

EVALUATION OF MATERNAL AND FOETAL OUTCOME IN TERM PREMATURE RUPTURE OF MEMBRANES MANAGED WITH EARLY INDUCTION

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ABSTRACT

BACKGROUND

Premature Rupture of Membranes (PROM) occurs in 10% of all pregnancies. The significance of PROM lies in the fact that it has obscure aetiology with difficulties in diagnosis and is associated with significant maternal and neonatal risks. There is still no universally accepted policy for the management of PROM at term.

OBJECTIVES

To identify the risk factors causing PROM and to study the labour outcomes and the maternal and perinatal morbidity and mortality in cases of PROM at term.

METHODS

This prospective descriptive study was conducted on seventy five patients with spontaneous rupture of membranes with gestational age ≥ 37 weeks and managed with early induction. A detailed history and examination were carried out. All parameters of maternal and foetal wellbeing were recorded. A sterile speculum examination and amniotic fluid culture were done. Labour was induced with intravenous oxytocin. Data was collected using a structured questionnaire. Neonates with poor Apgar score were admitted in Neonatology Intensive Care Unit (NICU). Observations for signs of infection were continued in puerperium. Data regarding mode of delivery, foetal weight, foetal Apgar score, weight, and neonatal outcome were recorded.

RESULTS

PROM occurs more frequently in unbooked, nulliparous women of low socioeconomic class. Incidence of LSCS (44%) and instrumental delivery (28%) were higher. E. coli (42.5%) was the most common pathogen isolated from vagina followed by commensals (17.5%). Puerperal pyrexia (10.7%) was a major cause for maternal morbidity followed by wound infection (2.7%) and chorioamnionitis (1.3%). 27.6% of the neonates required NICU observation for mild respiratory distress. 5.3% of neonates were admitted for perinatal asphyxia and 2.6% of neonates were admitted for neonatal sepsis. No perinatal deaths were there. Infections have increased with increasing period of latency.

CONCLUSION

Overall incidence of maternal and neonatal infectious complications were very less in our study. The early induction of patients in our study by reducing the duration of latency had contributed for the reduction in the incidence of infectious complications.

KEYWORDS

Premature Rupture of Membranes, Chorioamnionitis, Perinatal Asphyxia, Neonatal Sepsis, Bishop Score.

HOW TO CITE THIS ARTICLE: Arthi PN, Jalakandan B. Evaluation of maternal and foetal outcome in term premature rupture of membranes managed with early induction. J. Evolution Med. Dent. Sci. 2016;5(59):4092-4099, DOI: 10.14260/jemds/2016/936

INTRODUCTION

Premature Rupture of Membranes (PROM) is defined as rupture of membranes with a latent period before the onset of spontaneous uterine activity and can occur at any gestational age. The significance of PROM lies in the fact that it has obscure aetiology with difficulties in diagnosis and is associated with significant maternal and neonatal risks. PROM occurs in 10% of all pregnancies with majority of cases (60-70%) occurring before 37 completed weeks of gestation.^(1,2)

Unfortunately, 5% to 10% of women will not enter labour within 72 hours and 2% to 5% remain undelivered 7 days after PROM at term. Infections of lower genital tract and amniotic cavity are most common aetiologies of PROM.⁽³⁾ PROM is associated with severe maternal and neonatal complications.^(4,5)

There is no golden standard for diagnosing rupture of the membranes. The management strategies of PROM at term are diverse and controversial. Despite the extensive research and studies done in this field, there is still no universally accepted policy for the management of PROM at term and management varies between immediate induction and awaiting a certain period of time.⁽⁶⁾

With this magnitude and seriousness of the condition, the main objective for the obstetrician and for the woman with suspected PROM is a correct diagnosis and management that gives a high rate of successful vaginal deliveries without a rise in neonatal and maternal infections.

Hence, this study was conducted to identify the risk factors and to study the labour outcomes and the maternal

Financial or Other, Competing Interest: None.

Submission 22-05-2016, Peer Review 05-07-2016,

Acceptance 11-07-2016, Published 23-07-2016.

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DOI: 10.14260/jemds/2016/936

and perinatal morbidity and mortality in patients with PROM at term managed with early induction.

AIMS AND OBJECTIVES

- To identify the risk factors causing PROM.
- To study the labour outcomes and the maternal and perinatal morbidity and mortality in cases of PROM at term.

MATERIALS AND METHODS

This prospective, descriptive study was conducted on seventy five consecutive patients of spontaneous rupture of membranes with gestational age 37 to 40 weeks. Informed consent was obtained from all these patients.

Inclusion Criteria

- Gestation age group 37 to 40 weeks.
- Clinical confirmation of PROM by speculum examination.

Exclusion Criteria

- Antepartum haemorrhage.
- Preterm PROM.
- Anomalous baby.
- Intrauterine Death.

Procedure of Study

Patients with history suggestive of PROM were admitted to the labour room. A detailed history including age, menstrual history, high risk pregnancy, duration of pregnancy, gestational order, previous rupture of membranes, urinary tract infection within pregnancy, antibiotic intake, presentation of chorioamnionitis symptoms were all recorded and obstetric history with emphasis on exact time of membrane rupture, duration, and amount of leaking were recorded.

Thorough general and systemic examination including pulse, blood pressure, and temperature were recorded. In obstetric examination, uterine height, presentation, lie of foetus, and amount of liquor were noted. All parameters of maternal and foetal wellbeing were recorded.

A sterile speculum examination was conducted and presence of liquor amnii was noted and when no amniotic fluid was seen, the patient was asked to cough to see the drainage of amniotic fluid. In case of doubt, fluid from vagina was collected on slide and examined for pH and microscopically examined for ferning. Amniotic fluid culture (By cervical swab) were sent.

Obstetrical ultrasound was carried to confirm gestational age to assess the amount of liquor and to rule out congenital anomalies.

The Clinical Diagnosis of Chorioamnionitis was made in Presence of two or more of the following Criteria.⁽⁷⁾

- Maternal fever greater than 38°C.
- Maternal tachycardia (90 beats per minute or more).
- Leucocytosis (WBCs \geq 20,000/mm³).
- Foetal tachycardia (>160 beats per minute).
- Uterine tenderness.
- Foul-smelling amniotic fluid.

Pelvic examination was done to note the membranes, presenting part, and its station. Bishop score was assessed

and cord prolapse was excluded. Patients were induced with intravenous oxytocin diluted in Ringers Lactate. Its dose was adjusted according to uterine response intermittently. All cases were given prophylactic antibiotic at the time of admission. Data was collected using a structured questionnaire.

Maternal pulse, BP, temperature, uterine contractions, abdominal palpation to detect uterine tenderness, colour, and smell of liquor were recorded 4th hourly. Continuous electronic monitoring of maternal pulse, foetal heart rate, and partogram were done.

Success of induction was declared when effective uterine contractions were started along with improvement in Bishop score. Labour was then augmented if required. If there was failure to induce labour in 24 hours or evidence of maternal or foetal compromise, caesarean section was done. Antibiotics were given to babies after delivery with evidence of chorioamnionitis. Neonates with poor Apgar score were admitted in Neonatology Intensive Care Unit (NICU). Total hospital stay was noted. Observations for signs of infection were continued in puerperium.

Data regarding mode of delivery, foetal weight, foetal Apgar score, weight, and neonatal outcome were recorded on the proforma.

Maternal outcome was measured on the basis of presence of fever, mode of delivery. Foetal outcome was measured on the basis of presence of infection (Sepsis), Apgar score, and neonatal morbidity.

STATISTICAL ANALYSIS

At the end of the study, all gathered data in questionnaire was tabulated and interpreted. All categorical data was presented as number and percentage. Data was tested for significance with the chi-square test and Fisher exact tests. Statistical analysis was carried out using SPSS 15.0 version. P value <0.05 was considered statistically significant.

OBSERVATION AND RESULTS

The majority of patients were in the age group of 21-25 years (Table 1, Fig.1) and most were unbooked (Table 2, Fig.2) and nulliparous (Table 3, Fig.3). The difference was statistically very significant ($p < 0.001$).

The major risk factors were low socioeconomic class (62.7%) and primiparity (57.3%). More than 65.3% of the patients had more than one risk factors (Table 4, Fig.4). All the patients had an alkaline vaginal pH (Table 6, Fig.6).

The incidence of LSCS (44%) and instrumental delivery (28%) were higher (Table 7, Fig.7) with non-reassuring foetal heart rate (54.5%) as the most common indication for LSCS followed by cephalopelvic disproportion (27.3%) (Table 8, Fig.8) and it was statistically very significant ($p < 0.001$).

At the time of admission, majority of patients had an unfavourable cervix with Bishop score <6 (Table 5, Fig.5) and correspondingly the higher incidence of LSCS (54.9%) and instrumental delivery (27.5%) (Table 9, Fig.9).

E. coli (42.5%) was the most common pathogen isolated followed by commensals (17.5%). No growth was seen in 32.5% of cases. (Table 10, Fig.10).

The table 11 shows significant incidence of complications (14.7%) in women with PROM, with puerperal pyrexia (10.7%) as a major cause for maternal morbidity followed by

wound infection (2.7%) (Fig.11). The table 12 shows significant number of neonates (27.6%) required NICU observation for mild respiratory distress and 5.3% of neonates were admitted in NICU for perinatal asphyxia and 2.6% of neonates were admitted for neonatal sepsis. There were no perinatal deaths (Fig.12).

Majority (80%) of the patients had their latency period <12 hours, 14.7% of patients had between 12-24 hours and 5.3% of patients had more than 24 hours. Neonatal sepsis was not seen in neonates delivered within 24 hours of latency, but seen in 50% of neonates when latency exceeds 24 hours (Table 13, Fig.13).

DISCUSSION

Approximately 8-10% of term pregnancies will experience spontaneous ROM prior to the onset of uterine activity.⁽¹⁾ Infections of lower genital tract and amniotic cavity are most common aetiologies of PROM.⁽³⁾ There is good evidence to support the association between PROM and infection with *Chlamydia trachomatis*.⁽⁸⁾ and *Neisseria gonorrhoea*.⁽⁹⁾ Two or more induced abortions,⁽¹⁰⁾ antepartum vaginal bleeding,⁽¹¹⁾ were also a risk factor for PROM. Other factors include lower socioeconomic status, cigarette smoking, prior cervical conization, prior preterm delivery, uterine distention (e.g., twins, hydramnios), cervical cerclage, and amniocentesis. Each of these may be associated with PROM through membrane stretch or degradation, local inflammation, or a weakening of maternal resistance to ascending bacterial colonization. In many cases, the ultimate cause of PROM was unknown.

The mechanisms by which rupture takes place must be related to a weakness in the chorioamniotic membrane. BouResli et al had found that the membranes are thinner near the rupture site and the connective tissue layer contains a decreased number of poorly-organised collagen fibrils.⁽¹²⁾ With biochemical techniques, it has been shown that there is a decline in the collagen content of the prematurely ruptured amnion.⁽¹³⁾ Polzin et al had concluded that amniorrhexis occurs as a result of proteolytic enzyme-mediated weakening of the foetal membranes in the region of the cervix or the lower uterine segment.⁽¹⁴⁾

Risks of PROM include risk of subclinical chorioamnionitis, increased likelihood of operative delivery, increased incidence of marginal cord insertion, and battle door placenta, which itself is associated with retained placenta and both primary and secondary postpartum haemorrhage. Risk of abruptio placentae is 4-7%, postpartum endomyometritis is 10%, and there is also risk of maternal pyelonephritis.⁽⁴⁾ Reported incidence of neonatal sepsis is 2-4%. Foetal hypoxia may occur due to cord prolapse, cord compression, and abruptio placentae. Due to reduced volume of amniotic fluid, mechanical difficulties may occur in delivery resulting in neonatal morbidity. Additionally, prematurity, sepsis and respiratory distress syndrome (RDS) can also occur.⁽⁵⁾

The Traditional Minimally Invasive 'Gold Standard' for the Clinical Diagnosis of ROM relies on the ability of the Clinician to Document Two of Three Clinical Signs

- Visual 'pooling' of clear fluid in the posterior fornix of the vagina or leakage of fluid from the cervical os at the time of first sterile speculum examination;

- An alkaline pH of the cervicovaginal discharge ('Nitrazine test'); and/or;
- 'Ferning' of the cervicovaginal discharge on drying.

The management strategies of PROM at term were diverse and controversial. Despite the extensive research and studies done in this field, there was still no universally accepted policy for the management of PROM at term and management varies between immediate induction and awaiting a certain period of time.⁽⁶⁾

Currently available evidence supports the induction of labour when PROM occurs at term to decrease the risk for maternal infections.^(2,6) Expectant management carries high risk of maternal and neonatal infection as the latent period lengthens along with increased risk of umbilical cord compression and abruptio placentae. However, the main aim should be to deliver the baby before the signs of chorioamnionitis appear. Expectant management, also prolonged hospital stay maybe associated with worsening of perinatal outcome.⁽¹⁵⁾

The present study was undertaken to identify the risk factors and to study the labour outcomes and the maternal and perinatal morbidity and mortality in cases of PROM managed with early induction.

In our study, majority of the patients (54.7%) were in the age group of 21-25 years followed by 25.3% of patients in the age group of 26-30 years. Similar distribution was also seen in the study by Amjad et al⁽³⁾ Most of the cases (74.7%) were unbooked similar to the study by Jolly et al⁽¹⁶⁾ Most of the cases were booked elsewhere and ours being a referral centre, these cases were referred after membrane rupture and 62.7% of our patients belong to low socioeconomic class and their level of awareness and compliance were very low and that could partly explain the reason for such a high incidence of the unbooked cases in our study. Similarly, the low incidence of PROM in the booked cases in our study could be explained by good and regular antenatal checkups, identification of high risk cases, prediction of PROM in those cases, and appropriate management including early induction.

Our study had revealed that PROM occurs more frequently in nulliparous women (57.3%). Similarly, Fatehmeh et al⁽¹⁷⁾ and Hassan et al⁽¹⁸⁾ in their study had reported the incidence of PROM in nulliparous women as 59.7% and 50%, respectively. The major risk factors were low socioeconomic class (62.7%) and primiparity (57.3%). Other risk factors were genitourinary infection in current pregnancy (16%), history of abortions (14.7%), recent coitus (10.7%), previous history of PROM (8%), malpresentations (6.7%), and multiple gestation (1.3%).

Ladfors et al had suggested that differences in risk factors between the studies could be attributed to differences in the populations in which they were studied.⁽¹⁹⁾ Low socioeconomic class as a risk factor for PROM had been reported in many studies.^(18,20,21) The reason for a high incidence in our study could be explained by the fact that our hospital services were meant for managing poor patients.

Ladfors et al had suggested primiparity as one of the major risk factor for PROM.⁽¹⁹⁾ Fatehmeh et al⁽¹⁷⁾ and Hassan et al⁽¹⁸⁾ had reported the incidence as 59.7% and 50% respectively. Genitourinary infection in current pregnancy as another risk factor had been reported in many studies.^(3,20,22)

Linn et al⁽¹⁰⁾ and Harger et al⁽²³⁾ had found an association between a previous elective abortion or a previous dilatation and curettage and PROM. Naeye et al⁽²⁴⁾ and Mills et al⁽²⁵⁾ had observed sexual intercourse as a major risk factor for PROM. Ladfors et al⁽¹⁹⁾ Romero et al⁽²²⁾ and Harger et al⁽²³⁾ had concluded PROM in a previous pregnancy as one of the major risk factors. More than 65.3% of the patients had more than one risk factors and this finding was supported by Hassan et al⁽¹⁸⁾ and Ladfors et al⁽¹⁹⁾

All the patients had an alkaline vaginal pH. Jolly et al⁽¹⁶⁾ and Erdemoglu et al⁽²⁶⁾ had reported that the sensitivity and specificity of this test in diagnosing ROM ranges from 90 to 97% and 16 to 70%, respectively.

Incidence of LSCS (44%) and instrumental delivery (28%) were higher when compared to normal vaginal delivery. Frequency of operative deliveries had been reported as 48.4% by Grant et al⁽²⁷⁾ as 39.2% by Hannah et al⁽²⁾ and 32% by Hassan et al⁽¹⁸⁾ Non-reassuring foetal heart rate (54.5%) was the most common indication for LSCS followed by cephalopelvic disproportion (27.3%), as reported by Hannah et al⁽²⁾ and Fatehmeh et al⁽¹⁷⁾

At the time of admission, majority of patients (68%) had an unfavourable cervix with Bishop score less than 6 as observed by Jolly et al⁽¹⁶⁾ and Rhydstrom et al⁽²⁸⁾ There were higher incidence of LSCS (54.9%) and instrumental delivery (27.5%) in patients with poor Bishop score as concluded by Ladfors et al⁽¹⁹⁾ and Rhydstrom et al⁽²⁸⁾ in their studies.

E. coli (42.5%) was the most common pathogen followed by commensals (17.5%). Candida was isolated in 5% of cases and coagulase-negative Staphylococci in 2.5% of cases. Imseis et al⁽²⁹⁾ had found a heavier growth in 84% of the patients and majority of growth were E. coli.

In our study, 14.7% of patients had complications with puerperal pyrexia (10.7%) as a major cause for maternal morbidity followed by wound infection (2.7%) and chorioamnionitis (1.3%). Shehla et al⁽²¹⁾ had reported the incidence of puerperal pyrexia as 44.7% and Jolly et al⁽¹⁶⁾ as 7.58%. Incidence of wound infection had been reported as 6% by Chaim et al⁽³⁰⁾ and 2% by Andrews et al⁽³¹⁾ Incidence of Chorioamnionitis had been reported as 4% by Hannah et al⁽²⁾ and 1.6% by Ottervanger et al⁽³²⁾

In our study, significant number of neonates (27.6%) required NICU observation for mild respiratory distress and 5.3% of neonates were admitted in NICU for perinatal asphyxia and 2.6% of neonates were admitted for neonatal sepsis. There were no perinatal deaths. Hannah et al⁽²⁾ Seaward et al⁽⁴⁾ and Ladfors et al⁽¹⁹⁾ had found the rate of neonatal infection as 2.0-3.0%, which is similar to our figures. Hassan et al⁽¹⁸⁾ had reported perinatal asphyxia in 8.6% of babies following PROM.

In our study, majority (80%) of the patients had their latency period <12 hours, 14.7% of patients had between 12-24 hours, and 5.3% of patients had more than 24 hours. It was clearly evident that infections have increased with increasing period of latency with puerperal pyrexia occurring in 45.5% of patients with latency period between 12-24 hours and 25% of patients with latency period more than 24 hours. Neonatal sepsis was not seen in neonates delivered within 24 hours of latency, but seen in 50% of neonates when latency exceeds 24 hours. Ladfors et al⁽³³⁾ and Yancey et al⁽³⁴⁾ in a stepwise logistic regression analysis had found a

significant association between clinical sepsis and latency period.

The early induction of patients in our study by reducing the duration of latency had contributed for the reduction in the incidence of infectious complications. Maternal infectious morbidity as measured by the incidence of chorioamnionitis was lowest in deliveries managed by immediate oxytocin induction. The delayed induction was associated with an increase of neonatal infectious morbidity.⁽³⁵⁾

Age	No. of Cases	%	't' value	Significance
≤20 yrs.	13	17.3	25.559	0.000
21-25	41	54.7		
26-30	19	25.3		
31-35	2	2.7		
≥35	0	0		

Table 1: Age-Wise Distribution

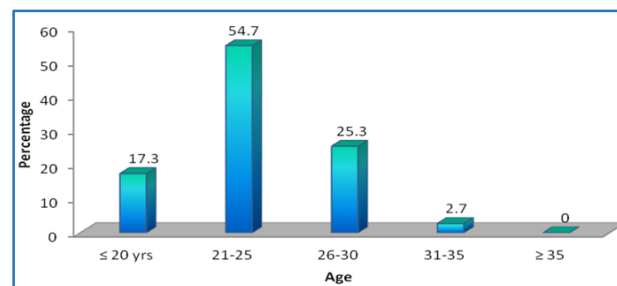


Fig. 1: Age-Wise Distribution

ANC	No. of Cases	%	't' value	Significance
Booked	19	25.3	34.547	0.000
Unbooked	56	74.7		

Table 2: Relation to Antenatal Care (ANC)

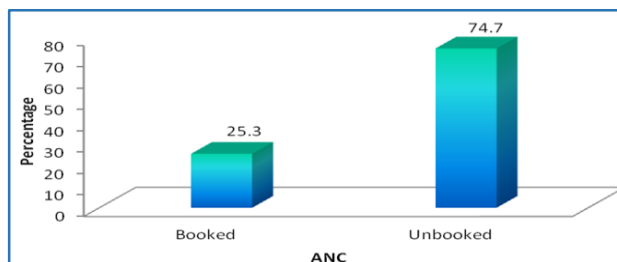


Fig. 2: Relation to Antenatal Care (ANC)

Gravida	No. of cases	%	't' value	Significance
Nulliparous	43	57.3	24.814	0.000
Multiparous	32	42.7		

Table 3: Parity-Wise Distribution of Cases

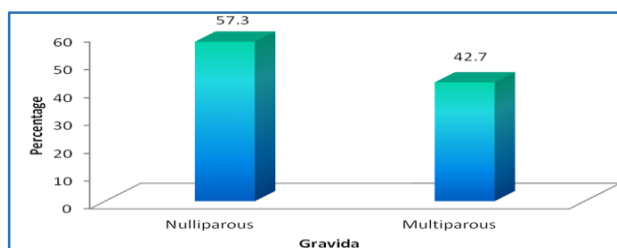


Fig. 3: Parity-Wise Distribution of Cases

Risk Factors	No. of Cases	%	't' value	Significance
Low socioeconomic class	47	62.7	12.447	0.000
Primigravida	43	57.3		
Breech	5	6.7		
H/O recent coitus	8	10.7		
Previous H/O prom	6	8		
Abortions	11	14.7		
Genitourinary infections	12	16		
Polyhydramnios	0	0		
Twins	1	1.3		
Unknown	7	9.3		

Table 4: Risk Factors for PROM

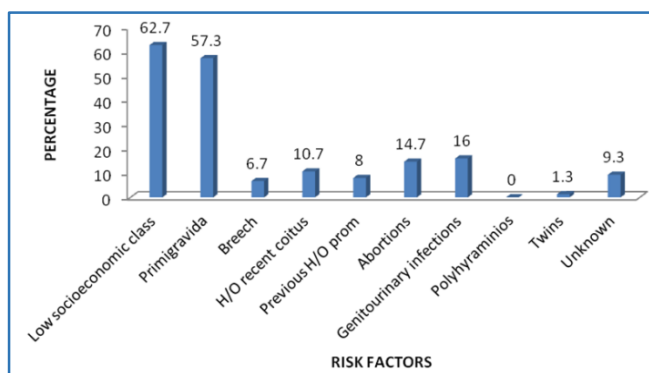


Fig. 4: Risk Factors for PROM

Bishop Score	No. of cases	%	't' value	Significance
<6	51	68	24.342	0.000
>6	24	32		

Table 5: Bishop Score at Admission

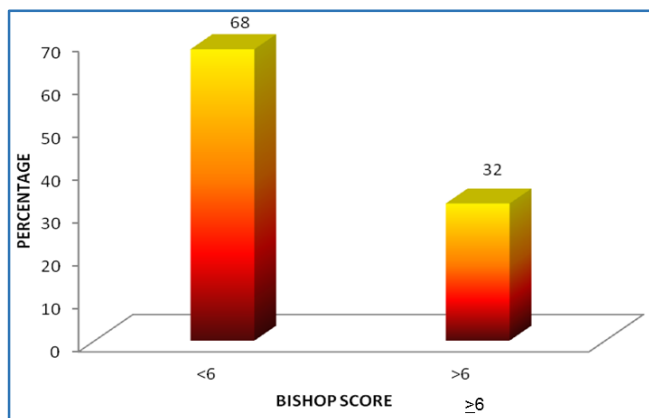


Fig. 5: Bishop Score at Admission

Vaginal pH	No. of cases	%
Acidic	0	0.00
Alkaline	75	100

Table 6: Vaginal pH

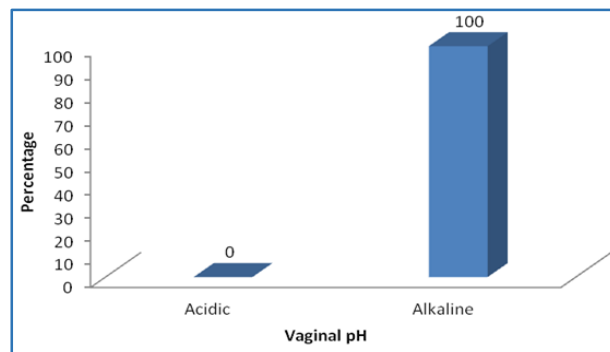


Fig. 6: Vaginal pH

Mode of Delivery	No. of Cases	%	't' value	Significance
Full-term vaginal delivery with RMLE (FTVD with RMLE)	18	24.0	17.821	0.000
Assisted breech extraction	3	4.0		
Outlet forceps delivery with RMLE	21	28.0		
Vacuum Delivery	0	0.0		
LSCS	33	44.0		

Table 7: Mode of Delivery

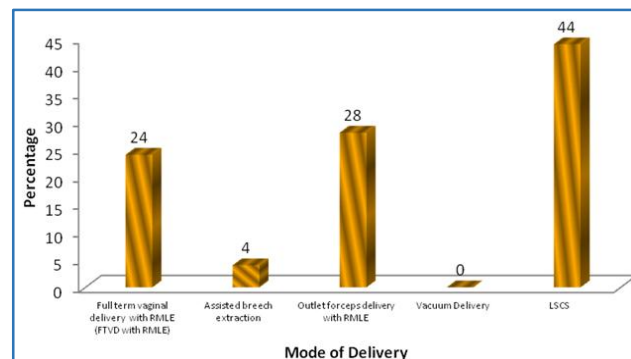


Fig. 7: Mode of Delivery

Total No. of cases 33

Indications	No. of cases	%	't' value	Significance
Non-reassuring foetal heart rate	18	54.5	7.837	0.000
Previous LSCS with PROM	1	3.0		
Failed induction	2	6.1		
Breech	2	6.1		
CPD	9	27.3		
Twin	1	3.0		

Table 8: Indications for LSCS.

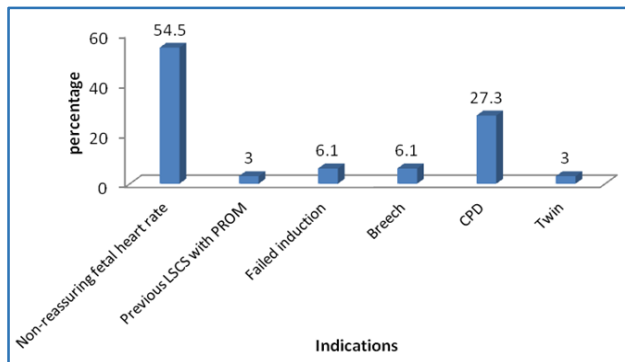


Fig. 8: Indications for LSCS.

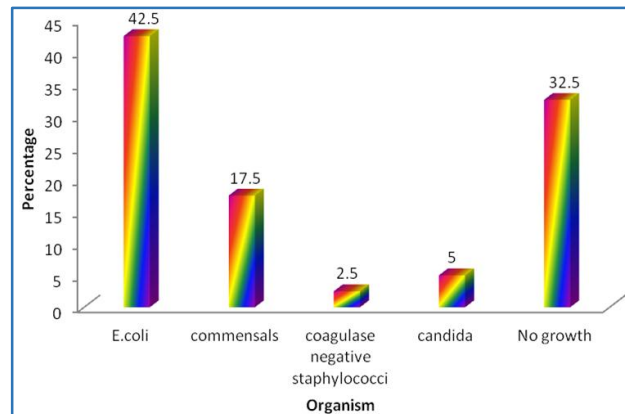


Fig. 10: Amniotic Fluid Culture from Suspected Cases

Mode of Delivery	Bishop score		Chi-square value	Significance
	<6	≥6		
FTVD with RMLE	8 (15.7%)	10 (41.7%)	10.569	0.015
Assisted breech extraction	1 (2%)	2 (8.3%)		
Outlet forceps delivery with RMLE	14 (27.5%)	7 (29.2%)		
Vacuum Delivery	0 (0%)	0 (0%)		
LSCS	28 (54.9%)	5 (20.8%)		

Table 9: Relation of Bishop Score on Admission to Mode of Delivery

Complications	No. of cases	Percentage	't' value	Significance
Puerperal pyrexia	8	10.7	32.874	0.000
Chorioamnionitis	1	1.3		
Wound infection	2	2.7		
No complications	64	85.3		

Table 11: Maternal Morbidity

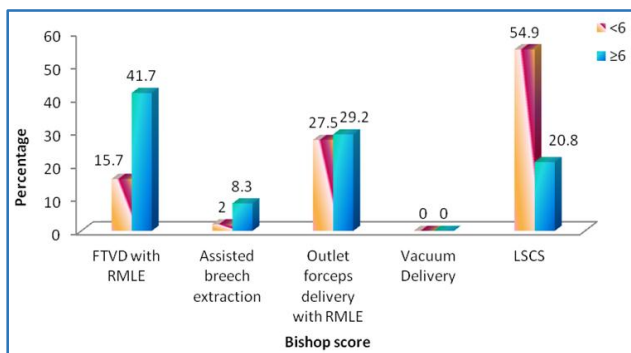


Fig. 9: Relation of Bishop Score on Admission to Mode of Delivery

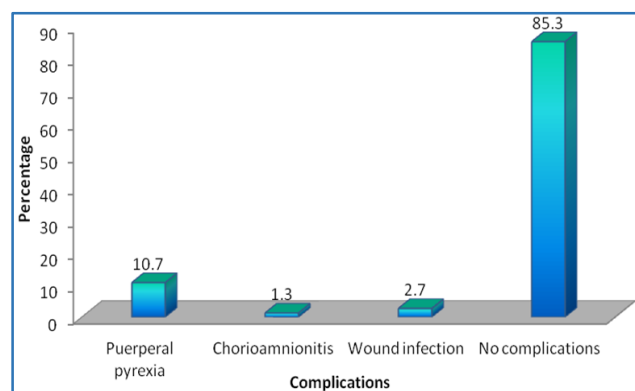


Fig. 11: Maternal Morbidity

Total No. of cases 40

Total no of cases 76

Organism	No. of Cases	%	't' value	Significance
E. coli	17	42.5	9.459	0.000
Commensals	7	17.5		
Coagulase negative staphylococci	1	2.5		
Candida	2	5.0		
No growth	13	32.5		

Table 10: Amniotic Fluid Culture from Suspected Cases

Complications	No. of cases	Percentage	't' value	Significance
Neonatal sepsis	2	2.6	41.178	0.000
Perinatal Asphyxia	4	5.3		
Neonatal deaths	0	0		
NICU observation	21	27.6		
No complications	49	64.5		

Table 12: Neonatal Morbidity and Mortality

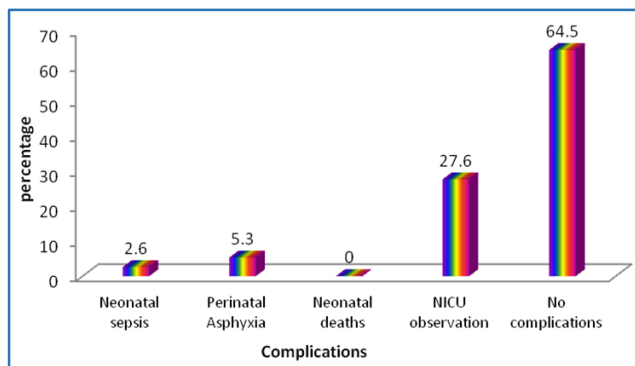


Fig. 12: Neonatal Morbidity and Mortality

No of Patients	Duration of PROM (Latency)			Chi-square value	Significance
	<12 hrs.	12-24 hrs.	>24 hrs.		
	60 (80%)	11 (14.7%)	4 (5.3%)	7.104	0.130
Puerperal pyrexia	2 (3.3%)	5 (45.5%)	1 (25%)		
Chorioamnionitis	0	1 (9.1%)	0		
Neonatal sepsis	0	0	2 (50%)		

Table 13: Relation of Duration of Rupture of Membranes with Maternal and Neonatal Infectious Complications

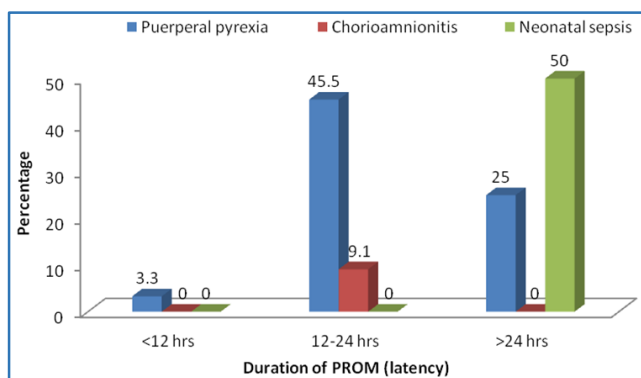


Fig. 13: Relation of Duration of Rupture of Membranes with Maternal and Neonatal Infectious Complications

CONCLUSION

PROM at term occurs more frequently in nulliparous women of low socioeconomic class. Genitourinary infection in current pregnancy, history of abortions, recent coitus, previous history of PROM, malpresentations, and multiple gestation were identified as other risk factors.

Incidence of LSCS and instrumental delivery were higher with non-reassuring foetal heart rate as the most common indication for LSCS. There were significant maternal and neonatal morbidity, but no mortality. Infections have increased with increasing period of latency.

Thus to conclude, overall incidence of maternal and neonatal infectious complications were very less in our study that could be explained by good antenatal care, good intrapartum management, sterile speculum examination, minimal digital cervical examination, antibiotic prophylaxis, and last but not the least, early induction of patients in our study by reducing the duration of latency had contributed for

the reduction in the incidence of infectious complications and maternal and perinatal morbidity.

However, further extensive comparative studies are needed to validate our conclusion.

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