*East African Medical Journal Vol. 92 No. 5 May 2015*
CURRENT MICROBIAL PATTERN OF PATIENTS PRESENTING WITH PRE-LABOUR RUPTURE OF MEMBRANES (PROM) AT KENYATTA NATIONAL HOSPITAL, NAIROBI, KENYA
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# CURRENT MICROBIAL PATTERN OF PATIENTS PRESENTING WITH PRE-LABOUR RUPTURE OF MEMBRANES (PROM) AT KENYATTA NATIONAL HOSPITAL, NAIROBI, KENYA

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## ABSTRACT

***Objective*: To determine the microbial pattern of patients presenting with PROM.**
***Design*: Case Control Study.**
***Setting*: Kenyatta National Hospital, labour ward, Nairobi Kenya.**
***Subject*: Fifty antenatal patients with premature Rapture of Membranes and 50 controls.**
***Results*: A total of 100 questionnaires and laboratory liquor microscopic culture and sensitivity results were analysed, 50 from the PROM group and 50 in the control group. There was no statistically significant difference in baseline social demographic and obstetric characteristics between the two groups. As for the mode of delivery 70% in PROM had SVD compared to 48% of the controls with 30% undergoing Caesarean section in PROM group and 52% of the controls. There were no complications recorded in the mothers both at and after delivery. *Escherichia coli* was the most common bacterial isolated accounting for 66.7% of bacterial isolate in the PROM group. Other isolates were *staphylococcus* species, *staphylococcus* and *streptococcus viridans*.With regard to anti-biotic sensitivity, 83.3% sensitivity to both cefuroxime and gentamicin while co-amoxiclav had 67.7% sensitivity. Among the newborns, in the PROM group 10% had Apgar score <7 with NBU admission rates of 20% and 6% respectively between the PROM and control groups respectively.**
***Conclusion*: *Escherichia coli* was the most common bacterial isolate in PROM and cefuroxime is the anti-biotic of choice where it's not possible to perform endocervical swab, cultures and sensitivity.**

## INTRODUCTION

Pre-labour rupture of membranes (PROM) refers to the rupture of foetal membranes before labour. Pre-term Pre-labour Rupture of Membranes (PPROM) is the spontaneous rupture of the membranes at less than 37 weeks gestation but at least one hour before onset of contractions (1,2). Pre-term deliveries are those that occur at less than thirty seven weeks of gestational age: however the low gestational age cut-off or that used to distinguish pre-term birth from spontaneous abortion varies by location. At KNH the lower cut-off is less than twenty eight weeks of gestation.

In spite of the advances that have been made in neonatal care over the past years, pre-term birth and pre-labour rupture of membranes have not reduced. Neonatal mortality and morbidity remains. PROM has attributed in 30-40% of pre-term birth (3,4,5). Infection has also been shown to be a leading cause of PROM. The causes of rupture of membranes in most cases are unknown but asymptomatic uterine infection is a frequent precursor (7,8).

Pre-term birth account for 75% of perinatal mortality and more than half of the long-term morbidity. The most common complication of PROM is development of intrauterine infection and pre-term labour. The greatest complication of pre-term labour is prematurity that can result in neonatal death or long-term disability (cerebral palsy, blindness, deafness) (6). The complications of infection include chorioamnionitis, maternal wound infection, and neonatal sepsis. Other complications of prolonged rupture of membranes include oligohydramnios and its attendant pulmonary hypoplasia, pneumothorax and skeletal deformity (1).Studies have shown improved neonatal and maternal outcome when anti-biotics are used in PROM. The aim of anti-biotic prophylaxis in PROM is to prevent maternal and

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infectious foetal morbidity, prolong the latency period prior to delivery and thereby reduce consequence of prematurity. The aim of the study was to delineate the bacterial patterns found in PROM and the ideal appropriate responsive anti-biotics.

## MATERIALS AND METHODS

The study was conducted at KNH labour wards and the antenatal clinics. The study participants were antenatal women with confirmed clinical diagnosis of PROM and the control group who were women at the antenatal clinic but not having PROM. The sample size was 100 and was calculation was performed using INFO version 5. The controls were recruited at the antenatal clinics and were not of corresponding gestation the PROM group. No matching of the groups was done. Exit interview of mothers attending the antenatal clinic was done by the principal investigator and the assistants to identify mothers to be recruited. The mothers recruited were those willing to participate in the study and of 32 weeks gestation and above. After explanation of the purpose of the study, consent and questionnaire were administered and a swab for microscopic culture and sensitivity taken. The participants had her details taken to facilitate follow-up on foetal outcomes at delivery and the maternal outcome. This was done sequentially until the desired sample size was attained. Data entry and analysis was done using SPSS version 13.

## RESULTS

**Table 1**
*Socio-demographic characteristics (N=100)*

| Characteristic | PROM (%) | Control (non PROM) (%) | P-Value |
|---|---|---|---|
| Age (years) | | | |
| ≤20 | 6(12.0) | 1(2.0) | |
| 21-25 | 20(40.0) | 13(26.0) | |
| 26-30 | 20(40.0) | 33(33.0) | 0.907 |
| 31-35 | 6(12.0) | 10(20.0) | |
| 35+ | 5(10.0) | 6(12.0) | |
| Education | | | |
| Primary | 11(22.0) | 9(18.0) | |
| Secondary | 26(52.0) | 21(42.0) | |
| College | 12(24.0) | 20(40.0) | |
| none | 1(2.0) | 0 | |
| Marital status | | | |
| Single | 9(18.0) | 4(8.0) | 0.834 |
| Married | 41(82.0) | 46(92.0) | |
| Employment | | | |
| Employed | 14(28.0) | 27(54.0) | 0886 |
| Unemployed | 36(72.0) | 23(46.0) | |
| Nature of employment | | | |
| Manual work | 38(76.0) | 39(78.0) | 0867 |
| Office work | 12(24.0) | 11(22.0) | |

Mean age of the study participants was 27.9 years, median 28.0 with a range of between 18 and 41 years. There was no statistical significance in the social demographic characteristics between the PROM and control groups.

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**Table 2**
*Current Obstetric History (N=100)*

| Current history | PROM | Control | P-value | Odds ratio | 95% CI |
|---|---|---|---|---|---|
| Gestation (weeks) | | | | | |
| 32-34 | 13(26.0) | 0 | | | |
| 35-36 | 9(18.0) | 7(14.0) | 0.764 | 0.92 | 0.46-1.64 |
| ≥37 | 28(56.0) | 46(86.0) | | | |
| ANC Profile | | | | | |
| Yes | 45(90.0) | 50(100.0) | 0.746 | 1.00 | 0.24-4.15 |
| No | 5(10.0) | 0 | | | |

Majority of PROM occurred at term 28(56%). While 5(10%) of the PROM group had no antenatal profile there was no statistical difference between the two groups.

**Table 3**
*Foetal Outcome*

| Outcome | Prom | Control | p-value | Odds ratio | 95% CI |
|---|---|---|---|---|---|
| Apgar score at 5′ | | | | | |
| <7 | 5(10.0) | 0 | 0.746 | 1.00 | 0.24-4.15 |
| >7 | 45(90.0) | 50(100.0) | | | |
| Birth weight (g) | | | | | |
| <1500 | 3(6.0) | 0 | | | |
| 1501-2499 | 10(20.0) | 0 | 0.851 | 1.00 | 0.45-2.22 |
| 2500-3999 | 36(72.0) | 48(96.0) | | | |
| ≥4000 | 1(2.0) | 2(4.0) | | | |
| Foetal admission to NBU | | | | | |
| Yes | 10(20.0) | 3(6.0) | 0.834 | 1.00 | 0.41-2.46 |
| No | 40(80.0) | 47(94.0) | | | |

While the PROM group had some babies with an Apgar score of less than 7 at 5 minutes none of the babies from the control group had this.Majority of the babies had birth weight more than 2500g that is 37(74%) and 50(100%) among the PROM and control group respectively.More babies were admitted to the NBU from the PROM group compared to the control group.There was no statistical significant difference between the two groups with regard to foetal outcome.

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**Table 4**
*Maternal outcomes (n=100)*

| Outcome | PROM | Control | p-value | Odds ratio | 95% CI |
|---|---|---|---|---|---|
| Mode of delivery | | | | | |
| SVD | 35(70.0) | 24(48.0) | 0.886 | 1.00 | 0.56-1.83 |
| C/S | 15(30.0) | 26(52.0) | | | |
| Complications at delivery | 0 | 0 | 0 | Undefined | Undefined |
| Complications at delivery | 0 | 0 | 0 | Undefined | Undefined |
| Duration of hospital stay | | | | | |
| 1 | 19(38.0) | 21(42.0) | | | |
| 2-4 | 15(30.0) | 28(56.0) | 0.899 | 1.00 | 0.59-1.69 |
| ≥5 | 16(32.0) | 1(2.0) | | | |

The mean duration of hospital stay for PROM was 3.2 days while that of controls was 2.6 days.Most of the PROM group delivered SVD by 35(70%) with 15 (30%) undergoing Caesarean section. On the other hand among the control group 24(48%) had SVD with 26(52%) undergoing CS.Other parameters of maternal outcome included complications at delivery (retained placenta, post-partum haemorrhage) plus complications in pueperium (fever, foul smell of lochia) however; none of these were recorded in any participant. There was no statistically significant difference between the two groups.

**Table 5**
*Gram Stain results (n=100)*

| Outcome | PROM | Control | p-value | Odds ratio | 95% CI |
|---|---|---|---|---|---|
| Gram positive | | | | | |
| Yes | 27(54.0) | 46(92.0) | 0.874 | 1.00 | 0.51-1.96 |
| No | 23(46.0) | 4(8.0) | | | |
| Gram negative | | | | | |
| Yes | 7(14.0) | 5(10.0) | 0.828 | 1.00 | 0.39-2.54 |
| No | 43(86.0) | 45(90.0) | | | |

Among the study participants, of the PROM group 27(54%) tested positive on gram stain while 46(72%) from the control group did.On the other hand 7(14%) were gram negative compared to 5(10%) of the controls. There was no statistically significant difference between the two groups.

**Table 6**
*Culture Results (n=100)*

| Outcome | PROM | Control | p-value | Odds ratio | 95% CI |
|---|---|---|---|---|---|
| Positive | 9(18.0) | 2(4.0) | | | |
| Negative | 41(82.0) | 48(96.0) | 0.822 | 1.00 | 0.38-2.64 |

When the swabs were cultured, 9(18%) of the PROM group had some growth while 2(4%) of the controls recorded some growth.There was no statistically significant difference in the culture results between the two groups.

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**Table 7**
*Culture Isolates (n=11)*

| Organism | PROM (%) N =9 | Control % N = 2 | P-Value |
|---|---|---|---|
| *Enterococcus* | 0(0) | 2(100.0) | 0.018 |
| *Streptococcus* | 1(11.1) | 0(0) | 0.818 |
| *Viridans* | | | |
| *Staphylococcus sp.1* | 1(11.1) | 0(0) | 0.818 |
| *staphylococcus* | (11.1) | 0(0) | 0.818 |
| *Aureus* | 6(66.7) | 0.181 | |
| *Escherichia coli* | 0(0) | | |

From the culture results it is noted that 6(66.7%) were *Escherichia coli* and 11(22%) of study participants had positive culture. Of the pathogenic organisms isolated 6(66.7%) were *Escherichia coli*. For the control group *enterococcus* was isolated.

**Table 8**
*Anti-biotic sensitivity pattern.*

| | | Bacteria Identified | | | | |
|---|---|---|---|---|---|---|
| | | *Entero* | *E-coli* | *strep* | *staph* | *Staph aureus* |
| Anti-biotic | Sensitivity | N=2 | N=6 | N=1 | N=1 | N=1 |
| Augmentin | Resistant | 0 | 33.3 | 100 | 0 | 0 |
| | Sensitive | 100 | 67.7 | 0 | 100 | 100 |
| Amoxicillin | Resistant | 0 | 0 | 100 | 0 | 0 |
| | Sensitive | 100 | 0 | 0 | 100 | 100 |
| Gentamycin | Resistant | 0 | 16.7 | 0 | 0 | 0 |
| | Sensitive | 100 | 83.3 | 100 | 100 | 100 |
| Nitrofurantoin | Resistant | 0 | 0 | 0 | 0 | 0 |
| | Sensitive | 100 | 0 | 0 | 0 | 0 |
| Vancomycin | Resistant | 0 | 0 | 0 | 0 | 0 |
| | Sensitive | 100 | 0 | 0 | 0 | 0 |
| Ciprofloxacin | Resistant | 0 | 0 | 0 | 0 | 0 |
| | Sensitive | 0 | 100 | 100 | 100 | 100 |
| Erythromycin | Resistant | 0 | 0 | 0 | 0 | 0 |
| | Sensitive | 0 | 0 | 0 | 100 | 100 |
| Cefuroxime | Resistant | 0 | 16.7 | 0 | 0 | 0 |
| | Sensitive | 0 | 83.7 | 100 | 100 | 100 |
| Minocycline | Resistant | 0 | 50 | 0 | 0 | 0 |
| | Sensitive | 0 | 50 | 0 | 0 | 100 |
| Ceftazidime | Resistant | 0 | 0 | 0 | 0 | 0 |
| | Sensitive | 0 | 100 | 0 | 0 | 0 |
| Ceftriaxone | Resistant | 0 | 0 | 0 | 0 | 0 |
| | Sensitive | 0 | 100 | 0 | 0 | 0 |

*Entero = Enterococcus* *E.coli= Escherichia coli* *Step =Streptococcus viridans*
*Staph= Staphylococcus* *Staph. Aureus= Staphylococcus aureus*

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As can be seen from the results above there is resistance to commonly used anti-biotics. For instance Augmentin has 100% sensitivity against *enterococcus* and *staphylococcus* while it has only 66.7% activity against *E.coli*.While ciprofloxacin has 100% sensitivity to *Escherichia coli* its use in pregnancy is contraindicated. Cefuroxime has 88.3% sensitivity while ceftriaxone has 100% sensitivity to *Escherichia coli*. Also cefuroxime has 100% sensitivity to both *staphylococcus* species and *staphylococcus aureus*.

## DISCUSSION

In this study, one hundred participants were recruited, with fifty in the PROM group and similar number in the control group. The mean age of the participants was 27.9 years, median 28.0 with a range of between 18 and 41 years. There was no statistical significance in the socio-demographic characteristics between the two groups.Studies have linked low socio-economic status with higher incidence of bacterial vaginosis that predisposes to PROM(7,8). However this was not seen in this study.

The bacterial isolated in this study were *Escherichia coli*, *streptococcus viridans*, *staphylococcus* species and *staphylococcus aureus*. Released epidemiological data demonstrate an association between colonisation of the genital tract by group *B streptococci*, *chlamydia trachomatis*, *Neisseria gonorrhea* and other organisms causing bacterial vaginosis (*Gardnerella vaginalis*, *Mobiluncus* species, genital *mycoplasma*) and increased risk of PROM (7,8). The identification of pathogenic microorganism in human vaginal flora soon after membrane rupture lends credence to the concept that bacterial infection may have a role in the pathogenesis of PROM (9).

When the isolates were subjected to anti-biotic sensitivity, co-amoxiclavhad a sensitivity of 66.7% to *E.coli;* Gentamycin had sensitivity of 83.3% while Cefuroxime had83.3% sensitivity. Ceftriaxone had 100% sensitivity to *E.coli* but its use is contraindicated in pregnancy.Various studies have looked at role of anti-biotics in the presence of PROM. The largest being the oracle study that compared use of Co-amoxiclav and Eryhromycin. The former was associated with high incidence of necrotising Enterocolitis. Thus it recommended the use of erythromycin (10). From the findings of this study we recommend cefuroxime as the drug of choice where microscopic culture and sensitised cannot be performed. In regards to maternal and foetal outcomes, the Cochrane reviews looked at various studies with varied interventions(11,12). In the Cochrane reviews, foetal outcomes looked at Apgar score<7 at five minutes, admission to newborn unit and also the lengthof NBU stay. From the Cochrane review,Apgar score <7 at five minutes RR 0.98 (95%CI 0.28, 3.34). These are similar to the parameters in this study, where among the PROM group, 5(10%) had Apgar score <7 at five minutes while the control group had Apgar score >7 at five minutes in 100% of the group. In this study, with regard to Apgar score OR 1.00 (95%CI 0.24, 4.15). As for Newborn unit (NBU) admission 10% of babies in the PROM group were admitted as compared to 6% of controls. The main indication for NBU admission was respiratory distress syndrome. As for birth weight, 36(72%) of the PROM and 48(96%) of the control group had birth weight above 2500g. There was no statistically significant difference between the two groups in terms of Apgar score at five minutes, birth weight and admission to NBU with P-values of 0.746, 0.851 and 0.834 respectively.

As for maternal outcomes, mode of delivery and complications during and after delivery were considered here. In the Cochrane review, various aspects of maternal outcome considered included suspected *chorioamnionitis*, operative delivery, Caesarean section, internal foetal monitoring, epidural analgesia, post-partum haemorrhage, length of hospital stay and some more. Use of anti-biotics statistically significant resulted in statistically significant reduction in endometritis, and maternal & neonatal hospital stay (12). In the PROM group 35(70%) delivered SVD while in the control group 26(52%) were delivered by Caesarean section. There were no recorded complications at and after delivery. The duration of hospital stay was also considered with PROM group staying mean 3.2 days while control stayed 2.6 days. There was no statistically significant difference in the mode of delivery between the PROM and control groups.

In conclusion , there was no difference in the social demographic features to the two groups. The mean age was 27.9 years. There was no statistically significant difference in foetal and maternal outcome between the PROM and control groups. *Escherichia coli* was the most commonly isolated organism in PROM. Cefuroxime were found to be the most sensitive to organisms isolated and is recommended in PROM. Regular institution assessment of antimicrobial resistance pattern is recommended, to advice on choice of anti-biotics to use.

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