

Original Research Article

Incidence of morbidity and mortality in neonate born to mothers with premature rupture of membranes

Sumant Lokhande*, Rajendra Nistane

Department of Pediatrics, Dr. Panjabrao Alias Bhausaheb Deshmukh Memorial Medical College, Amravati, Maharashtra, India

Received: 11 August 2016

Accepted: 24 September 2016

*Correspondence:

Dr. Sumant Lokhande,

E-mail: mrsuantlokhande@gmail.com

Copyright: © the author(s), publisher and licensee Medip Academy. This is an open-access article distributed under the terms of the Creative Commons Attribution Non-Commercial License, which permits unrestricted non-commercial use, distribution, and reproduction in any medium, provided the original work is properly cited.

ABSTRACT

Background: Preterm premature rupture of membranes (PPROM) refers to PROM prior to 37 weeks of gestation. Premature rupture of membranes (PROM) is one of the most common problems in obstetrics complicating approximately 5-10% of term pregnancies. The objective of this study was to know the incidence of early onset sepsis following PROM (premature rupture of membranes) more than 18 hours, mortality among neonates born to mothers with PROM more than 18 hours.

Methods: The study was conducted in department of pediatrics, Dr. Panjabrao Deshmukh memorial medical college and hospital, Amravati. All neonates born to healthy mothers with PROM more than 18 hours during their hospital stay were studied. An allowable error sample size of 60 was calculated. Detailed birth history including resuscitation details, APGAR score and gestational age assessment were evaluated. In examination of the neonate, the pulse, respiratory rate, CFT and temperature were noted followed by systemic examination. Required investigations were done for the neonate and were followed during their hospital stay. All the details were fed into the preformed teacher-made proforma.

Results: 51.7% of the neonates were males and 48.3% were females. 65% of the total neonates were born by normal vaginal delivery and 35% were delivered by caesarean section. 53.3% of the cases had premature rupture of membranes of 18 - <24 hours duration, 38.3% cases had premature rupture of membranes of 24 to 72 hours and 8.3% cases had premature rupture of membranes of more than 72 hours. RDS was the most common clinical manifestation (36.7%) followed by septicemia (8.3%), meningitis (1.7%) and pneumonia (1.7%).

Conclusions: Premature rupture of membranes is a high-risk obstetric condition. Active management is needed to enable delivery within 24 hours of premature rupture of membranes as it offers better neonatal outcome. Morbidity increases as the duration of premature rupture of membranes increases. The incidence of neonatal infection in neonates born to mothers with PROM was 8.3%. CRP was positive in 30% of cases. Out of 60 cases 1.7% had leucopenia and 18.3% had leucocytosis. Most common organisms isolated in blood culture were staphylococcus followed by Klebsiella, E. coli, pseudomonas and coagulase negative Staphylococci.

Keywords: Neonate, Premature membrane rupture, Respiratory distress, Sepsis

INTRODUCTION

Premature rupture of membranes (PROM) is one of the most common problems in obstetrics complicating approximately 5-10% of term pregnancies.

Preterm premature rupture of membranes (PPROM) occurs approximately in 1% of all pregnancies.¹ The fetal and neonatal morbidity and mortality risks are significantly affected by duration of latency and gestation at PROM. The primary complication for the mother is

risk of infection. Complications for the newborn consists of prematurity, fetal distress, cord compression, deformation and altered pulmonary development.²

The most significant maternal risk of term PROM is intrauterine infection, the risks of which increase with the duration of membrane rupture.³ For patients with PPROM, the most likely outcome is preterm delivery within one week with its associated morbidity and mortality risks such as respiratory distress, necrotizing enterocolitis (NEC), intra-ventricular hemorrhage and sepsis.⁴

Neonatal sepsis can be divided into two main subtypes depending on whether the onset is during the first 72 hours of life or later. Early onset septicemia is caused by organisms prevalent in the genital tract or in the labor room. Early onset bacterial infections occur either due to ascending infection following rupture of membranes or during the passage of baby through infected birth canal.⁵

PROM of duration more than 18 hours is the appropriate cut-off for increased risk of neonatal infection.⁶ There are recommendations of antenatal antibiotic administration in pregnant women who had PROM ≥ 18 hours but the regimen to prevent postnatal neonatal infection still varies among institutions.⁷

The objective of this study was to know the incidence of early onset sepsis following PROM more than 18 hours and to know the incidence of mortality among neonates born to mothers with PROM more than 18 hours, and to know the incidence of neonatal infection in neonates born to mothers with history of PROM more than 18 hours who have not received antibiotics before labour.

METHODS

The period of this study was 13 months, and sample size of 60.

Inclusion criteria

All neonates born to healthy mothers with PROM more than 18 hours during their hospital.

Exclusion criteria

- Antepartum haemorrhage
- Toxaemia of pregnancy
- Medical disease in mother other than infection
- Meconium aspiration syndrome
- Rh or ABO haemolytic disease
- Major congenital malformations
- Neonates with hyaline membrane disease
- Neonates with respiratory distress requiring ventilator support
- Mother with PROM of more than 18 hours who have received antibiotics before labour.

The design of this study was prospective, observational, and cross-sectional.

Following investigations were carried out

- Hb% was estimated by automated analyser
- Total leukocyte count (TLC) estimated by automated analyser
- Differential leucocyte count (DLC) done by peripheral smear
- Band count estimated by peripheral smear
- Toxic granules estimated by peripheral smear
- CRP semi - quantitative estimation by latex agglutination technique
- Blood culture and sensitivity
- Urine analysis, urine culture and sensitivity
- Chest x-ray (if required)
- CSF analysis and head ultrasound (if required)
- Informed consent was obtained
- Data entered into set proforma
- Results tabulated.

Statistical methods

Chi-square test, mean and SD.

Chi-square test

$$\sum (O_i - E_i)^2$$

χ^2 = Where O_i is observed frequency and E_i is expected frequency

Statistical software

- SPSS 16.0 -analysis of data
- Microsoft word and Excel- generate graphs, tables, etc.

RESULTS

Out of 60 neonates, 31 (51.7%) were males and 29 (48.3%) were females. 65% of the total neonates were born by normal vaginal delivery and 35% were delivered by cesarean section. 53.3% of the cases had premature rupture of membranes of 18 - <24 hours duration, 38.3% cases had premature rupture of membranes of 24 to 72 hours and 8.3% cases had premature rupture of membranes of more than 72 hours. RDS was the most common clinical manifestation (36.7%) followed by septicemia (8.3%), meningitis (1.7%) and pneumonia (1.7%). Out of 60 cases, 52.7% neonates were asymptomatic and 47.3% were symptomatic. Neonatal morbidity was more common in preterm babies. RDS was the commonest clinical presentation in these babies.

The incidence of septicemia was 8.3%. The incidence of septicemia was more in premature rupture of membranes of longer duration.

Table 1: Distribution of cases of according to birth weight.

Weight in grams	Number of cases	Percentage
<1500	4	6.7
1500-2500	15	25
>2500	41	68.3
Total	60	100

Table 2: Distribution of cases according to duration of PROM.

Duration in hours	Number of cases	Percentage
18-<24 hours	32	53.3
24-72 hours	23	38.3
>72 hours	5	8.3
Total	60	100

The analysis shows that out of 60 mothers, 32 (53.3%) had PROM of 18-<24 hours duration, 23 (38.3%) had PROM of 24-72 hours and 5 (8.3%) had PROM of >72 hours of duration.

Out of 60 cases, 29 cases (48.3%) had morbidity. Out of that, 8 (27.6%) cases were <34 weeks old, 13 (44.8%) were born between 34 and 37 weeks. So neonatal morbidity was more common in preterm babies.

Out of 22 cases of RDS, 15 cases (25%) were of preterm gestation. Septicemia was more common in preterm babies. There was highly significant difference in morbidity among preterm (<37 weeks) and term (>37weeks). Out of 24 cases with gestational age less than 37 weeks, 21 cases (87.5%) had morbidity. 31 (51.7%) neonates were free from morbidity.

Table 3: Neonatal morbidities in relation to gestational age.

Morbidity	Gestation age in weeks			Total cases
	< 34	34-37	> 37	
RDS	5 (55.5%)	10 (66.7%)	7 (19.4%)	22(36.7%)
Septicemia	3 (33.3%)	1 (6.7%)	1 (2.8%)	5(8.3%)
Meningitis	0 (0%)	1 (6.7%)	0 (0%)	1(1.7%)
Pneumonia	0 (0%)	1 (6.7%)	0 (0%)	1(1.7%)
No morbidity	1 (11.1%)	2 (13.3)	28 (77.8%)	31(51.7%)
Total	9 (100%)	15 (100%)	36 (100%)	60(100%)

$\chi^2 = 27.5$; $P < 0.001$.

Table 4: Neonatal morbidity in relation to duration of PROM.

Complication	PROM 18-<24 hours	PROM 24-72 hours	PROM >72 hours
RDS	12	3	1
Septicemia	0		2
Meningitis	0	0	1
Pneumonia	0	0	1
No complication	20	7	0
Total	32	23	5

Out of the total morbid neonates, 12 (41.4%) were born after PROM of 18-<24 hours, 6 (20.7%) were born after PROM of 24-72 hours and 5 (17.24%) were born after PROM of >72 hours. This table shows that as PROM increases incidence of EOS also increases. If duration of PROM is more than 24 hours, the incidence of septicemia was 8.3% as compared to zero incidence when duration was less than 24 hours. Data is statistically significant. Analysis shows that out of 60 neonates with history of PROM, one case (1.7%) died who had PROM duration of > 72 hours. The analysis shows that out of 60 neonates born to healthy mothers with PROM of more than 18 hours, 7 cases (11.7%) had growth in blood culture.

Table 5: Distribution of neonatal deaths according to duration of PROM.

Duration in hours	Live cases		Deaths		Total	
	No	%	No	%	No	%
18- <24	32	53.3	0	0	32	53.3
24-72	23	38.3	0	0	23	38.3
>72	4	6.7	1	1.7	5	8.3
Total	59	98.3	1	1.7	60	100

Table 6: Distribution of cases according to their blood culture.

Blood culture	Number of cases	Percentage
Positive	7	11.7
Negative	53	88.3
Total	60	100

Table 7: Organism isolated in blood culture in relation to neonatal mortality status.

Organism	Live		Deaths		Total	
	No	%	No	%	No	%
Staphylococcus	2	28.5	1	14.2	3	42.8
Klebsiella	1	14.2	0	0	1	14.2
E.coli	1	14.2	0	0	1	14.2
Pseudomonas	1	14.2	0	0	1	14.2
Coagulase negative staphylococcus	1	14.2	0	0	1	14.2
Total	6	85.3	1	14.2	7	100

The analysis shows that Staphylococcus was the most common organism causing sepsis, 3 (42.8) out of 7 cases. Out of 7 cases, 1 case (14.2) died due to Staphylococcal septicemia.

DISCUSSION

The present study was undertaken to know the incidence of early onset septicemia and mortality among neonates born to mothers with PROM more than 18 hours and also to know the incidence of neonatal infection in neonates born to mothers with history of PROM more than 18 hours who had not received antibiotics before labour. This was a prospective, cross-sectional study conducted from November 2013 to December 2014. Total of 60 neonates were included in this study, born in Dr. Panjabrao Deshmukh medical college and research centre, Amravati. In the present study out of 60 cases, 51.7% were males which is consistent with Woranart et al study.⁸

In the Shubeck F et al study, incidence of PROM was more in babies weighing less than 2500 gms (24.8%).⁹

In the present study, the incidence of PROM was more in babies weighing more than 2500 gms (68%) but this is due to fact that the total number of babies weighing

>2500 gms were more in the sample. Similar results were observed in Woranart et al study.

Table 8: Comparison of studies based on sex of neonates.

Total number of cases studied	Woranart et al (n = 5.182)	Present study (n=60)
Male	53.96	51.7
Females	46.04	48.3

Table 9: Comparison of studies based on birth weight of neonates.

Weight in grams	Woranart et al	Shubeck F et al	Present study
≤2500	28.84%	2%	31.7%
>2500	71.15%	24.8%	68.3%

Kifah Al-Q Qa and Fatin Al-Awayshah study found that incidence of PROM was more in preterm gestation.¹⁰ According to Danforth, 70% of cases of PROM occurred at term and 30% of PROM was preterm.¹

The present study shows increase in incidence of PROM in term gestation. These results are consistent with Woranart et al study.

Table 10: Comparison of studies based on gestational age of neonates.

Gestational age in weeks	Woranart et al	Kifah Al-Q Qa and Al-Awayshah study	Danforth	Present study
≤37	42.3%	62%	30%	38.3%
>37	57.69%	38%	70%	61.7%

Table 11: Comparison of studies based on mode of delivery of neonates.

Mode of delivery	Kifah Al-Q Qa and Fatin Al-Awayshah study	Sanyal and Mukherjee study	Kodkany and Telang study	Present study
Normal vaginal delivery	54%	87%	81%	65%
Caesarean section	20%	13%	19%	35%

In Sanyal and Mukherjee study, 87% cases were delivered by vaginal route and 13% were delivered by LSCS.¹¹ In the Kodkany and Telang study, 81% were delivered by vaginal route and 19% were delivered by LSCS.¹² In the present study, vaginal delivery was found to be the commonest mode of delivery. These results are consistent with Kifah al-Q QA and Fatin Al Awayshah study. In Kifah Al-Q Qa and Fatin Al-Awayshah study, 74% cases had PROM of ≤ 72 hours duration and 26% had PROM of >72 hours.¹⁰

Table 12: Comparison of studies based on duration of PROM.

Duration	Woranart et al	Kifah Al-Q Qa and Fatin Al-Awayshah study	Present study
≤ 72 hours	92.3%	74%	91.6%
>72 hours	7.69%	26%	8.3%

Table 13: Comparison of studies based on neonatal morbidity.

Morbidity	Nili and AA Shams Ansari	Anjana Devi and Reddy Devi	Anjana Devi	Present study
Rds	33.3	18.3%	-	36.7
Septicemia	5.5	53.8%	11.5%	8.3
Meningitis	-	-	2.9%	1.7
Pneumonia	2.5	-	5.8%	1.7

In the present study, 91.6% case had PROM of ≤ 72 hour's duration, which is consistent with Woranart et al study.

Devi A and Reddy Devi found neonatal infection in 53.8% cases and RDS in 18.3%.¹³ Devi A and Reddy Devi found septicemia in 11.5%, pneumonia in 5.8% and meningitis in 2.9% cases.¹⁴ In the present study, RDS was seen in 36.7% cases, septicemia in 8.3% cases and pneumonia, in 1.7% cases. These results are consistent with observations made by F. Nili F and AA Shams Ansari.² In the present study, 1.7% of cases had meningitis. Merenstein GB and Weisman LE observed that when PROM is accompanied with prematurity, the incidence of proven sepsis is 4-6%.¹⁵

Miller HC and Jekel F observed that neonatal morbidity is affected mainly by prematurity itself, rather than by the occurrence of PROM.¹⁶

Table 14: Comparison of studies based on neonatal morbidity in relation to gestation.

Morbidity	Gestation in weeks	
	≤ 37 weeks	>37 weeks
RDS	25%	11.7%
Septicemia	6.7%	1.7%
Meningitis	1.7%	0
Pneumonia	1.7%	0

Table 15: Comparison of studies based on neonatal morbidity in relation to duration of PROM.

Complication	≤ 24 hours			>24 hours		
	Nili and sham study	Taylor study	Present study	Nili and sham study	Taylor study	Present study
Septicemia	18.4%	1.3%	0	15.3%	13.3%	3.3%
Meningitis	0	0	0	0	0	1.7%
Pneumonia	1.2%	0	0	2.5%	0	1.7%

In the present study also, neonatal morbidity was more among preterm neonates with PROM.

F Nili and AA Shams Ansari observed that the risk of pneumonia and mortality were much higher in group with > 24 hours of PROM.²

Taylor claimed that as latent period increased from 12 hours to more than 24 hours neonatal infection rate also increase from 1.3% to 13.3%.¹⁷

The present study shows that complications are more as the duration of PROM increases.

Neonatal deaths according to duration of PROM

Analysis from the present study shows that mortality in neonates born to mothers with PROM is directly related to the duration of PROM. Nili F and AA Shams Ansari observed that mortality in one group with PROM <24 hours is less than mortality in one group with PROM >24 hours.²

Table 16: Comparison of studies based on leucocyte counts of neonates.

Variable	Kifah Al-Q Qa and Fatin Al-Awayshah study	Present study
<5000	41.7%	21.7%
5000-20000	58.3%	60%
>20,000	0	18.3%

Kifah Al-Q Qa and Fatin Al-Awayshah observed leucopenia in 41.7% cases and 58.3% cases had leucocyte count between 5000 - 20000 cells/cumm.¹⁰

The present study analysis shows that 21.7% of the neonates had leucopenia. Leucocytosis was observed in 18.3% cases.

In the present study, CRP was positive in 30% of cases. These results are consistent with observations made by Kifah AlQa Qa and Fatin Al-Awayshah in their study.¹⁰

Table 17: Comparison of studies based on organisms isolated in blood cultures of neonates.

Organism	Asinidi A asindi et al	Shubeck et al	Present study
Staphylococcus	-	50%	42.8%
Klebsiella	13%	14%	14.2%
E. coli	-	-	14.2%
Pseudomonas	11.3%	4%	14.2%
Coagulase negative staphylococcus	29%	-	14.2%

Shubeck et al observed growth of Staphylococcus in 50% of cases followed by Klebsiella in 14% of cases and Pseudomonas in 4% of cases.⁹

Asindi AA et al isolated coagulase negative Staphylococcus in 29% cases, Klebsiella in 13% and Pseudomonas in 11.3% cases.¹⁸

In the present study, staphylococcus (42.8%) was the most common organism causing sepsis followed by Klebsiella (14.2%), E. coli (14.2%), pseudomonas (14.2%) and coagulase negative staphylococcus (14.2%).

CONCLUSION

Premature rupture of membranes is a high-risk Obstetric condition. Active management is needed to enable delivery within 24 hours of premature rupture of membranes as it offers better neonatal outcome.

Premature rupture of membranes, though common in term patients, is not responsible for increased maternal and fetal morbidity and mortality in them.

Premature rupture of membranes is responsible for increased perinatal morbidity among preterm neonates.

Morbidity increases as the duration of premature rupture of membranes increases.

Advances in care of preterm babies may reduce the perinatal mortality following premature rupture of membranes, but the ultimate solution lies in prevention of premature rupture of membranes before term.

Funding: No funding sources

Conflict of interest: None declared

Ethical approval: The study was approved by the Institutional Ethics Committee

REFERENCES

1. Doyle C. Premature rupture of membranes. IN: RS Gibbs, BY Karlan, AF Haney, IE Nygaard (eds). Donforth's obstetrics and gynaecology. 9th edi, Philadelphia. Lippincott Williams and Wilkins Publishers; 2008:2:91.
2. Nilli F, Shams AA. Neonatal complications of premature rupture of membrane. Acta Medica Iranica. 2003;41(3):176.
3. Kifah Al, Al-Awayshih F. Neonatal outcome and prenatal antibiotic treatment in premature rupture of membranes. Pakistan J Med Sci. 2005;3:2.
4. Bey Down SN, Yasin SY. Premature rupture of membranes before 28 weeks: conservative management. Am J Obstet Gynecol. 1986;155:470-1.
5. Davies PA. Bacterial infection in the fetus and newborn. Arch Dis Child. 1971;46:1.

6. WA Carlo. Maternal disease and the fetus. In: RM Kliegman, BF Stanton, JW St. Geme, RE Behrman, NF Schor (ed). *Nelson Textbook of Pediatrics*. Nineteenth Edi: Philadelphia; 2012:545.
7. Egmter C, Leitich H, Karas H, Wieser F, Husslein P, Kaider A, et al. Antibiotics treatment in preterm premature rupture of membranes and neonatal morbidity: a meta-analysis. *Am J Obstet Gynaecol*. 1996;174:589-97.
8. Korn WR, Jariya WS. Incidence of neonatal infection in newborn infants with maternal history of premature rupture of membranes (PROM) for 18 hours or longer by using Kutklar Hospital clinical practice guidelines. *J Med Assoc*. 2005;8:7.
9. Shubeck F, Benson RC, Clark WW. Fetal hazards after rupture of membrane. *Obstet Gynecol*. 1966;28:22.
10. Gerdes JS. Clinicopathologic approach to diagnosis of neonatal sepsis. *Clinical Perinatol*. 1991;18:361-374.
11. Sanyal MK, Mukherjee TN. Premature rupture of membrane; an assessment from a rural medical college of West Bengal. *J Obstet Gynecol India*. 1990;40(4):623-8.
12. Kodkany BS, Telang MA. Premature rupture of membranes: a study of 100 cases. *J Obstet Gynecol India*. 1991;41(4):492-6.
13. Devi A, Devi R. Premature rupture of membrane - a clinical study. *J Obstet Gynecol India*. 1996;46:63-8.
14. Devi A, Rani R, Devi A. Premature rupture of membranes - a clinical study. *J Obstet Gynaecol India*. 1996;46(1):63-8.
15. Merenstein GB, Weisman LE. Premature rupture of membranes-neonatal consequences. *Semin Perinatal*. 1996;20(5):375-80.
16. Miller HC, Jeker JF. Epidemiology of spontaneous premature rupture of membranes: factors in preterm births. *Yale J Biol Med*. 1989;62:241.
17. Taylor ES, Morgan RL, Bron PD, Broose VE. Neonatal infection. *Am J Obstet Gynecol*. 1961;82:1341.
18. Asindi A, Eric I, Nivedita B. Mother - infant colonization and neonatal sepsis in prelabour rupture of membranes. *Saudi Med J*. 2002;23(10):1270-4.

Cite this article as: Lokhande S, Nistane R. Incidence of morbidity and mortality in neonate born to mothers with premature rupture of membranes. *Int J Contemp Pediatr* 2016;3:1394-1400.