Effect of Maternal Colonization with History of Prolonged Rupture of Membrane on Neonatal Colonization and Early Onset Sepsis

M. Hanif Memon[1], Shahina Hanif[2], Farhan Saeed[3], Muhammad Iqbal[4], Muhammad Athar Khan[5], Fatima Siraj[6], Aisha[7]

Abstract

Objective: To determine the effect of maternal colonization with history of PROM on neonatal colonization and early onset sepsis.
Methods: A descriptive cross-sectional study was carried out at a single tertiary care hospital of Karachi from June 1st 2018 to May 31st 2019. A total of 155 patients' full-term new-borns between 37 to 41 weeks of gestation with history of rupture of membranes more than 18 hours duration was selected by convenience sampling method. High vaginal swab was collected of all full-term pregnant women with history of PROM. After delivery of their new-borns, all babies were kept in nursery under closed observation for 72 hours duration and their blood cultures, CRP (C- Reactive Protein) and CBC (complete blood count) was sent within 24 hours of delivery.
Results: In our study, out of 155 PROM cases 58 (37.4) were growth positive and 50 (32.3) neonates had positive blood C/S at delivery. Out of 58 cases with suspected growth positive PROM mothers 51 had gram negative organisms in HVS while only 7 mothers were gram positive in HVS. Of all neonates with positive blood C/S at delivery 44 cases were gram negative organisms in their blood.
Conclusion: In our study organisms found in high vaginal swab of mother are similar to the organisms found in the blood culture of their new-born with early onset sepsis.
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Introduction

Rupture of membranes more than 18 hours earlier is defined as Prolonged Rupture of Membranes (PROM)[1]. It is associated with tenfold increase in neonatal infections[2] and is a common reason for hospital admission and antibiotic treatment[3,4]. The risk of mortality and morbidity in fetus and neonates are significantly affected by duration of latency and gestation at PROM[5]. The incidence of PROM was 12.6 per 1000 live births[6].

The most significant risk of term PROM is intrauterine infection in mothers which increases with the duration of rupture of membrane. Fetal risks include umbilical cord compression and ascending infection[7]. The pathogens most commonly involved in maternal genital colonization in Europe, Australia and United States of America are group B Streptococci (GBS), Listeria monocytogenes and Escherichia coli (E.coli) and are equally the most involved pathogens of sepsis in neonates including those born with history of PROM.[6] Neonatal sepsis is classified as early-onset during the first 72 hours and late-onset neonatal sepsis after 72 hours[8].

Management of infants born to mothers with PROM proves to be a dilemma in the absence of

[1,3,4]Department of Paediatrics,
Liaquat College of Medicine & Dentistry
[2]Department of Paediatrics, United Medical & Dental College
[5]Department of Community Medicine,
Liaquat College of Medicine & Dentistry, Karachi
[6]Final Year MBBS student,
Liaquat College of Medicine & Dentistry, Karachi
[7]Private General Practitioner

Correspondence: Dr. Farhan Saeed
Department of Paediatrics,
Liaquat College of Medicine & Dentistry
Email: dr.farhansaeed21@gmail.com
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early specific and sensitive diagnostic tools for neonatal sepsis, especially for asymptomatic neonates at birth[9]. In countries with low and middle-income, antibiotics are given routinely to term neonates whose mothers have prolonged rupture of membranes, but this may unnecessarily expose many new-borns to the untoward effects of antibiotics[10]. In this scenario investigation mainly CBC and CRP should be used to guide decisions. The utility of CBC in predicting those with sepsis has been investigated and proven unreliable[11]. This study contributes to avoid under treatment with antibiotics in laboratory positives but asymptomatic patients, and to avoid unnecessary use of antibiotics in asymptomatic and laboratory negative patients. In this way protect the new born from adverse effect of antibiotics and to cut unnecessary cost burden from low income countries like Pakistan.

The objective of this study was to determine the effect of maternal colonization with history of PROM on neonatal colonization and early onset sepsis.

Subjects and Methods

A descriptive cross-sectional study was conducted at a single tertiary care hospital of Karachi from June 1st 2018 to May 31st 2019 after the ethical approval from hospital ethical committee. Sample size was calculated by Open Epi version 3 using 95% confidence level, 10% frequency of PROM in all pregnancies. The required sample after adjustment or 10% non-response was 155. A total of 155 patients attending the outpatient departments of hospital were enrolled using non-probability consecutive sampling after taking informed consent. The patients were interview and laboratory records were collected from the MIS department and data was recorded on a preformed proforma. All full-term new-borns between 37 to 41 weeks of gestation with history of rupture of membranes more than 18 hours duration was selected. Prolong rupture of membrane was defined as rupture of membranes more than 18 hours. Neonatal sepsis is classified as early-onset with in the first 72 hours and late-onset neonatal sepsis after 72 hours of birth. All preterm and post term new-borns, babies born with congenital malformations and history of rupture of membranes less than 18 hours were excluded from the study. High vaginal swab was collected of all full-term pregnant women with history of PROM. After delivery of their new-borns, all babies were kept in nursery under closed observation for 72 hours duration and their blood cultures, CRP (C-Reactive Protein) and CBC (complete blood count) was sent within 24 hours of delivery. Results were expressed as mean ± SD for numerical variables and frequency (%) for categorical variables. Categorical data were compared using chi-square test. $p< 0.05$ was considered as statistically significant. SPSS version 21 was used for data entry and analysis.

Results

There were 155 cases of pregnant women with PROM during the study period. The maternal age was 24 + 8 years. History of gestational diabetes and PIH fever were recorded in 22 (14.2), 13 (8.4) mothers respectively. Around 50 (32.3) of the mothers included was having history of fever, 101 cases (65.2%) were multigravida and 54 (34.8) were primigravida with 97 (62.6) vaginal delivery, and 97 (62.6) had >2 number of PV examination in labour room. History of clear leaking fluid was positive in 92 cases (40.6) and foul smelling of leaking fluid positive in 53 cases (34.2) Most neonates had normal respiratory rate 151 (97.4) and approximately equal in gender characteristics (male 52.9%, female 47.1%). The maternal and neonatal characteristics of the study participants are summarized in Table 1.

Out of 155 PROM cases 58 (37.4) were growth positive and 50 (32.3) neonates had positive blood C/S at delivery. Out of 58 cases with suspected growth positive PROM mothers 51 had gram negative organisms in HVS while only 7 mothers were gram positive in HVS. Of all neonates with positive blood C/S at delivery 44 cases were gram negative organisms in their blood. The commonest isolates were Escherichia coli 19 (32.8), Klebsiella pneumonia 17 (29.3) and Pseudomonas aeruginosa 15 (25.9) in vaginal swab C/S at delivery in PROM mothers while in neonates commonest organisms in blood C/S were Escherichia coli 18 (36), Klebsiella pneumonia 16 (32) and Pseudomonas aeruginosa 10 (20).

Table 1. Characteristics of study participants (n=155)

Characteristics	N (%)
Gravida	
Primigravida	54(34.8)
Multigravida	101(65.2)
History of UTI	
Positive	19(12.3)
Negative	136(87.7)
History of Gestational Diabetes	
Positive	22(14.2)
Negative	133(85.8)
History of PIH	
Positive	13(8.4)
Negative	142(91.6)
History of Fever	
Positive	50(32.3)
Negative	105(67.7)
Numbers of PV Examination in LR	
< 2	58 (37.4)
> 2	97 (62.6)
Mode of Delivery	
Vaginal Delivery	97(62.6)
Vaginal Delivery + Episiotomy	6(3.9)
C-Section	52(33.5)
Type of Leaking Fluid	
Clear	92(40.6)
Cloudy	63(59.4)
Smell of Leaking Fluid	
Foul Smelling	53(34.2)
No Smell	102(65.8)
Gender of New-born	
Male	82(52.9)
Female	73(47.1)
Respiratory Rate of New-born	
Bradypnea	2(1.3)
Tachypnoea	2(1.3)
Normal	151(97.4)
Heart Rate of New-born	
Bradycardia	3(1.9)
Normal	152(98.1)

Table 2. Lab Results of infants of mothers with PROM

Variable	N (%)
CRP >6	50(32.3)
Hemoglobin (mean +sd)	18.6 + 1.7
TLC	
Normal	106(68.4)
Leukocytosis	49(31.6)
Platelets Count	
Normal	154(99.4)
Thrombocytopenia	1(0.6)
ANC	
Normal	49(31.6)
Neutropenia	106(68.4)

Table 3. Comparison of Bacterial Growth in Pregnant Women and Neonates

	Mother HVS C/S n(%)		P-value
Newborn Blood C/S	Positive	Negative	
Positive	48(82.8)	02(2.1)	
Negative	10(17.2)	95(97.9)	<0.001
Total	58(100)	97	

Pearson Chi Square Value = 115.676

Discussion

This is a prospective study conducted to determine the organism in blood culture of neonates born to mothers with PROM (prolong rupture of membranes). PROM results in the loss of foetus normal barrier of protection and intrauterine contents from invasion of bacteria. It occurs in 10% of deliveries[12]. PROM is mostly associated with anatomic abnormalities, infections and pregnancy related factors; but cause remains unknown in certain cases[13]. Different geographical areas have difference in pathogens involved in PROM[14]. Organisms that because early neonatal sepsis are mainly found in maternal genital tract, operation theatres and in labour rooms[15].

In our study 52.9% were male which is similar to studies done by Alam MM et al[4] and Hexia et al[16] having 59.6% and 52.3% male respectively. In this study 65% mothers with PROM were multigravida whereas in study done by Semczuk et al[17] primigravida were predominant. The 58 mothers with history of PROM were positive for high vaginal swab and 86% of them new-borns were blood C/S positive.

In our study 31.6% new born were positive for both CRP and blood C/S and 68% were negative for both CRP and blood C/S in contrast study done by Manar et al[9] revealed raised CRP in 6.25% and positive blood C/S in 5.1% new born. Another study conducted by Effat et al[18] showed 76.9% new born were positive for both CRP and blood C/S. In our study 49.4% new born of mothers with PROM and more than 2 digital per vaginal examinations before delivery were positive for blood C/S in contrast study done by Usha et al[19] it was 1.7% only.

Liquor was foul smelling in 34.2% of mothers with history of PROM which is comparable with study done by Mersha A et al[20] revealed foul smelling

liquor in 41.3%. We found 45.6% vaginally delivered new-born were blood culture positive where as it 4% only in study was conducted by Alam MM et al[4]. In an Indian study 15 positive blood cultures in term new-born was 20%, where as 32.3% term new-born was found positive in our sample. In our study the pathogens derived from the genital tract of PROM mothers were predominantly gram-negative rods like E. coli, Klebsiella pneumonia and Pseudomonas while similar pathogens found in blood culture of their new-born. Similarly study of Ramesh et al[5] revealed E. coli as most common pathogen followed by Staphylococcus and Klebsiella in maternal high vaginal swab culture. In contrast to this, study done by Nafiseh et.al[21] revealed E. coli followed by Staphylococcus epidermis, enterococcus and candida albicans. Another study by Bin Zhou et al[22] revealed Staphylococcus aureus, Acinetobacter Baumanni, Klebsiella pneumonia, Staphylococcus epidermis in studies conducted in Nepal by Bhishmapokhrel[24] and Shah GS[23]. In contrast studies done by Alistair et.al[24] and Seaward [25] showed group B streptococci as predominant organism in blood culture of term new-born with maternal history of premature rupture of membranes, Enteroccusspp, Pseudomonas aeruginosa and E. Coli in neonatal blood cultures. Similarly, blood culture of preterm and term babies of mothers with history of PROM and foul-smelling liquor revealed Klebsiella, staphylococcus and Enterobacter species.

Conclusion

In our study organisms found in high vaginal swab are similar to that present in blood cultures of our new-born with early onset sepsis. Usually blood culture report taken seven days and its yield is almost 50%, whereas vaginal swab culture report is available within 48 hours. So, if a new-born delivered with history of PROM develop signs of sepsis within 48 hours after birth and we can start antibiotic according to culture and sensitivity of vaginal swab as organism colonizing birth canal of mother are responsible for early onset neonatal sepsis according to our study.

Conflict of Interest

Authors have no conflict of interests and no grant/funding from any organisation.

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