



Maternal risk factors associated with preterm labour

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Abstract

Objectives: *To identify and study the prevalence of maternal risk factors causing preterm labour.*

Materials and Methods: *This is a cross sectional study of 230 women, who had singleton live pregnancies at a gestational age between 24 weeks to 36 weeks 6 days, who came in spontaneous true preterm labour.*

Results: *Moderately prevalent (10-25% prevalence) risk factors observed were periodontal infections, PPRM, cervical incompetence, history of previous cesarean section, short interpregnancy interval, placental abnormalities and fetal malpresentations. Other factors like maternal anemia, polyhydramnios, congenital uterine anomalies, congenital fetal anomalies, previous history of preterm delivery and low pre pregnancy BMI, had a low prevalence (<10%) in preterm labour.*

All the study participants delivered with majority undergoing vaginal delivery. Birth weights correlated against early and late preterm births, were found to be statistically significant (p<0.02). The perinatal morbidity was 78.3% and majority were admitted in intensive care unit for reasons like low birth weight care, respiratory distress syndrome, birth asphyxia, hyperbilirubinemia, sepsis, meconium aspiration and intraventricular hemorrhage. The overall perinatal mortality in our study was 10.4% and it was significantly (p<0.001) associated with early preterm births.

Conclusion: *Preterm labour can occur spontaneously due to many factors, many of which are preventable, like maternal obesity/underweight, genitourinary infections, short interpregnancy interval. Also, with adequate knowledge, other risk factors can also be detected early in pregnancy and appropriately managed, so that preterm labour can be prevented. Thereby, the maternal and perinatal outcome can be improved and perinatal mortality rates can be brought down tremendously.*

Keywords: *Preterm labour; bacterial vaginosis; cervical incompetence; polyhydramnios; hyperbilirubinemia; meconium aspiration.*

Introduction

Preterm labour is defined as the onset of regular contractions associated with cervical changes occurring before 37 completed weeks or 259 days of gestation. Globally, around 10-11% of all

births, or approximately 15 million births per year are estimated to be preterm. Of the estimated 4 million neonatal deaths each year, approximately 35% are attributed to preterm births. Babies born prematurely, but who survive the immediate

postnatal period, have an increased risk of death and morbidity during childhood as well as well as delay in both growth and development compared to babies born at term.

According to World Health Organization (WHO) and the International Federation of Gynecology and Obstetrics (FIGO), the definition of spontaneous preterm labour is labour resulting in birth before 37 completed weeks (259 days) of gestational age.

Objectives

To identify and study the prevalence of maternal risk factors including microbiologic factors, leading to preterm labour.

Methodology

This a descriptive cross sectional study done at Government Medical College, Thrissur on singleton pregnancies at less than 37 weeks of gestation, with spontaneous onset of preterm labour, satisfying the inclusion criteria. The study was conducted during a twelve month period, from September 2016 to September 2017.

Socioeconomic stratification was done into APL and BPL according to the entry in the ration card provided by the State Government.

Study Subjects

Antenatal patients presenting in preterm labour (<37 weeks of gestation), meeting the inclusion criteria, attending the Department of Obstetrics and Gynaecology in Government Medical College, Thrissur.

Sample Size

230 antenatal patients in preterm labour, meeting the inclusion criteria

Inclusion Criteria

Antenatal patients with singleton intrauterine pregnancies with gestational age < 37 completed weeks and more than 24 weeks.

Patients presenting with spontaneous onset, true labour pains or with leaking per vaginam (preterm premature rupture of membranes (PPROM)), with cervical changes.

Exclusion Criteria

- 1) Antenatal patients with false labour pains or with induced preterm labour (for example, in triplet pregnancies).
- 2) Gestational age less than 24 weeks or more than 37 completed weeks.
- 3)

Materials and Methods

After obtaining ethical clearance, this descriptive cross sectional study was conducted from September 2016 to September 2017, on 230 antenatal women attending the Department of Obstetrics and Gynecology, Government Medical College, Thrissur. This was done after strictly following the inclusion criteria. All the patients in the study underwent a standardized form of labour management.

Blood and urine routine and culture & sensitivity testing were sent for indicated patients .High vaginal swabs were taken from all study subjects, on admission, which will undergo swab culture and sensitivity testing on blood agar, Mac conkey agar and tellurite agar. Those positive will undergo Gram staining and biochemical testing to identify the organism. Also smears were prepared from high vaginal swabs and sent for cytology examination, to look for clue cells and to identify any genital pathogens present.

Ultrasound reports were also studied to identify any predisposing factors for preterm labour like polyhydramnios, congenital uterine anomalies, congenital fetal anomalies, malpresentations or cervical incompetence.

Mean while, the patients were closely monitored for the outcome of preterm labour and modes of delivery were noted. Relevant baby details were also recorded classifying them as early (less than/= 33 weeks 6 days) and late preterm births (34 weeks- 36 weeks 6days) (Williams et al). Baby weight, Apgar score , congenital anomalies and neonatal complications like low birth weight, respiratory distress, jaundice, birth asphyxia, intra ventricular hemorrhage, warranting intensive care unit admission were noted.

Detailed maternal history taking , examination and investigations will help detect any antepartum risk factors like hypertension, diabetes, obesity, short stature, previous history of preterm deliveries, cervical incompetence, genitourinary infections, preterm premature rupture of membranes, malpresentations, placental abnormalities, congenital uterine anomalies, family history of preterm deliveries and many more.

After finding out the mode of delivery, association between early and late preterm births and most prevalent risk factors were noted. Neonatal outcome was also recorded which can help identify various neonatal complications of preterm delivery. Also, some of the risk factors for preterm labour, like congenital fetal anomalies, which might have been missed during routine antenatal ultrasound, can be noted. Perinatal morbidity and mortality can also be assessed based on this data.

Data Analysis

Data will be coded and entered into Microsoft excel. Analysis will be done with SPSS version 17 statistical software.

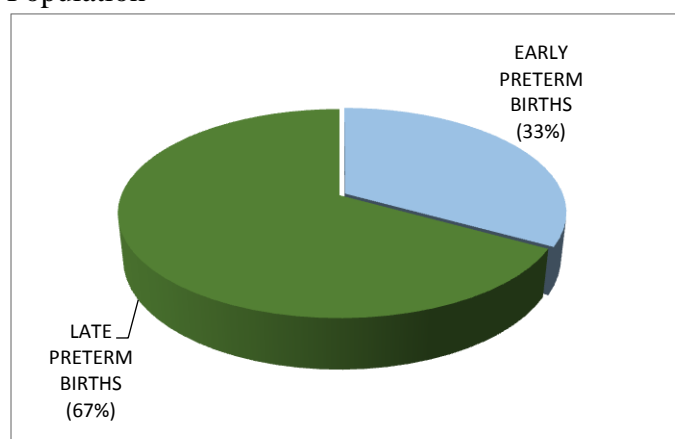
Results

1. Socio Demographic Profile of Study Group

1.1 Age Distribution

Majority, that is 81.3 %, belonged to 20- 34 years age category. The mean age was 26.5 ± 5.5 SD years.

Fig 7 Distribution of Preterm Births in Study Population



1.2 Gravidity

Majority were primigravid as constituting 43.5% of total study population

1.3 Socio Economic Status

Majority of the study subjects were in the below poverty line category -76.5%

2. Present Pregnancy

2.1 Gestational Age at Presentation

Majority (67%) belonged to 34-36 weeks category with a mean gestational age of 34 weeks ± 2 weeks 4 days SD.

2.2 Booking Status

Majority, 90% of subjects had their booking visits initially.

2.3 Antenatal Checkups

83% women had regular antenatal checkups.

2.4 Presenting Complaints

Most common presenting complaint for women in preterm labour was pain with 64.8% women having it.

2.5 History of First/Second Trimester Bleeding

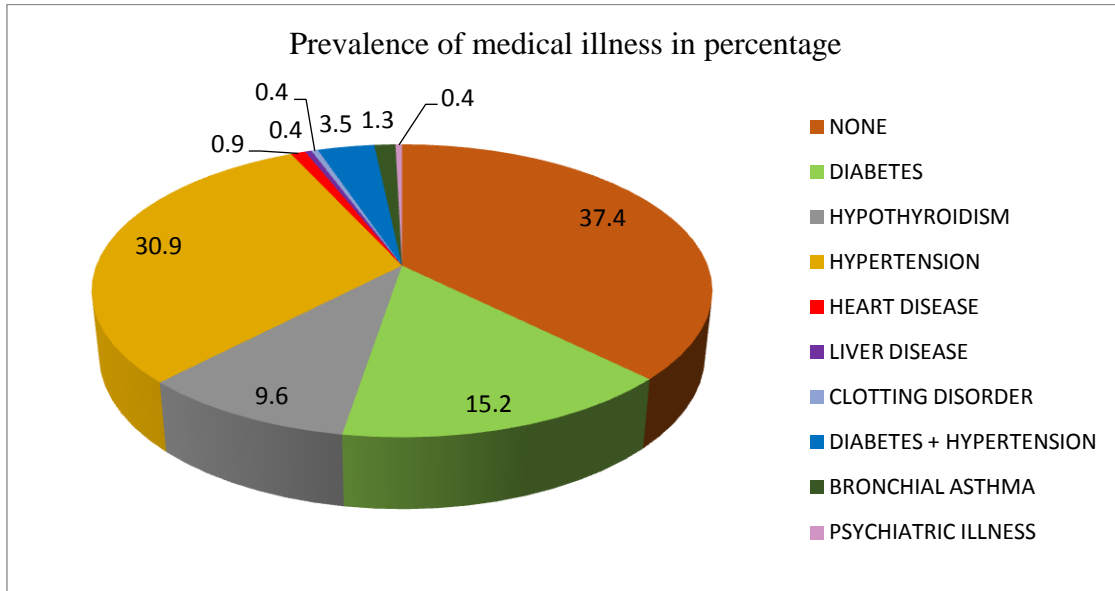
There were 61 women with either first or second trimester bleeding with majority (22.2%) belonging to first category.

2.9 Prevalence of Anemia

4.3% women presenting in preterm labour were having anemia.

2.10 Medical Comorbidities

Fig 11 Distribution of medical illnesses in study group



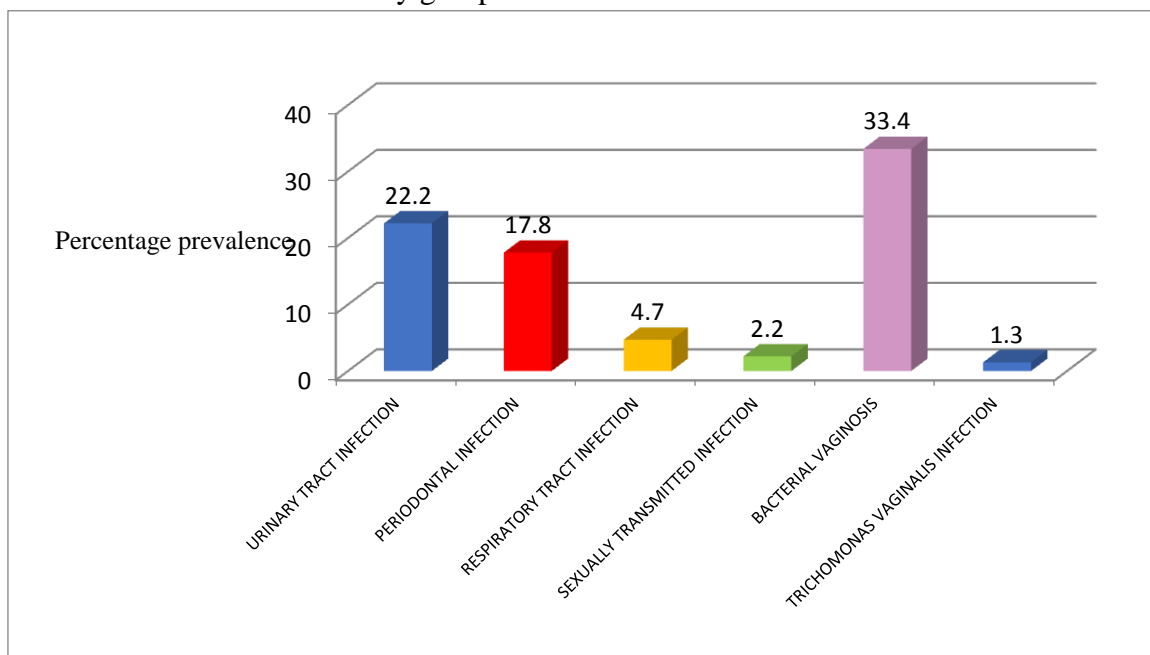
Among the medical illnesses, hypertension constitutes the majority at 30.9% among which 12.6% was constituted by chronic hypertension patients and 18.3% by hypertensive disorders of pregnancy.

Diabetes mellitus was observed in 15.2% of women, out of which 10% had overt diabetes and 5.2% had gestational diabetes mellitus.

2.11 Infections

33.4% women in preterm labour had bacterial vaginosis followed by urinary tract infections, comprising 22.2%.

Fig 12. Distribution of infections in study group



2.12 Preterm Premature Rupture of Membranes (PPROM)

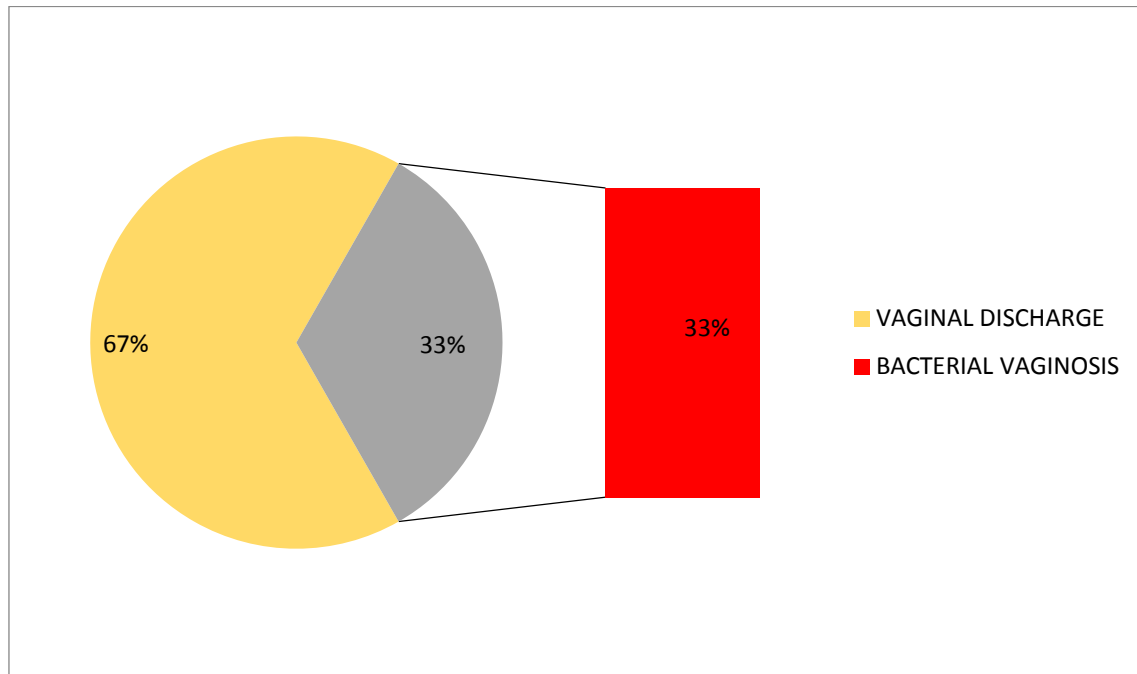
20.9% women in preterm labour had PPRM.

2.13 Psychological Factors

It was observed that 49.6% women described themselves to be in a normal state of mind whereas 31.3% were anxious and 18.7 % were depressed.

2.14 Vaginal Discharge and Bacterial Vaginosis

Fig 13 Distribution of bacterial vaginosis and vaginal discharge in study group



Out of the total 153 women with complaints of vaginal discharge 77 tested positive for bacterial vaginosis, which is 33% of total study subjects.

2.15 Interventional Procedures during Pregnancy

There were 2 rescue cerclage, 1 amniocentesis and 1 external cephalic version.

3. Past Obstetric History

7.8% women had a history of at least one preterm delivery in the past.

3.2 History of Previous Abortions

27.8% women had previous history of abortions and 12.6% of these women had undergone surgical evacuation in the past.

3.3 Previous Cesarean Section

There were 14.3% of preterm labour patients with history of cesarean section.

3.4 Interpregnancy Interval

49.1% of preterm labour cases had a mean interpregnancy interval of 31.9 months \pm 16.5 months with the majority lying in 18-59 months category. 13.9% women had a short interpregnancy interval of less than 18 months.

4. Past History of Infertility Treatment

10% cases of preterm labour had history of infertility treatment but no history of use of assisted reproductive technology

5. Family History

30% cases of preterm labour had a positive family history of preterm delivery.

6. Personal History

The prevalence of smoking was 0.4% and drinking was 0.8%

7. General Examination

7.1 Height

Mean height was 153.3 +3.9 cm

7.2 Weight

Mean weight was 62.1±8.64 kg

7.3 Body Mass Index

Mean body mass index was 27.8±4.3

7.4 Investigations

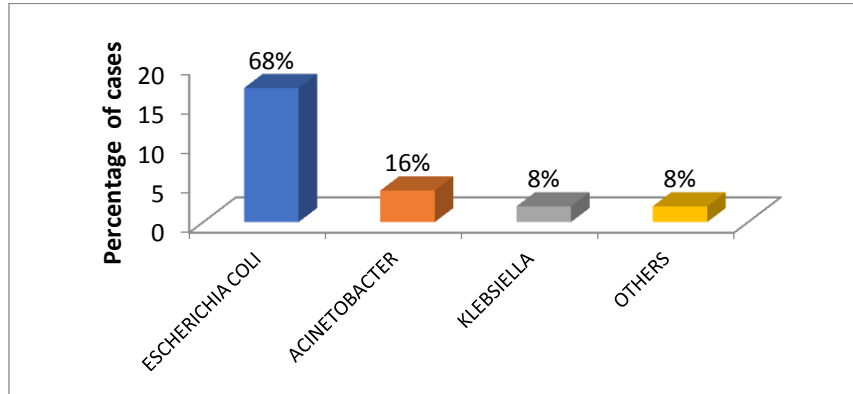
7.4.1 Blood Investigations

Blood culture was done for 6 patients, all of which were sterile

7.4.2 Urine Investigations

Urine culture was done for 25 patients (10.9%) with positive results as follows:

Fig 16. Distribution of urinary micro organisms in study group

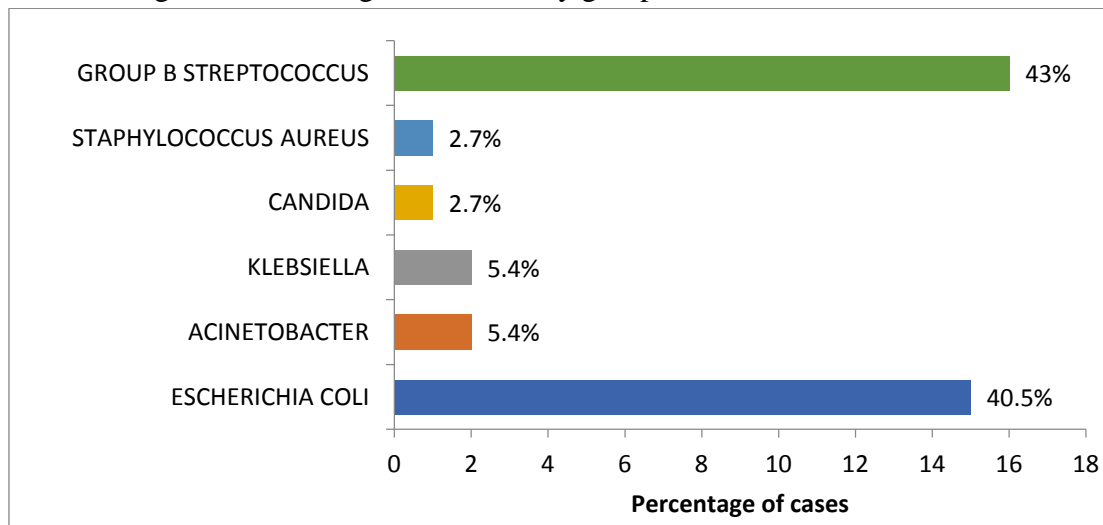


Highest contribution to urinary tract infections were by E.Coli (68%) of urine culture positive cases.

7.4.3 High Vaginal Swab Investigations

Total swab positive for microbial growth in 37 women (16%) with the following microbiological results:

Fig 17. Distribution of genital micro organisms in study group



Group B streptococcus (43%) constituted the majority of culture positive cases of high vaginal swab.

8. Ultrasound Findings

8.1 Polyhydramnios

There were 5.7% cases with polyhydramnios.

Table 44. Association between birth weight and early/late preterm births- unpaired t test

Group	Mean Birth Wt ± SD(kg)	Mean Difference	t	P value
Early preterm birth	2.02 ± 0.50	0.15	2.38	0.02 (P < 0.05, Significant)
Late preterm birth	2.17 ± 0.45			

8.2 Congenital Uterine Anomalies

There were 3.5% cases with congenital anomalies with 6 cases of septate uterus and 2 cases of bicornuate uterus.

8.3 Malpresentations

There were 17.4% cases of malpresentations in the study population with majority being non-vertex breech presentations.

8.4 Cervical Incompetence

23.9% women in preterm labour were diagnosed with cervical incompetence either clinically or from ultrasound, in the present study.

9. Preterm Labour Outcome

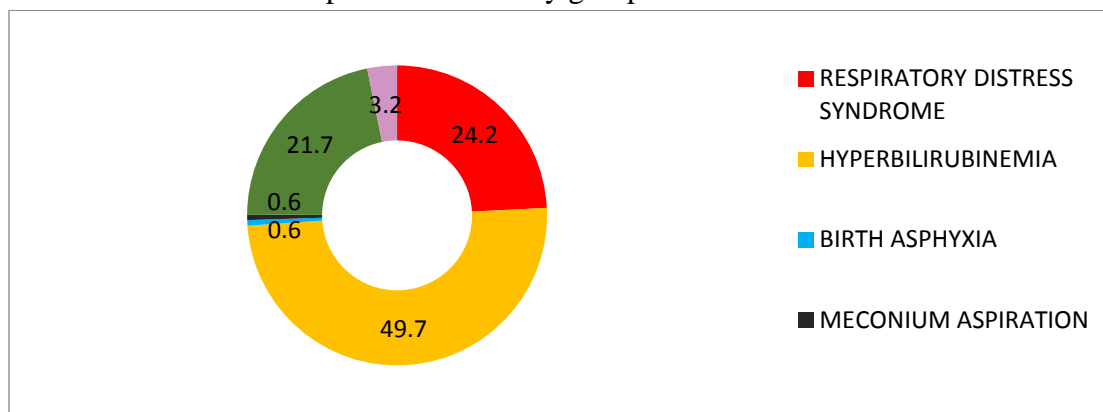
9.1 Mode of Delivery

Table 42. Distribution of mode of delivery in study group

	No. of cases	Percentage
VAGINAL	209	90.9
CESAREAN SECTION	21	9.1

10.5 Neonatal Complications

Fig 19 Distribution of neonatal complications in study group



10.4 Perinatal Mortality

There were 24 cases of neonatal deaths contributing to 10.4% neonatal mortality. There were no cases of still births in our study.

9.2 Type of Preterm Births

There were 33% early preterm births and 67% late preterm births

10. Baby Details

10.1 Birth Weight

Majority of babies were in the range 2-2.5 kg with a mean weight of 2.12+0.47 SD kg.

The association between early/late preterm births and birth weights were found to be statistically significant.

10.2 APGAR at 5 min

Mean Apgar score was 7.2 ±2.2

10.3 Congenital Anomalies

There were 6.1% neonates with single anomalies and 2.6% with multiple anomalies. Majority were minor anomalies, which were usually not known to cause preterm labour.

10.4 NICU Admission

Out of the 180 admissions, 23 cases were for routine low birth weight care .And the rest were for the complications described below.

10.5 Correlation between Perinatal Mortality and Early/Late Preterm Births

Perinatal Mortality		Preterm births		Total
		Early	Late	
	Number	24	0	24
Percentage	31.6%	0%	10.4%	

$X^2 = 54.30$, P value < 0.001

The association revealed a p value of less than 0.001 which was statistically significant. Early preterm births had a significant association with perinatal mortality.

Discussion

Majority of the study population, 81.3 %, belonged to 20- 34 years age category with a mean age of 26.5 ± 5.5 SD years. Extremes of age group accounted for 18.7% of total women. In a study done by Renay Weiner et al in Kenya, 18.8% of cases were in the extremes of reproductive age group.

Gravidity and preterm labour

Out of the 230 cases of preterm labour, 100% underwent preterm delivery. Out of these women, 90.8% underwent vaginal delivery and 9.2% underwent cesarean section.

Antenatal risk factors and preterm labour

67 % women were at 34-36 weeks gestational age category and 33% were in less 34 weeks gestational age category ,with a mean gestational age of 34 weeks ± 2 weeks4days SD.90% cases were booked and 83% cases had regular antenatal checkups so far.64.8% women presented with preterm pain as their primary complaint.

Medical illnesses and preterm labour

In our present study, 30.9% women in preterm labour had different types of hypertensive disorders of pregnancy ranging from chronic hypertension to different grades of pre eclampsia.15.2% women in our study, had diabetes mellitus, 9.6 % had hypothyroidism. 3.5% study population, had a combination of diabetes and hypertension, 0.9% had heart disease, 0.4% had liver disease, 0.4% had clotting disorders, 1.3% had bronchial asthma and 0.4% had psychiatric illness. Also it was found in our

study that 12.6% patients had chronic hypertension and 10% cases had overt diabetes.

Comparison of prevalence of hypertension and diabetes in various studies

The higher incidence of hypertensive disorders and diabetes in our study could be due to the fact that most cases in the present study were referred from peripheries and the institution where this study was conducted, is a tertiary care centre which caters to most of high risk pregnancies.

Infections and preterm labour

In our study, we found there was a prevalence of 22.2% urinary tract infections(UTI) in women with preterm labour. The results are comparable to a study by Pandey et al. where the prevalence of UTI was 20.34%⁹. Meis et al. found a prevalence of around 11% for UTI in spontaneous preterm labour.¹⁰

In the present study, out of 25 (10.9%) positive urine cultures, majority (17 cases) were positive for Escherichia Coli and very few cases of Acinetobacter, Klebsiella and others. In a study by Shannon et al, the prevalence of E.Coli infections were the highest among positive urine culture, constituting 8.29% of total.

Periodontal infections in our study had a prevalence of 17.8%.

153 women (67%) had vaginal discharge and 33.4% were diagnosed with bacterial vaginosis.

The high vaginal swabs of all patients were tested and 37(16%) were found to be positive .The highest contribution was from Group B Streptococcus , which were 17 cases followed by EColi which were 16 cases, along with few cases of Candida, Acinetobacter, Klebsiella and Trichomonas Vaginalis

Respiratory tract infections had a prevalence of 4.7% and sexually transmitted infections had a prevalence of 2.2%.

PPROM and preterm labour

PPROM was present in 20.9% of cases in spontaneous, preterm labour. In a study by Michael et al., preterm premature rupture of membranes was associated with preterm labouran delivery with an adjusted odds ratio of 19.29.¹⁴

Psychological factors and preterm labour

The disparity in results of depression may be that our patients, coming from a lower socio economic strata, find it difficult to talk about their state of mind, probably fearing stigma.

Past obstetric history and preterm labour

In the present study, 7.8% had history of one preterm delivery, 0.8% had history of two preterm deliveries and 0.4% had history of three preterm deliveries in the past.

In our present study, 27.8% women had previous history of abortions.59 cases(25.6%) had history of one abortion , 4 cases(1.7%) had history of two abortions and 1 case(0.4%) had history of three abortions in the past. In a study by Arias et al, women with history of one , two , three abortions were 13 % , 9% and 20% respectively.¹⁵

Previous Cesarean section and preterm labour

14.3% cases in our study had history of previous cesarean section.

Our studies' prevalence is higher may be because, our institution is a tertiary care centre where mostly high risk and complicated cases get referred.

Interpregnancy interval and preterm labour

Majority of cases, 49.1% fall in the 18-59 months interpregnancy interval with a mean of 31.9 months \pm 16.5 months .13.9% cases of preterm labour has an interpregnancy interval of less than 18 months.

Infertility treatment and preterm labour

4.3% cases in our study gave a history of undergoing infertility treatment .But none had any use of assisted reproductive technology.

The lower rates of infertility treatment may be due to the fact that our institution caters to people of lower socio economic strata, who cannot afford most of the treatment expenses.

Family history of preterm labour

It was found in our study that, 30% cases of preterm labour had a family history of preterm delivery.

Personal History

Only 1 woman (0.4%) admitted to smoking and 2 women (0.8%) admitted to alcohol intake during pregnancy and no history of substance abuse.

The small prevalence of addictions in our study may be due to the presence of socio cultural stigma in revealing these details.

Height and preterm labour

In our study, 80.9% belonged to 150-159 cm category with a mean height of 153.3 \pm 3.9 cm.

Body Mass Index and preterm labour

Majority of cases, 39.6% had a BMI of 25-29 range with a mean BMI of 27.8 \pm 4.3.33.9% cases were obese with a BMI of 30-40 and 0.9% had a BMI in the range 40-50.25.7% had BMI in the normal range of 18.5-24.9 with 5% cases in the lower range of pre pregnancy BMI.

Polyhydramnios and preterm labour

There were 5.6% cases with polyhydramnios in our study. Many et al studied the association of polyhydramnios and preterm labour and found that 12.6% of these women delivered preterm. Shreshta et al did a study in Nepal whose results were 0.7% women with polyhydramnios went into preterm labour.

The disparity in results may be due to the fact that our study took into account only the women coming in established spontaneous preterm labour. So there is a highly likely chance that mamny may be missed, if they present with leaking already.

Cervical incompetence and preterm labour

There were 23.9 % cases with ultrasound features of cervical incompetence, in preterm labour, in the present study. And 2 cases (8.6%) underwent rescue cerclage and hence, did not progress to preterm delivery

Malpresentations and preterm labour

In the present study, the prevalence of malpresentations in preterm labour was found to be 17.4 %.The most common malpresentation was non –vertex and in that breech presentation

Congenital uterine anomalies and preterm labour

3.4 % cases in our study had congenital uterine anomalies with 6 of them septate uterus and 2 having bicornuate uterus. This was comparable to a study by Pandey et al where the uterine anomalies were 4.82 %.

Placental abnormality and preterm labour

In our study , 55cases(23.9%) were found to have some form placental abnormalities like low lying placenta(17.4%), placenta previa(2.6%) ,adherent placenta(1.3%),succenturiate lobe (0.8%), bilobed placenta(1.3%) and velamentous insertion (0.8%).Chisholm et al conducted a study where he found that at least 75% of placentas in cases of preterm labour and delivery , demonstrated one feature of maternal vascular malperfusion.

Labour outcomes

All cases (100 %) delivered following onset of preterm labour. There were 33% cases of early preterm births and 67 % of late preterm births. Even though rescue cerclage was put for two cases of cervical incompetence, they delivered as early preterm births itself.

Mode of delivery

Out of 230 cases, 90.8 % underwent preterm vaginal deliveries and 9.2% underwent cesarean section. These results were comparable with a study by U M Reddy et al. where the incidence of vaginal deliveries in preterm births were more than 80%.

Baby details

- **Birth weight**

Majority of babies were in the range 2-2.5 kg with a mean weight of 2.12+0.47 SD.

- **Apgar score**

In our study, 56.5% babies had Apgar at 5 minutes ranging from 5-7, 16.1% cases had Apgar<5 and 27.4 had Apgar 8 or more.

Congenital anomalies

In the present study, there were 20 babies (8.6%) with visible congenital anomalies. Out of which 6.1% had single anomalies and 2.6% had multiple anomalies.

Neonatal complications and NICU admission

There were 157 newborn with neonatal morbidity in the present study accounting for 68.2%.The neonatal complications were respiratory distress (24.2%), hyperbilirubinemia (49.7%), birth asphyxia (0.6%), meconium aspiration(0.6%), neonatal sepsis(21.7%) and intraventricular hemorrhage (3.2%), according to the present study.

There were 180 admissions (78.3%) to newborn intensive care unit. Apart from the above morbidities 23 babies (0.1%) were admitted for low birth weight care.

Neonatal mortality

There were 24 cases of neonatal mortality in the present study, constituting 10.4% of total 230 preterm births.

Conclusion

Majority were in the 20-34 years age group with most having only primary school education or below, and belonging to a lower socioeconomic strata. All of the women underwent preterm delivery with a vast majority undergoing vaginal delivery compared to cesarean section. It was found that, among the antenatal risk factors, highest prevalence (more than 25%) was observed for high pre pregnancy BMI, first/second trimester bleeding, bacterial vaginosis, gestational hypertension , maternal anxiety, past history of abortions and family history of preterm deliveries. Even though, these factors were clinically more associated with early and late preterm births, their statistical associations were not found to be significant.

Among infections, bacterial vaginosis was most prevalent , followed by urinary tract infections , mostly contributed by E Coli. High vaginal swab results showed that majority of the genital microbes were Group B Streptococci and E Coli.

Periodontal infections with a moderate prevalence were also found in women with preterm labour.

Moderately prevalent (10-25% prevalence) risk factors observed were PPROM, cervical incompetence, history of previous cesarean section, short interpregnancy interval, placental abnormalities and fetal malpresentations.

Minor contributions to spontaneous preterm labour (less than 10% prevalence) were seen with factors like maternal anemia, polyhydramnios, congenital uterine anomalies, congenital fetal anomalies, previous history of preterm delivery and low pre pregnancy BMI.

All of the women in preterm labour, delivered, with 90.9% undergoing vaginal delivery and 9.1% undergoing cesarean section. 77% of women underwent late preterm births, delivered babies with an average weight ranging from 2-2.5kg. Birth weights compared against early and late preterm births, were found to be statistically significant.

More than half of the preterm babies had an Apgar of less than 7, at 5 minutes, with a morbidity of 78.3% and majority being admitted in newborn intensive care unit due to various factors like low birth weight care, respiratory distress syndrome, birth asphyxia, hyperbilirubinemia, sepsis, meconium aspiration and intraventricular hemorrhage. The overall perinatal mortality in our study was 10.4% and it was significantly associated with early preterm births.

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