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Bacteriological profile of Premature rupture of membranes (PROM) in preterm pregnant women: A cross sectional study in Dr. Prabhakar Kore Charitable Hospital, Belagavi, India

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Abstract
Background: Premature rupture of membranes is the Preterm Premature rupture of membranes (PPROM) is the rupture of amniotic membranes before the onset of labour prior to 37 weeks gestation. PPROM complicates 3.5% to 5% of pregnancies. There are several risk factors which precipitate PPROM. The commonest risk factors are vaginal infection, short cervix, urinary tract infections. Some common complications seen in Preterm PROM are delivery within one week, cord compression, respiratory distress syndrome, abruptio placenta. Since all patients with PPROM have to be screened for vaginal infections as initiating antibiotics is an important aspect in the management. This study aims to assess the bacteriology involved in PPROM in this centre.
Aim & Objectives: To determine bacteria isolated from PPROM and the antibiotic sensitivity of the isolates.
Materials and Methods: This is a Cross-sectional study conducted on 60 pregnant women with PPROM who got admitted in labour room of KLE Dr. Prabhakar Kore Charitable Hospital. PPROM was confirmed by nitrazine paper and sterile speculum examination. Under aseptic conditions high vaginal swabs were collected.
Result: In this study 57% of the deliveries were through cesarean section. 30% of deliveries included in this study occurred within 24 hours. Bacteria isolated were *Enterococcus faecalis* (39%), *Escherichia coli* (28%), *Klebsiella pneumonia* (13%), *Staphylococcus aureus* (11%), *Proteusmirabilis* (6%), *Pseudomonas aeruginosa* (4%). Imipenem showed (94%) sensitivity to gram negative bacteria isolated and Linezolid showed sensitivity to (77.7%) of Gram-positive isolates compared to other antibiotics.
Conclusion: Vaginal infection is an important risk factor for PPROM and preterm labour. Patient with risk need to be monitored closely and correct treatment need to be given to manage PPROM reducing the chances of morbidity and mortality.

Keywords: RDS-Respiratory distress syndrome, PPROM-Preterm premature rupture of membrane, VLBW-Very low birth weight, CC – Cord compression

Introduction
Preterm births contribute to significant maternal and perinatal morbidity and mortality worldwide [14]. The burden of preterm births on the medical management team and the family is huge. 15 million preterm babies are born every year before 37 completed weeks. In most low and middle income countries like India, infections are a leading cause of preterm births. Among the various causes of preterm births, PPROM accounts to about 40% of all preterm births [3]. PPROM is defined as the rupture of membranes before 37 weeks of gestation. It complicates around 8% of all the pregnancies [1]. The etiology of PPROM is multifactorial with cervico-vaginal infections being the most important [4]. Intrauterine infection is also cited to be one of the important cause of PPROM [10] Some common complications seen in preterm PROM are: Delivery within one week (50-75%), respirat0ry distress syndrọme (35%),“ chorioamnionitis(13-60%), abruptio placentae (4-12%),” intrauterine fetal death (1-2%). Management of preterm births presents a significant problem obstetrician and neonatologist [12].
The fetus and amniotic cavity are at risk of infection when the pathogens gain access when:
1. Vaginal flora gets migrated upwards into the amniotic cavity.
2. Placenta infected by hematọgenous spread.
3. Iatrọgenic introduction due to invasive”prọcedures.

4. Retrọgade flow from peritoneal cavity through fallopian tubes [10].

The patient in PPROM presents with per vaginal leak of amniotic fluid without contractions.
In pathogenesis of PPROM the role of ascending infection is that several bacterial proteases like collagenase and phospholipase play an important role to weaken the membranes. Other cause of PPROM include trauma, cervical" incompetence etc. Further colonization also causes" inflammatory response which include production, of prostaglandins, cytokines and metalloproteinases which leads to weakening of, membranes. [20] As per other studies bacterial etiology involved in PPROM are Escherichia, coli, Enterococci, Group B streptococcus, Candidal species, Staphylococcus aureus, Klebsiella [1, 2, 3, 5]. The incidence of bacterial cause in infection with PPROM in various studies done is 40-50%. [10, 17] "From India there is limited data available about the microflora involved in PPROM. Furthermore to ensure appropriate therapy, current knowledge of the organism that causes PPROM and their resistance pattern to antimicrobial agents is needed. This present study will be helpful in determining pattern and bacterial association if found in early detection, treatment and prevention of complications both in mother and the neonate.

Methodology

Ethical clearance: This study was approved by the Institutional ethical committee of Jawaharlal Nehru Medical College, KAHER. Written consent forms were provided for all patients.

Study Centre: This" study was c0ndućted at the Department 0f" Micr0biology, J N Medica1 Co11ege, KAHER Belagavi, India.

Source of data: High vaginal swab samples collected from women with PPROM admitted to labour room, which are received in the Department of Microbio1ogy of J N Medical Co11ege, from Dr. Prabhakar Kore Charitable Hospital, Belagavi.

Study design: A one year cross-sectional study.

Study period: One year (from "January" 2019 to"December"2019).

Sampling Procedure: Universal sampling.
Sample size: As per universal sampling procedure 60 patients who fulfilled the inclusion, criteria were furțher studied.

Inclusion Criteria: Women who presented to the labor room with complaints suggesting rupture of membranes before 37 weeks.

Exclusion criteria: Multiple pregnancies, Preeclampsia, Diabetes Mellitus, women already taking antibiotics for PPROM.

Microbiological analysis

High vaginal swabs were collected and each sample was inoculated on sheep blood agar and Macconkey agar. Further the plates were incubated for 24 hrs at 37 ºC. The swabs were used to make smears on the slide for microscopy and graded by lactobacillary grading and further biochemical tests were carried out.

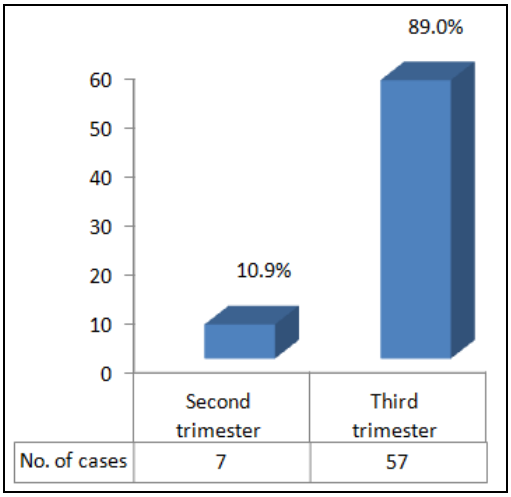
Statistical Analysis: Percentage used to know the prevalence of commonest organism and respective susceptibility pattern.

Results

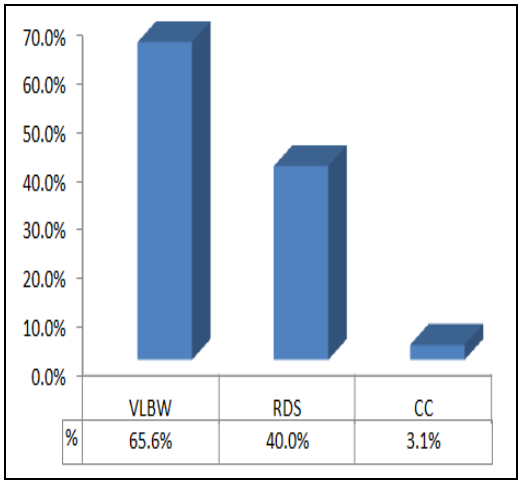
64 Pregnant women with PPROM were included in this study. The participants in this study are between the age groups of 19-35 yrs. Among the 64 women, 38 were primigravida and 26 were multigravida. 36 women delivered by CS and 28 women delivered vaginally. In most cases who underwent CS, fetal distress was the most common indication. 70% of the women were of low socio-economic status.

Table 1: Sociọdemo graphiccharacțerstics of the wọmen in study.

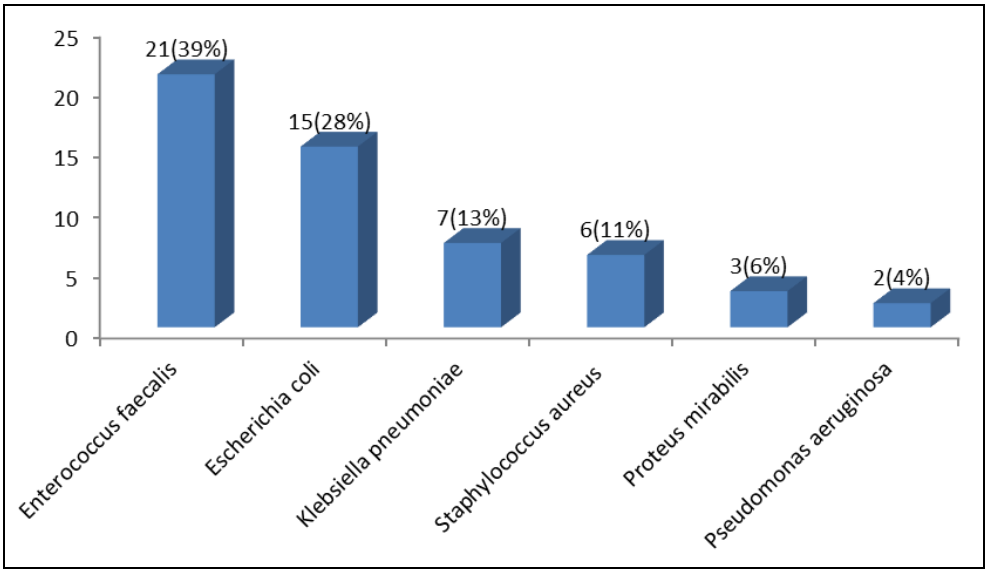
Characteristics	Cases (%) N=64
Age(years)	
18-24	48 (75%)
25-31	12(18.7%)
31-35	2 (3.07%)
Parity	
0	40(63%)
1-2	21(33%)
3-4	3(5%)
5 and above	0(0%)
Social class	
Low	45 (70%)
Middle	12 (19%)
High	07 (11%)



Graph 1: Graph showing PPR0M based on Trimester.



Graph 2: Neonạtal 0utcomẹ



Graph 3: Graph showing distribution of isolates in the study.

Table 2: The antibiotic sensitivity patterns of gram negative organisms.

	Antibiotics	Sensitivity pattern No.(%)
First line drugs	Gentamicin(GEN)	5(18.5%)
	Ampicillin (AMP)	4(14.8%)
Second line drugs	Imipenem (IMP)	22(81.4%)
	Amikacin(AK)	18(66.6%)
	Meropenem(MRP)	17(62.96%)
	Amoxyclav(AMC)	11(40.7%)
	Ciprofloxacin(CIP)	11(40.7%)
	Ceftriaxone(CTX)	10(37.0%)
	Piperacillin+Tazobactam	8(29.6%)
	Cefuroxime(CXM)	5(18.5%)
Third line drugs	Aztreonam	6(22.2%)
	Ceftazidime(CAZ)	4(14.8%)

Table 3: The antibiotic sensitivity patterns of gram positive organisms.

	Antibiotics	Sensitivity pattern (No. &%)
First line drugs	Ampicillin(AMP)	10(37.0%)
	Penicillin(P)	5(18.5%)
	Erythromycin(E)	4(14.8%)
Second line drugs	Linezolid(LZ)	19(70.3%)
	Vancomycin(VA)	15(55.5%)
	Tetracyclin(TE)	7(25.9%)
	Clindamycin	14(51.8%)
	Ciprofloxacin(CIP)	8(29.6%)

Discussion

In the present study total of 64 women with PPROM were studied within a time period of one year (2019-2020) which were between the gestational age 24 to 37weeks. A h¡ighpercentages of the case of Preterm PR0M (48%) was seen to occur between estimate̤d gestating age of 34 -36 weeks, fo1low by the case that occur between 31-33 weeks gestation which is (25%). "PPROM between" gestation 28 -30 wks was (11.6%) and between gestation 24-27 weeks was (15%). PPROM cases are most seen in women near term. Low birth weight babies (66%) were seen in most of the cases.

Maximum of deliveries occurred within 24 hours of admission. Delivery is recommended once there is ruptures of membrane and when risk of, infection outweigh the risk of premature birth. Perinatal morbidity was seen due to babies being very low birth weight (65.5%), RDS(40%) and cord compression (3.1%).

PPROM was seen common in age group below 25 years as per other studies done by Noor *et al*. and Dr. S Usha *et al*. showed 58.8% and 58%. In our study 70% of PPROM cases were seen below 25years of age. If PPROM occurs in early months of gestation it highly risks the neonate and the mother and if infection comes out to be the cause it gets difficult to manage as antibiotics show resistance to the associated organism.

Among these 64 cases Enterococcus faecalis (38.8%) was seen

to be the most predominant organism associated with PPROM followed by *Escherichia coli* (27.7%), *Staphylococcus aureus* (11.1%), *Klebsiella pneumonia* (12.9%),"*Pseudomonas aeruginosa* (3.7%) and *Proteus, mirabilis(5.6%)*". Among the studies done in India no study has yet given the championship to *Enterococcus faecalis* causing PPROM. No growth was seen in 3 cases out of 64 cases.

In a study which was conducted by Sujata S *et al*, reported *Escherichia coli* (34%) to be the commonest organism followed by *Enterococcus* (20%). A similar study conduted by Nafiseh *et al* in iran(2016), showed *Escherichia coli* (24.2%), *Staphylococcus saprophyticus* (12.5%) followed by *Enterococcus* (11.7%).

A study done by Adewumi OA *et al* showed *Klebsiella* (32.1%) as the common organism isolated.Most gram negative organisms were sensitive to Imipenem (88.8%) followed by Amikacin (66.6%), Amikacin was seen (90%) sensitive in a study done by Sujata S. in gram negative bacteria isolated. Linezolid was sensitive to (70.3%) and Vancomycin(55.5%) Gram positive isolates compared to other antibiotics in this study as compared to other studies by Sujata S *et al* show 100% sensitivity to Linezolid and Vancomycin to gram positive isolates.

Among 64 babies delivered 56% were delivered by LSCS and 44% had delivered vaginally. The similar is seen in study done by Hend S *et al*(Egypt),60% of women delivered by CS which was due to fetal distress. Indication of LSCS in PPROM in this study was due to fetal distress and severe oligohydramnios.

To reduce serious complications and to optimize perinatal outcome early, Need of correct diagnosisthat is accurate for PPROM, will allow the gestational, age and specific designed, obstetric interventions."

Limitations of this study

Further work should involve larger studies and advanced techniques to cultivate all the microflora present that are involved in PPROM.

Conclusion

64 women with PPROM were studied for isolation of bacteria involved. Infection is associated as the most common cause of PPROM. Women with PPROM should be diagnosed early and hospitalized, further follow up should be done until delivery. PPROM lead babies to be born as low birth weight and due to being preterm the babies are at high risk of morbidity and mortality. Prematurity is seen to be the cause of neonatal complications. In the present study PPROM is commonly seen in low socio-economic status, younger age group women and primigravidae. As socio-economic status plays a role, women should be told to keep good hygiene practices. Women with previous history of PPROM are at greater risk.

Our study shows *Enterococcus faecalis* (38.8%) and *Escherichia coli* (27.7%) as the commonest bacteria isolated in women with PPROM. Patient with risk need to be detected early and correct treatment of vaginal infection can reduce the chances of morbidity and mortality. Imipenem (88.8%) and Amikacin (66.6%) are seen effective against gram negative organisms and Linezolid (70.3%) and Vancomycin (55.5%) for gram positive organisms. Our results will be helpful in providing empirical treatment to PPROM patients.

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