NEONATAL COMPLICATIONS OF PREMATURE RUPTURE OF MEMBRANES

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Abstract- Premature rupture of membranes (PROM) is one of the most common complications of pregnancy that has a major impact on neonatal outcomes. With respect to racial, nutritional and cultural differences between developed and developing countries, this study was conducted to detect the prevalence of neonatal complications following PROM and the role of the duration of rupture of membranes in producing morbidities and mortalities in these neonates in our hospital. Among 2357 pregnant women, we found 163 (6.91%) cases of premature rupture of the fetal membranes in Tehran Vali-e-Asr Hospital during April 2001 to April 2002. Route of delivery was cesarean section in 65.6% of women. Urinary tract infection occured in 1.8%, maternal leukocytosis and fever in 20.2% and 5.5%, chorioamnionitis in 6.1%, fetal tachycardia in 1.2% and olygohydramnios in 4.9%. Gestational age in 138 (86%) of neonates was less than 37 completed weeks. Thirty five infants (21.47%) had respiratory distress syndrome and 33 (20.245%) had clinical sepsis. Pneumonia in 6 (3.7%) and skeletal deformity in 7 (4.294%) were seen. Rupture of membrane of more than 24 hours duration occurred in 71 (43.6%) of the patients. Comparison of morbidities between two groups of neonates and their mothers according to the duration of PROM (less and more than 24 hours) showed significant differences in NICU admission, olygohydramnios, maternal fever, leukocytosis and chorioamnionitis rates ($p<0.05$). The risks of pneumonia and mortality were much higher in group with >24 hr of PROM with an odds ratio of 2.68 and 2.73, respectively. Positive blood and eye cultures were detected in 16 cases during 72 hours of age. Staphylococcus species, klebsiella, E.coli and streptococcus were the predominant organisms among positive blood cultures. Mortality was seen in 18 (11%) of neonates because of respiratory failure, disseminated intravascular coagulation, septic shock, and a single case of congenital toxoplasmosis. In this study, the prevalence of prematurity, sepsis and prolonged rupture of membrane were higher than previous studies.

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INTRODUCTION

Premature rupture of fetal chorioamniotic membranes by definition occurs before the onset of labor. Premature rupture of fetal membranes (PROM) occurs in approximately 10% of all pregnancies (1). When this event occurs before 37 weeks of gestation, it is deemed preterm premature rupture of membranes (PPROM) that has been estimated to affect 3% to 4.5% of all deliveries. The independent relationship with perinatal complications has been illusterated by Arias and Tomich, who have prospectively shown higher rates of severe neonatal morbidity in pregnancies complicated by PPROM than those caused by idiopathic preterm labor (27% versus 15.1%, $P< 0.02$). PPROM affects 32% to 40% of preterm deliveries, with 60% to 80% of these patients entering spontaneous labor within 48 hours, and the subsequent neonatal sequelae of preterm delivery ensuing (2). The fetal and neonatal morbidity and mortality risks are significantly affected by severity of oligohydramnious, duration of latency, and gestation at PROM. The primary complication for the mother is risk of infection. Complications of PROM for the fetus and newborn consist of prematurity, fetal distress, cord compression, deformation and altered pulmonary development leading to pulmonary hypoplasia and pulmonary hypertentsion. Infectious morbidities in mother, fetus and newborn have been related to both PROM and prolonged rupture of membranes. For preterm gestations with extended duration of PROM, the risk of clinically evident chorioamnionitis seems greatest in the first 72 hours, and decreases with advanced latency. Cumulative data suggest that subclinical infection may be present before PROM and is an etiologic factor in this complication (1). Racial differences have been appreciated among women with PPROM. An increased incidence has been demonstrated specifically among black patients from 5.1% to 12.5% which is contrasted with corresponding

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white groups of 1.5% to 2.2% (4). Socioeconomic parameters have not been found to directly influence the occurrence of PPROM (5).The role of smoking and sexual activity in producing PPROM are still points of some cotroversy. Deficiencies in vitamin C, copper, zinc, and overall nutritional status reflected by body mass index (BMI) have been associated with increased rates of PPROM. There seems to be a relatively strong association between vaginal bleeding and PPROM, with risk ranging between two folds and seven folds higher than control patients. Cervical parameters, multifetal preganacy, poor obstetric history, pre-existing medical conditions like maternal hypertension or diabetes and genital tract infection have been suggested to have some roles on PPROM (2). With respect to racial, nutritional, and cultural differences between developed and developing countries, this study was conducted to detect the prevalence of neonatal complications following PROM and the role of the duration of rupture of membranes in producing these morbidities and mortalities in neonates in our hospital.

MATERIALS AND METHODS

All pregnant women with their babies who had the history of rupture of membranes before labor were entered into this study from April 2001 to April 2002. Time of rupture of membranes from delivery, neonatal sepsis, pneumonia, respiratory distress, NICU admission, skeletal deformities, mortality and maternal characteristics comprising olygohydramnios, fever, leukocytosis, chorioamnionitis, urinary tract infections, fetal heart rate > 160 were recorded and the data compared in two groups ROM < 24 hrs (group 1) and ROM> 24 hrs (group2) and using Chi -square test to compare the two groups.

RESULTS

From 2357 pregnant women 163 (6.91%) were complicated with PROM. Route of delivery in 107 (65.6%) women was cesarean section. Fifty eight percent of women received antibiotic before labor and corticosteroid were used in 87(53.4%) of cases to induce fetal lung maturity. Gestational age in 138 (84.66%) infants was less than 37 weeks. Mean birth weight of these infants was 2214.7 ± 767.04 grams. The mean time for PROM was 90.1 hours. Ninety two (56.4%) cases had PROM < 24 hours and 71 (43.6%) > 24 hours. 77 (47.2%) and 86 (52.8%) of cases were female and male respectively. 32 (19.6%) of male and 23 (14.1%) of female cases had clinical sepsis (Table 1). Comparison of Neonatal intensive care unit (NICU) admission, olygohydramnios, maternal fever , leukocytosis and chorioamnionitis showed significant differences between two groups ($p<0.05$). Also the difference of mortalities between two groups was relatively significant (P= 0.053). The risks of pneumonia, NICU admission and mortality were higher in group 2 (odds: 2.68, 4.12, 2.73). Club foot in 7, developmental dysplasia of hip (DDH) in 2, nasal septal deviation in 1 and skull deformity of vertex region in 1 were the most common deformities.

Table 1. Maternal and neonatal complications in premature rupture of membranes

Complications	PROM < 24 hours	PROM > 24 hours	Total	P value	Odds ratio
Number	92 (56.4%)	71 (43.6%)	163(100%)		
Clinical sepsis	30 (18.4%)	25 (15.3%)	55 (33.7%)	0.741	1.123
Pneumonia	2 (1.2%)	4 (2.5%)	6 (3.7%)	0.405	2.68
RDS	31 (33.7 %)	24 (33.3)	55 (33.7%)	0.98	1.004
NICU admission	7 (4.3%)	18 (11%)	25 (15.3 %)	0.002	4.12
Olygohydramnios	1 (1.8%)	7 (9.85%)	8 (4.9%)	0.022	9.95
Mortality	7 (7.6 %)	13 (28.3)	20 (12.26%)	0.053	2.73
Skeletal deformity	8 (8.6%)	6 (8.45%)	14 (8.5%)	1.00	0.96
Mat. Fever	0	9 (12.67%)	9 (5.52%)	0.000	28.12
Mat. Leukocytosis	12 (13%)	21 (29.57%)	33 (20.24%)	0.011	2.8
Choriamnionitis	0	10 (14.08%)	10 (6.134%)	0.000	31.58
UTI	2 (2.2%)	1 (1.4%)	3 (1.8%)	1.00	0.64
FHR> 160	2 (1.2%)	1 (1.4%)	3 (1.8%)	1.00	0.76

Positive blood and eye cultures were detected in 16 (9.8%) cases during 72 hours of birth. From 9 (5.5%) blood cultures there were 3 klebsiella, 2 Staphylococcus aureus, 2 Staphylococcus epidermidis, 1 E. Coli and 1 Streptococcus. Sepsis was detected in 48 (34.78%) and 6 (27%) of premature and term infants, respectively. The rate of infantile sepsis was 25%, 66.66%, 36.36% and 100% in maternal chorioamnionitis, urinary tract infection, leukocytosis and fever respectively. Low Apgar score was detected in 6 infants.

DISCUSSION

Rupture of membranes before 37 weeks of gestation accounts for 20% to 40% of PROM (3). Prematurity is the most significant factor in the increased perinatal morbidity and mortality associated with PROM because delivery occurs within 7 days of PROM in over 80% cases (4). So PROM is not an independent risk factor for neonatal morbidity in preterm births. Neontal morbidity is affected mainly by prematurity itself, rather than by the occurrence of PROM (5). 84.66% of our infants were preterm which is more than two fold in other reported cases. Comparing clinical sepsis, pneumonia, RDS and mortality in two groups, there were not significant differences relating to the time of PROM from delivery, signifying that the time of PROM from delivery by itself is not an indepenent risk factor for producing neonatal morbidities. The neonatal pulmonary consequences of PPROM include congenital pneumonia which often is associated with maternal chorioamnionitis and surfactant deficiency (RDS) following preterm delivery, and pulmonary hypoplasia and pulmonary hypertention are secondary to interruption of fetal lung growth associated with loss of amniotic fluid. These three conditions may occur simultaneously in the same patient, and presenting signs of each may overlap with other confounding bedside diagnosis.The frequency of pulmonary hypoplasia following midtrimester PPROM has been reported as 0% to 24%. Kilbride et al. identified the risk of pulmonary hypoplasia as nearly 80% with early rupture of the membranes (<25 weeks getation) combined with duration of severe oligohydramnios greater than 14 days (1). In our study there was no case of pulmonary hypoplasia.

Although previous reports have suggested that prolonged PROM might accelerate pulmonary maturity, this effect has not consistently been recognized. For infants with respiratory distress, surfactant should be given as soon as possible after birth. A recent study suggests that complicted RDS cases, including those with superimposed asphyxia or infection following PROM, may benefit from earlier surfactant retreatment. In addition to RDS, severe preterm infants are at risk for other major morbidities, including intraventricular hemorrhage, necrotizing enterocolitis, retinopathy of prematurity, and chronic lung disease. Limited outcome data suggest that these complications occur at similar rates for PROM survivors as for infants born without PROM (1). In our study 33.7% of infants had RDS and the statistical difference between two groups was not significant that may support this idea.

In PROM cases deformities are significantly related to the duration and severity of oligohydramnios. The reported incidence of skeletal abnormalities in PROM series ranged from 0% to 35% (10,11). Commonly, the newborn`s feet or hands are broad and spade-like and may be somewhat edematous. In vertex presentation, the skull is elongated with molding, often with potter facies. Breech positioning, which is two to three times more frequent following oligihydramnios in early midtrimester, may result in marked fetal hip flexion contractures and hyperextention of the lower extremities with an increased risk of hip dislocation (12). In our study 8.5% of infants had skeletal defomities with club foot being the most common. Incidence of documented sepsis in the neontes born to mothers with rupture of membranes greater than 24 hours is approximately 1%. When signs and symptoms of chorioamnionitis are present the risk of proven sepsis increases to 3% to %5. When prolonged rupture of membranes accompanied with prematurity, the incidence of proven sepsis is 4-6% and in highly suspected and proven sepsis the rate is 7- 11% (6). Although the risk of neonatal sepsis is reduced after intrapartum prophylaxis, a 5% to 8% risk remains (1). Documented sepsis during 72 hours of life was detected in 5.52% of our patients and 55.8% of women received antibiotics. Our suspected cases of sepsis were 33.7% of whom 15.3% were located in group 2. Sign of infection may be difficult to assess, particularly when the newborn has been partially treated. For preterm infants it is recommended that a sepsis work-up and empiric antimicrobial therapy is started shortly after birth. Depending on the antibiotic used for maternal prophylaxis, resistant or unusual organisms may predominate as etiologic agents for neonatal sepsis. As always, treatment should be based

on local experience and upon invitro sensitivity testing of the identified organism (1).

Table 2. Comparison of morbidities between our study with the other`s

	Our study	Other`s
Incidence of PROM	6.91%	10%
Indidence of PPROM	5.85	3%-4.5%
Incidence of PPROM	84.66%	20-40%
Pulmonary hypoplasia	0%	0%-24%
RDS	33.7%	39%
Skeletal deformity	8.5%	0%-35%
Cesarean section	65.6%	59.9%
Prolonged ROM	71%	48 %
Sepsis	5.5%	3.8%

Comparison of incidence of morbidities between our study and that of others showed that prematurity, sepsis and cesarean section in our study were higher. Respecting the sample size for maternal risk factors in our study, it seems that maternal infections like urinary tract infection and chorioamnionitis appear to be much higher in group 2 and neonatal infection occurred more when maternal infection exists. Because most of the women with leukocytosis in group with PROM >24 hrs were received corticosteroid, the difference between two groups may not be reliable. Maternal colonization with group B stereptococcus (GBS) without other clinical complications carries a risk of neonatal sepsis of 0.55 to 1%, similar to the risk of uncomplicated prolonged rupture of membranes. The density of maternal and neonatal GBS colonization is an infrequent quantified but potentially important determinant of the risk of invasive disease. Light colonization may lead to infection, when accompanied by PROM (13). In our study gram negative organisms and staphylococcus species were the most prevalent agents and streptococcus species were detected in only one case. It has been suggested that inflammatory mediators may have a possible role in brain injury, even in the absence of overt sepsis. Because these inflammatory markers are elevated following PROM and preterm labor, there remain concerns that these obstetric complications may have long term neurologic consequences. This hypothesis is further supported by a recent epidemiologic study in which the risk of spastic diplegia was found to be increased in newborns whose delivery was complicated by PROM. Whether intrapartum antibiotic prophylaxis can modify these effects in PROM cases awaits further investigation (1).

With respect to our higher rate of infection and prematurity in pregnancies complicated with PROM and the probable risk of future neurologic sequela and other neonatal complications, it seems investigating about the etiologies of PROM and the type of infection in these these pregnancies is mandatory.

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