YES	28	-	2.9	8	Vaginal	-	NO	150
128	2204113	23	1	P	-	-	-	17-Apr-2012	24-Jan-2013	-	21		20	20	-	30.0	LB	NO	38	4	2.8	8	Vaginal	-	NO	156
129	2115886	23	2	1	-	1	-	24-Mar-2012	31-Jan-2012	-	20	-	21	20	-	30.0	LB	NO	40	5	3.0	8	Vaginal	-	NO	152
130	2287207	20	1	P	-	-	-	22-Apr-2012	22-Jan-2013	-	21	-	20	21	-	29.0	LB	NO	38	-	2.3	8	Vaginal	-	NO	150
131	483889	23	2	1	-	1	-	11-Apr-2012	18-Jan-2013	-	22	-	21	21	-	29.0	LB	NO	38	-	2.8	8	Vaginal	-	NO	153
132	483745	25	1	P	-	-	-	17-Apr-2012	22-Jan-2013	-	20	-	21	21	-	30.0	LB	NO	38	-	2.5	7	Vaginal	-	NO	154
133	483919	19	1	P	-	-	-	23-Apr-2012	30-Jan-2013	-	21	-	20	21	-	30.0	LB	NO	38	-	3.2	8	Vaginal	-	NO	154
134	483749	24	1	P	-	-	-	24-Apr-2012	31-Jan-2013	-	21	-	20	20	-	30.0	LB	NO	39	-	3.0	7	Vaginal	-	NO	152
135	483254	22	2	1	-	1	-	24-Apr-2012	31-Jan-2013	-	20	-	20	21	-	32.0	LB	NO	39	-	3.3	8	Vaginal	-	NO	150
136	483755	20	1	P	-	-	-	17-Apr-2012	24-Jan-2013	-	21	-	20	21	-	30.0	LB	NO	38	-	2.8	8	Vaginal	-	NO	156
137	483921	20	3	2	-	2	-	18-Apr-2012	25-Jan-2013	-	21	-	21	20	-	29.0	LB	NO	39	-	2.9	8	Vaginal	-	NO	153
138	483845	21	1	P	-	-	-	15-Apr-2012	22-Jan-2013	-	21	-	21	20	-	34.0	LB	NO	38	4	2.5	8	Vaginal	-	NO	152
139	484214	23	2	1	-	1	-	16-May-2012	20-Feb-2013	-	21	-	20	19	3	36.0	LB	YES	36	5	2.9	7	Vaginal	-	NO	155
140	484483	20	1	P	-	-	-	16-May-2012	20-Feb-2013	-	21	-	20	20	-	35.0	LB	YES	36	4	2.9	8	Vaginal	-	NO	150

ANNEXURE III - MASTER CHART

Serial Number	OPD Number	Age (Years)	Obstetric history					LMP	EDD	Corrected EDD	POG		Fundal height (Weeks)	Cor POG		Cervical length (mm)	Pregnancy Outcome										
			Gravida	Para	Abortion	Living	Died				Weeks	Days		Weeks	Days		Outcome	Term	Term		Birth weight (Kg)	APGAR Score	Mode of delivery	Indication	NICU admission	Height (Cms)
																			Weeks	Days						
141	2277069	23	1	P	-	-	-	2-Apr-2012	9-Jan-2013	-	20	-	19	20	-	32.0	LB	NO	40	1	3.0	8	Vaginal	-	NO	148
142	505397	24	2	1	-	1	-	3-Apr-2012	11-Jan-2013	-	21	-	21	21	-	32.0	LB	NO	40	-	2.8	8	Vaginal	-	NO	149
143	504292	27	1	P	-	-	-	18-Apr-2012	26-Jan-2013	-	21	-	21	20	-	30.0	LB	NO	37	3	2.1	8	Vaginal	-	NO	153
144	2143434	20	1	P	-	-	-	29-Mar-2012	6-Jan-2013	-	20	-	21	20	-	30.0	LB	NO	41	-	2.7	7	Vaginal	-	NO	154
145	2241138	23	2	1	-	1	-	8-Apr-2012	13-Jan-2013	-	21	-	20	19	-	32.0	LB	NO	40	-	2.6	8	Vaginal	-	NO	156
146	2363713	24	1	P	-	-	-	7-Apr-2012	14-Jan-2013	-	20	-	21	20	-	28.0	LB	NO	39	6	2.5	8	Vaginal	-	NO	157
147	501824	23	1	P	-	-	-	24-Mar-2012	30-Dec-2012	-	20	-	20	20	-	27.0	LB	YES	34	6	2.1	8	Vaginal	-	NO	153
148	2218387	21	2	1	-	1	-	27-Mar-2012	3-Jan-2013	-	20	-	21	20	-	30.0	LB	NO	41	-	3.2	8	Vaginal	-	NO	150
149	2227687	20	1	P	-	-	-	7-Apr-2012	22-Jan-2013	-	20	-	20	21	-	34.0	LB	NO	38	5	2.1	8	Vaginal	-	NO	149
150	2237494	21	1	P	-	-	-	3/15/2012	2/24/2012	-	21	-	20	21	-	29.6	LB	NO	39	-	3.0	9	Vaginal	-	NO	153
151	2208706	23	1	P	-	-	-	4/20/2012	1/27/2012	-	22	-	20	21	-	32.0	LB	NO	40	-	2.8	8	Vaginal	-	NO	153
152	2191678	22	1	P	-	-	-	4/17/2012	12/24/2012	-	21	-	20	21	-	30.6	LB	NO	39	-	2.9	8	Vaginal	-	NO	153
153	2145180	24	2	1	-	1	-	3/22/2012	12/29/2012	-	21	-	20	20	-	38.2	LB	NO	39	-	2.7	8	Vaginal	-	NO	153
154	1699891	23	2	1	-	1	-	2/19/2012	9/20/2012	-	21	-	20	21	-	22.6	LB	NO	39	2	3.0	8	Vaginal	-	NO	154
155	2269989	21	3	2	-	2	-	2/23/2012	11/30/2012	-	21	-	20	20	-	41.0	IUD	NO	41	-	2.2	0	Vaginal	-	NO	153
156	2149094	19	1	P	-	-	-	6/1/2012	3/8/2013	-	21	-	20	21	-	27.0	LB	YES	36	-	2.7	8	Vaginal	-	NO	154
157	2232998	26	2	1	-	1	-	3/15/2012	2/24/2012	-	22	-	20	21	-	27.0	LB	NO	39	-	2.8	8	Vaginal	-	NO	152
158	2249902	20	1	P	-	-	-	4/20/2012	1/27/2012	-	21	-	20	21	-	30.0	LB	NO	40	-	3.4	8	Vaginal	-	NO	153
159	2250102	23	1	P	-	-	-	4/17/2012	12/24/2012	2/27/2013	21	-	20	20	-	34.0	LB	NO	40	-	3.2	8	Vaginal	-	NO	154
160	2256137	20	1	P	-	-	-	3/22/2012	12/29/2012	-	21	-	20	20	-	47.0	LB	NO	39	-	3.0	8	Vaginal	-	NO	153
161	2243809	21	1	P	-	-	-	2/19/2012	9/20/2012	-	21	-	20	21	-	35.6	LB	NO	38	-	3.0	8	Vaginal	-	NO	154
162	2251679	24	2	1	-	1	-	2/23/2012	11/30/2012	-	21	-	20	20	-	31.6	LB	NO	41	-	3.4	8	Vaginal	-	NO	153
163	2265664	22	2	1	-	1	-	6/1/2012	3/8/2013	-	21	-	20	21	-	34.0	LB	NO	40	-	3.1	8	LSCS	-	NO	154
164	2246814	26	3	1	1	1	-	6/10/2012	3/17/2013	-	21	-	20	20	-	25.0	LB	NO	39	-	2.6	8	Vaginal	-	NO	153
165	2223094	25	2	1	-	1	-	5/16/2012	2/28/2013	-	21	-	20	21	-	35.0	LB	NO	38	-	2.0	8	Vaginal	-	NO	154
166	2270759	22	1	P	-	-	-	6/10/2012	3/17/2013	-	20	-	20	20	-	30.6	LB	NO	37	6	2.7	8	Vaginal	-	NO	152
167	2246448	21	1	P	-	-	-	6/11/2012	3/17/2013	-	18	-	20	W1I	-	28.0	LB	NO	40	-	3.7	8	Vaginal	-	NO	154
168	523132	22	1	P	-	-	-	7/22/2012	4/29/2013	-	20	-	20	2W3	-	25.0	LB	YES	36	2	2.2	8	Vaginal	-	NO	153

ANNEXURE III - MASTER CHART

Serial Number	OPD Number	Age (Years)	Obstetric history					LMP	EDD	Corrected EDD	POG		Fundal height (Weeks)	Cor POG		Cervical length (mm)	Pregnancy Outcome										
			Gravida	Para	Abortion	Living	Died				Weeks	Days		Weeks	Days		Outcome	Term	Term		Birth weight (Kg)	APGAR Score	Mode of delivery	Indication	NICU admission	Height (Cms)
																			Weeks	Days						
169	522525	21	1	P	-	-	-	7/1/2012	5/6/2013	-	21	-	20	21	-	36.0	LB	YES	34	-	1.9	6	VAGINAL	-	NO	152
170	1656201	28	3	1	1	1	-	5/31/2012	2/7/2013	2/9/2013	21	-	20	21	-	27.0	LB	NO	40	-	2.5	9	Vaginal	-	NO	153
171	1005909	23	3	1	-	1	-	4/3/2012	1/10/2013	-	21	-	20	21	-	30.5	LB	NO	40	2	3.5	9	Vaginal	-	NO	153
172	2169118	23	2	1	-	1	-	4/28/2012	2/4/2013	-	21	-	20	1WL	-	30.0	FSB	NO	38	-	2.2	9	LSCS	TMSL	NO	152
173	2177984	24	3	1	-	1	-	3/29/2012	1/5/2013	-	21	-	20	20	-	27.0	LB	NO	40	-	3.0	8	Vaginal	-	NO	156
174	2140757	23	2	1	-	1	-	3/26/2012	1/2/2013	-	21	-	20	21	-	30.0	LB	NO	38	-	2.6	9	Vaginal	-	NO	154
175	2121347	26	1	P	-	-	-	4/19/2012	1/26/2013	-	21	-	20	20	-	27.0	LB	NO	38	-	3.0	9	Vaginal	-	NO	152
176	2250176	21	1	P	-	-	-	4/27/2012	2/4/2013	-	20	-	21	21	-	30.0	LB	NO	39	-	3.0	9	Vaginal	-	NO	156
177	2309665	29	1	P	-	-	-	4/15/2012	1/20/2013	-	20	-	21	20	-	28.0	LB	NO	40	-	3.5	8	Vaginal	-	NO	152
178	2196497	36	1	P	-	-	-	4/22/2012	1/29/2013	-	21	-	20	21	-	32.0	LB	YES	36	5	3.1	8	Vaginal	-	NO	152
179	2117176	19	1	P	-	-	-	2/25/2012	12/3/2012	-	22	-	21	21	-	27.0	LB	NO	38	-	2.9	8	Vaginal	-	NO	154
180	2187256	28	1	P	-	-	-	4/24/2012	1/31/2013	-	20	-	21	21	-	30.0	LB	NO	39	6	2.8	8	Vaginal	-	NO	153
181	2314159	20	1	P	-	-	-	6/19/2013	3/26/2013	-	21	-	20	21	-	29.0	LB	NO	40	4	2.8	8	Vaginal	-	NO	153
182	2149513	22	1	P	-	-	-	4/17/2012	1/22/2013	-	20	-	20	21	-	32.0	LB	YES	36	4	2.3	8	Vaginal	-	NO	153
183	2222960	22	1	P	-	-	-	4/15/2012	1/22/2013	-	21	-	20	21	-	32.0	LB	NO	38	-	2.6	8	Vaginal	-	NO	150
184	2354363	20	1	P	-	-	-	4/11/2012	1/18/2013	-	21	-	20	1WL	-	28.0	LB	NO	38	-	2.9	8	Vaginal	-	NO	153
185	2204113	23	1	P	-	-	-	4/17/2012	1/24/2013	-	21	-	20	20	-	30.0	LB	NO	38	4	2.8	8	Vaginal	-	NO	156
186	2223094	20	1	P	-	-	-	5/15/2012	3/5/2013	-	21	-	20	21	-	32.0	LB	NO	38	-	2.5	9	Vaginal	-	NO	156
187	2292847	21	1	P	-	-	-	3/30/2012	1/6/2013	-	21	-	22	21	-	31.0	LB	NO	38	-	2.8	8	LSCS	BREECH	NO	153
188	2335960	23	1	P	-	-	-	4/20/2012	1/27/2012	-	21	-	20	20	-	29.0	LB	NO	38	-	2.6	8	Vaginal	-	NO	154
189	2342968	22	1	P	-	-	-	3/31/2012	1/7/2012	-	20	-	21	21	-	35.0	LB	NO	38	-	2.5	9	Vaginal	-	NO	152
190	2371609	20	1	P	-	-	-	5/18/2012	2/25/2013	-	21	-	20	21	-	30.0	LB	YES	36	4	2.3	8	Vaginal	-	NO	154
191	2335759	20	2	1	-	1	-	4/26/2012	2/3/2013	-	20	-	21	20	-	40.0	LB	NO	39	3	3.0	8	Vaginal	-	NO	153
192	2265695	26	2	1	-	1	-	5/25/2011	2/1/2013	-	21	-	20	21	-	24.0	LB	YES	36	-	2.2	8	Vaginal	-	NO	152
193	549248	23	1	-	-	-	-	11/19/2012	8/27/2013	-	21	-	20	21	-	30	LB	NO	39	3	3.3	8	Vaginal	-	NO	143
194	549445	20	1	-	-	-	-	11/19/2012	8/27/2013	-	20	-	21	21	-	30	LB	NO	39	2	3.2	9	Vaginal	-	NO	145
195	545662	25	1	-	-	-	-	11/19/2012	8/28/2013	-	21	-	20	21	-	32	LB	NO	41	3	2.6	9	Vaginal	-	NO	143
196	546561	25	1	-	-	-	-	11/18/2012	8/26/2013	-	20	-	21	20	-	30	LB	NO	38	4	2.4	8	Vaginal	-	NO	142
197	520044	23	1	-	-	-	-	5/18/2012	4/16/2013	-	21	-	20	21	-	20	LB	YES	35	6	3	8	Vaginal	-	NO	144

ANNEXURE III - MASTER CHART

Serial Number	OPD Number	Age (Years)	Obstetric history					LMP	EDD	Corrected EDD	POG		Fundal height (Weeks)	Cor POG		Cervical length (mm)	Pregnancy Outcome										
			Gravida	Para	Abortion	Living	Died				Weeks	Days		Weeks	Days		Outcome	Term	Term		Birth weight (Kg)	APGAR Score	Mode of delivery	Indication	NICU admission	Height (Cms)
																			Weeks	Days						
198	515272	23	1	-	-	-	-	6/18/2012	2/24/2013	-	20	-	20	20	-	30	LB	NO	38	0	2.8	8	Vaginal	-	NO	154
199	516078	20	1	-	-	-	-	6/9/2012	2/9/2013	-	21	-	20	21	-	35	LB	NO	41	1	3.2	8	Vaginal	-	NO	157
200	516205	24	1	-	-	-	-	5/6/2012	2/13/2013	-	20	-	21	20	-	35	LB	NO	40	2	2.8	8	Vaginal	-	NO	154
201	516308	20	2	1	-	1	-	6/18/2012	2/24/2013	-	21	-	20	20	-	37	LB	NO	38	0	2.8	8	Vaginal	-	NO	150
202	516424	24	1	-	-	-	-	6/28/2012	2/4/2013	-	21	-	20	21	-	35	LB	NO	38	0	2.7	8	Vaginal	-	NO	154
203	549275	29	3	2	-	2	-	11/17/2012	8/25/2013	-	20	-	21	20	-	32	LB	NO	38	0	3.7	8	Vaginal	-	NO	153
204	549325	20	1	-	-	-	-	11/16/2012	8/25/2013	-	21	-	20	20	-	37	LB	NO	40	0	2.8	7	Vaginal	-	NO	155
205	549332	23	1	-	-	-	-	12/24/2012	9/18/2013	-	20	-	21	20	-	35	LB	NO	37	0	2.3	6	Vaginal	-	NO	156

Annexures

Annexure III

ANNEXURE III – KEY TO MASTER CHART

BOH	-	Bad obstetric history
Cms	-	Centimeter
Cor POG	-	Corrected period of gestation
EDD	-	Expected date of delivery
GEST HTN	-	Gestational hypertension
Kg	-	Kilogram
LB	-	Live birth
LMP	-	Last menopausal date
LSCS	-	Lower segment caesarean section
mm	-	Millimeter
MSB	-	Macerated still birth
NICU	-	Neonatal Intensive Care Unit
OLIG	-	Oligohydroaminous
OPD	-	Out patient department
P	-	Primi
PIH	-	Pregnancy induced hypertension
POG	-	Period of gestation
PPROM	-	Preterm premature rupture of membrane
PREV	-	Previous
TMSL	-	Thick meconium stained liquor