

Research Article

Prevalence of Microorganisms Associated with Preterm Premature Rupture of Membranes in Minia University Hospital. Prospective Study



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Abstract

Background: Premature rupture of membranes (PROM) constitutes one of the major dilemmas in current obstetric practice. **Aim of the study:** detection of local dominant microorganism strains isolated from women with Preterm Premature Rupture of Membrane attending Minia Maternity University Hospital. **Patients and methods:** A Prospective laboratory-based study was carried out on 101 patients at the Department of Obstetrics and Gynecology at Minia Maternity University Hospital, Egypt from January 2023 to December 2023. **Results: The isolated strains were:** 29(28.7%) patients had E. coli, 9(8.9%) patients had coagulase negative staphylococcus, 23(22.8%) patients had Staphylococcus aureus, 26(25.7%) patients had Klebsiella pneumoniae, 16(15.8%) patients had Acinetobacter baumannii, 1(0.99%) patient had Enterococcus spp, 7(6.9%) patients had non-hemolytic streptococci and 5(4.95%) patients had no growth after 48h incubation. 40(39.6%) Patients had Gram positive bacteria while 71(70.3%) had Gram negative bacteria. The mean of duration of PPROM was 9.7 with SD 16.8. **Conclusion:** Various vaginal infections pose a risk of preterm premature rupture of membranes (PPROM) and negative effects for both the mother and the newborn. The predominant microbiological growth in the culture of the vaginal swab consisted of Gram-negative bacteria, Gram-positive bacteria, E. coli, Klebsiella pneumoniae, and Staphylococcus aureus.

Keywords: Microorganisms, Premature Rupture of Membranes, Maternal Outcome

Introduction

Premature rupture of membranes (PROM) is a significant challenge in obstetric practice. Premature rupture of membranes, or PROM, is the term used to describe the rupture of the amniotic sac before the start of labor. PPROM is the term used to describe the premature rupture of membranes that happens before 37 weeks of gestation^[1]. It occurs in 1-4% of all pregnancies and is linked to 30-40% of all preterm births.^[2,3]

Potential risk factors for preterm premature rupture of membranes (PPROM) are:

infection, prior history of PPROM, smoking, low socioeconomic status, maternal nutritional deficiency, previous cervical conization, second and third trimester bleeding, previous episodes of preterm contractions, amniocentesis, polyhydramnios, sexual activity, specific connective tissue disorders, and genital and multiple gestations. The precise reason is uncertain and complex, but it is multifactorial, including the unique structure of the fetal membranes, protective elements, and risk factors that contribute to preterm premature rupture of membranes (PPROM).^[4] Intraamniotic infection is a

significant factor in 50-70% of cases of preterm premature rupture of membranes (PPROM). There is a strong connection between infection and the rupture of membranes before labor, which provides a explanation for at least one theory of premature rupture of membranes (PROM)^[5, 6].

The aim of this study was the recognition of local dominant microorganism strains isolated from women with Preterm Premature Rupture of Membrane attending Minia Maternity University Hospital.

Patients and Methods

This was a Prospective study was carried out on 101 individuals at the department of Obstetrics and Gynaecology at Minia Maternity University Hospital, Egypt from January 2023 to December 2023.

Inclusion criteria: All patients admitted to the hospital and confirmed diagnosis of PPRM from GA from 24 wk to 36+6 wk, singleton fetus and not in labor.

Exclusion criteria: Patients who were in labor, rupture of membranes at gestational age <24 or > 37 weeks of gestation, fetal congenital anomalies, multiple gestation and patients' refusal to participate in the study.

Method

All patients were subjected to:

Complete history taking: Personal history, Complaint & its duration, Menstrual history: menarche, regularity, amount, duration, cycle length and most importantly last menstrual period and obstetric history

Physical examinations

Abdominal examination

Abdominal obstetric examination to estimate the gestational age, fetal presentation, position and check for fetal heart and exclude any signs of chorioamnionitis like abdominal tenderness.

Digital examination

By using sterile gloves and only if there are symptoms and signs of preterm labour as it could introduce infection.

Microbiological culture

Specimens' collection: High vaginal swab

was taken to exclude possible infection. Precautions of High vaginal swab: The use of sterile cotton swab. In lithotomy position. Before any medical intervention including vaginal ultrasound, antibiotics, and corticosteroids.

Technique of High vaginal swab

Perform high vaginal swabs (HVS) by using a speculum to separate the walls of the vagina. Insert the swab as deeply as possible into the vaginal vault. (posterior fornix) and rolling for 6-10 seconds.

Preparation

Explain the procedure to the patient and obtain informed consent. Ensure the patient was comfortable and relaxed in a lithotomy position (lying on their back with knees bent and legs apart). Hand Hygiene: Wash hands thoroughly and put on clean disposable gloves.

Swab Collection

Gently insert a sterile swab stick into the vagina, carefully avoiding contact with the vulva, perineum, or any non-vaginal surfaces. Advance the swab stick approximately 2-4 inches (5-10 cm) into the vaginal canal until you reach the posterior fornix. Rotate the swab gently to ensure good contact with the vaginal walls and cervix. Carefully withdraw the swab without touching any non-sterile surfaces.

Processing of Specimens

All samples were collected under complete aseptic conditions to perform culture on blood and Maconeky, all plates underwent incubation at $35\pm 1^{\circ}\text{C}$ for 18:24hrs agar. In the Microbiology Laboratory, all obtained samples underwent antibiotic susceptibility testing and organism identification using standard microbiological techniques. Several typical conventional microbiological techniques, such as colony macroscopic morphology, microscopic inspection, and other biochemical assays, were used to confirm the identities of the recovered isolates. An automated identification method called Vitek® 2 (Biomérieux, France) was utilized for further identification.

Management plan

All patients with PPRM were adequately assessed and planned throughout the rest of

her pregnancy and delivery. All patients were put under conservative management as long as there were no signs of clinical or subclinical infection up to 37 weeks then offered delivery.

Conservative management was in items of: Patients counseling. Steroids to enhance fetal lung maturity prior to 34 weeks (dexamethasone 24mg within 48 hours). Fetal monitoring with daily fetal kick count and CTG. After delivery, the placenta was sent for culture and histopathology to exclude chorioamnionitis. Delivery was attended by pediatrician in all cases

Ethical Consideration

As Projects must be authorized by the local research Ethics committee (REC) in the department of Obstetrics & Gynecology

before commencement, ethical permission was sought from the department's local ethical committee, then institutional ethical Committee approval (approval No:603/2023 on 16/1/2023). The potential benefits and inconveniences of all aspects of the study were clearly stated in the patient information sheets.

Statistical Analysis

Data collection by Serial clinical examination and radiological assessment utilizing Computer software IBM SPSS (V.23; Chicago, IL, USA). Statistical tests ANOVA test and T test was used for the outcome measures. Data were expressed as numbers and percentage for qualitative variables and mean \pm standard deviation (SD) for quantitative one.

Results

Table (1): Demographic data of the studied patients (risks factors for PPRM).

	Studied patients (n=101)	
	Mean	SD
Maternal age (years)	27.18	5.82
Gravidity	3.62	2.51
Parity	1.88	1.78
Gestational age (weeks)	30.86	3.09
	No.	%
Residence		
Rural	68	67.3
Urban	33	32.7
Occupation		
Working	25	24.8
Housewife	76	75.2

The mean \pm SD of maternal age was 27.18 \pm 5.82, the mean \pm SD of gravidity was 3.62 \pm 2.51, the mean \pm SD of parity was 1.88 \pm 1.78 and the mean \pm SD of Gestational age was 30.86 \pm 3.09 and 68 of patients was rural while 33 was urban, 25 of patients was working while 76 was housewife. (Table 1)

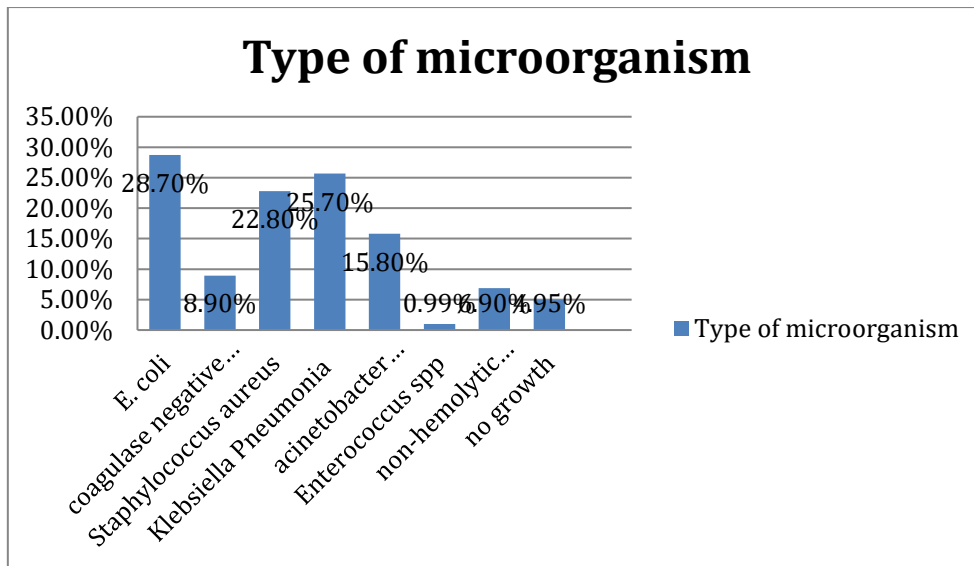


Fig. (1): Distribution of microbial growth in culture of vaginal swab in the studied patients.

This figure showed that there were 29(28.7%) patients had E. coli, 9(8.9%) patients had coagulase negative staphylococcus, 23(22.8%) patients had Staphylococcus aureus, 26(25.7%) patients had Klebsiella pneumonia, 16(15.8%) patients had Acinetobacter baumannii,

1(0.99%) patient had Enterococcus spp, 7(6.9%) patients had non-hemolytic streptococci and 5(4.95%) patients had no growth after 48 h incubation. 40(39.6%) Patient had Gram positive bacteria while 71(70.3%) had Gram negative bacteria. (figure 1)

Table (2) shows distribution of duration of PPRM (hrs) between the studied groups.

	Studied patients (n=101)	
	mean	SD
duration of PPRM (days)	9.7	16.8

ROM between the studied groups in this table showed that the mean of duration of PPRM was 9.7 with SD 16.8. (Table 3)

According to the latency period (duration between PPRM and delivery) (hrs) between the studied groups. this table

shows that the mean of the latency period of PPRM was 9.7 with SD 16.8.

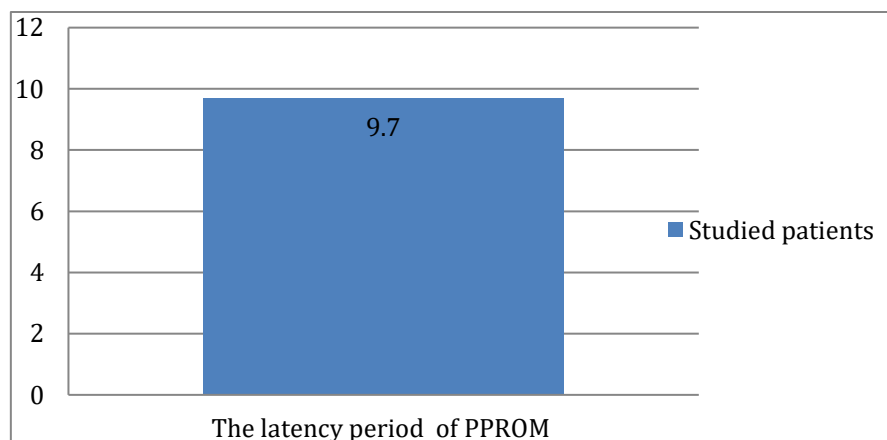


Fig. (2): Distribution of the latency period of PPRM in the studied patients.

Discussion

On a global scale, the incidence of preterm premature rupture of membranes (PPROM) exhibits minimal variation and affects roughly 1-4% of all pregnancies⁽⁷⁾. PPRM can occur in any environment. Nevertheless, developing countries experience a significant burden of maternal mortality and newborn mortalities resulting from premature births. PPRM, or preterm premature rupture of membranes, is a widely recognized condition that increases the risk of giving birth prematurely. It is responsible for around 30-40% of all cases of preterm deliveries⁽⁸⁾. Preterm births contribute to 50% of neonatal deaths and 75% of all perinatal mortality.

PROM, or premature rupture of membranes, is associated with maternal infections in 15% to 25% of cases. It also increases the risk of chorioamnionitis in 13% to 60% of cases, placental abruption in 9% to 12% of cases, and can lead to disseminated intravascular coagulopathy (DIC) and operative deliveries⁽⁹⁾.

Regarding demographic data, the current study showed that the mean \pm SD of maternal age was 27.18 ± 5.82 , the mean \pm SD of gravidity was 3.62 ± 2.51 , the mean \pm SD of parity was 1.88 ± 1.78 and the mean \pm SD of Gestational age was 30.86 ± 3.09 and 68 of patients was rural while 33 was urban, 25 of patients was working while 76 was housewife.

Comparable with the current study Mohammed et al., showed that the mean age of women with PROM was 28.7 ± 9.03 years with mean GA was 32.9 ± 12.21 weeks, and 44.1% were primigravida.^[10]

As regard microbial growth in culture of vaginal swab, the current study revealed that the most common microorganism was *E. coli* among 29(28.7%) patients followed by *Klebsiella pneumonia* among 26(25.7%) then *Staphylococcus aureus* among 23(22.8%) patients however, 5(4.95%) patients had no growth after 48 h incubation. Among the studied groups there were 40(39.6%) patients had Gram-positive bacteria while 71(70.3%) had Gram-negative bacteria.

In agreement with the current study Mohammed et al., enrolled 320 patients with PROM and revealed that *E. coli* and *S. agalactiae* were nearly equally isolated from 25.9% and 25% of PROM patients and *Staphylococcus aureus* was found in 13.9%. No aerobic pathogen was found among 15.6%. The overall Gram-positive bacteria was isolated in 66.8% of PROM participants while Gram-negative bacteria was isolated from 43.4% of them.^[10]

According to the duration of preterm premature rupture of membranes (PPROM), we found that the mean duration of PPRM was 9.7 ± 16.8 days.

Singhal et al., revealed that the mean latency period in our study group was 4.84 ± 6.55 days, 51.66% delivered within 48 hours and 14.16% remained undelivered after a week from presentation.^[11]

It was reported that PROM contributes to maternal infections (15%–25%) (15), chorioamnionitis (13%–60%), placental abruption (9%–12%), and increase risk of disseminated intravascular coagulopathy and operative deliveries.^[12]

Also, Gupta et al., performed a study on 200 pregnant women with PROM and showed that the prevalence of specific neonatal complications was as follows: birth asphyxia (8%); neonatal sepsis (4%); NICU admission (26%); and neonatal mortality (2%). Complications increased with an increasing latent period.^[13]

Limitations:

The current study was limited by small sample size, the lack for control group, being a single center study and relatively short follow up period.

Conclusion

The lack of standardized treatment for infected women is highlighted by the variance in prevalence of bacterial isolates across studies and locations. It is crucial to accurately diagnose intra-amniotic infections and provide exact medical treatment during pregnancy in order to maintain the health of both the mother and the newborn. Different vaginal infections

carry risk of PPROM and adverse maternal and neonatal outcomes. E. coli, Klebsiella pneumoniae and Staphylococcus aureus were the most common microbial growth in culture of vaginal swab.

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Conflict of Interest: Nil

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