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Original Article

Obstetrics and Gynaecology Section

Impact of Fetal Presentation on Pregnancy Outcome in Preterm Premature Rupture of Membranes

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ABSTRACT

Aim of the Study: To determine the impact of fetal presentation on pregnancy outcome in preterm premature rupture of membranes (PPROM)

Study Design: Retrospective.

Materials and Methods: Fifty eight PPROM patients (gestational age of 24-34 wk, complicated by PPROM and latency more than 24 h) between January 2008 to December 2012 were categorized into cephalic and non cephalic and pregnancy outcome were analyzed with standard statistical methods including the Chi-square test, t- test and Mann Whitney test.

Results: The non cephalic (20.7%, 12/58) and cephalic group (79.3%, 46/58) among the 58 patients with PPROM were demographically homogenous. PPROM was significantly earlier in non cephalic group although latency was not much different in both groups. Maternal complications (abruption, chorioamnionitis and post operative wound infection) as a composite were more in non cephalic group. Neonatal death was also significantly more in non cephalic than cephalic.

Conclusion: Non cephalic presentation at diagnosis of PPROM is likely to have an unfavorable effect on the maternal and fetal outcome

Keywords: Oligohydraminos, PPROM, Presentation, Pregnancy outcome

INTRODUCTION

PPROM is defined as spontaneous rupture of fetal membranes at least an hour prior to onset of labour and before 37 completed wk of gestation [1,2]. PPROM complicates 3% of all deliveries and is associated with 30-40% of preterm deliveries [3]. It is an important risk factor for perinatal mortality and morbidity [1,2].

Clinical factors associated with PPROM include low socioeconomic status, tobacco use, preterm labour history, urinary tract infection, vaginal bleeding at any time in pregnancy, uterine distension (e.g., polyhydramnios, multifetal pregnancy), cerclage and amniocentesis [4,5]. In one study, women with prior history of PPROM had a 13.5% risk of subsequent preterm birth due to PPROM compared to 4.1% risk amongst their peers without such a history [6].

The major maternal risks are chorioamnionitis (35%), abruption (19%) & sepsis (<1%) [5]. Placental abruption is more common if rupture of membranes occur prior to 28 wk of gestation [7]. The risk of abruption increases 24 h after membrane ruptures, particularly in the presence of intrauterine infection or oligohydraminos [8,9]. Chorioamnionitis is also associated with gestational age at which PPROM occurs.

Major fetal morbidity is pulmonary hypoplasia, RDS, .sepsis, intraventricular haemorrhage and contractures. Pulmonary hypoplasia is frequent if PPROM occurs before 26 wk and the latency is prolonged for more than 5 wk. The premature infant who delivers in presence of PPROM has increased risk of infection and if it occurs it heightens the risk of infection and other morbidities.

Latency, defined as the time from rupture of membranes till delivery has been described to be longer if PPROM occurs at an earlier gestational age [7,10]. Oligohydraminos as a result of PPROM has been found to be associated with shorter latency and increased neonatal morbidity, but not associated with an increased maternal or neonatal infections [11]. When the presentation is non cephalic in PPROM these risks appear to be increased when oligohydraminos is present, although this has not been well studied [12].

The use of antenatal corticosteroids reduces neonatal morbidity and mortality. The rate of respiratory distress syndrome (RDS), Necrotising Enterocolitis (NEC), and Intraventricular Haemorrhage (IVH) were lower when antenatal corticosteroid was given [7].

There are reports about unfavorable impact by noncephalic presentation of the fetus with PPROM on the antepartum, intrapartum and neonatal risks, which were primarily in regard to cord prolapse [12]. This is not well studied especially in regard to the expectant management depending on the presentation of fetus. The purpose of this study was to determine whether fetal presentation at the diagnosis of PPROM has an effect on the maternal, fetal and or neonatal outcome.

MATERIALS AND METHODS

A retrospective analysis of the five year data was done for the study. The patients who had PPROM between 24-34 wk, including both were considered. Multiple gestation, known fetal anomalies and those with latency less than 24 h were excluded from the study. The data was collected from Labour register and Electronic Medical Record (EMR).

The diagnosis of PPROM was made by the conventional method, with performance of speculum examination and observation of pooled fluid. Once the diagnosis of PPROM is confirmed , an ultrasound scan was done to document presentation and amniotic fluid volume. Oligohydraminos is defined as an amniotic fluid index of ≤5 that was obtained by the sum of the largest vertical pockets in each of the 4 quadrants [13,14].

A single course of antenatal corticosteroids was give on admission and prophylactic latency antibiotic were instituted. The antibiotic used was intravenous Ampicillin 1gm 6th hourly and Amikacin 500mg 12th hourly usually for 7 d followed by oral cephalosporin. 750 mg 12th hourly. The use of tocolytics was under the discretion of treating physician.

After admission close maternal and fetal monitoring was done to assess the onset of labour, chorioamnionitis or fetal compromise. Clinical chorioamnionitis was defined as antepartum temperature of ≥100.4^{0}F, presence of uterine tenderness, fetal or maternal tachycardia and or foul smelling vaginal discharge [15-17]. Maternal demographics, history of bleeding in any trimester of

Variable	Cephalic(n=46)	Noncephalic(n=12)	p-value
Age [a]	29.1± 5.5	28.5± 6.5	0.744 [c]
Gravidity [b]	2 (1-5)	1.5 (1-5)	0.339 [d]
Parity [b]	0 (0-2)	0 (0-2)	0.806 [d]
Risk Factors,n(%)	15(32.6)	6(50)	0.32 [e]
History of preterm delivery or PPROM,n(%)	4(8.7)	1(8.3)	0.139 [e]

[Table/Fig-1]: Demographic characteristics of patients, [a]Data are given as mean ± SD: [b]Calculated with t test; [d] Data given as median (Range); [d] Calculated with Mann Whitney test; [e] Calculated with Chi –Square test

Variable	Cephalic(n=46)	Non cephalic(n=12)	P value
AFI(cm) [a]	6.99 ± 2.8	7.09 ± 4.1	0.917 [c]
Cervical length(cm) [a]	2.7 ± 0.9	2.8 ± 1.1	0.880 [c]
Steroids,n (%)	37(80.4)	10(83.3)	1.000 [e]
Tocolytics ,n(%)	16(34.8)	7(58.3)	0.189 [e]
Antibiotic, n(%)	71.7 (33)	83.3 (10)	0.719 [e]
WBC(cells/mm^3) [a]	13.9 ± 3.9	16.2 ± 5.4	0.106 [c]
*CRP [b]	7 (0.2-51.4)	20.4 (1.5-104)	0.063 [d]
Growth on +HVS,n(%)	14(30.4)	6(50)	0.307 [e]
Gestational age of PPROM(weeks) [a]	31.4 ± 2.5	27.5 ± 2.3	<0.001 [c]
Latency [b]	28 (24-456)	33.5 (24-240)	0.176 [d]
Vaginal delivery, n(%)	26(56.5)	5(43.5)	0.553 [e]

[Table/Fig-2]: Clinical parameters in both groups, Data are given as mean ± SD: [c]Calculated with t test; [b] Data given as median (Range); [d] Calculated with Mann Whitney test; [e] Calculated with Chi –Square test,* C Reactive Protein,+High vaginal swab

pregnancy, medical and obstetric history, presence of cerclage, estimated gestational age at diagnosis of PPROM, latency in hours, presentation at diagnosis and delivery, mode of delivery and indications, intrauterine and postpartum infections, postpartum complications were documented. Length of maternal hospital stay was not included as the patients may stay till the baby is discharged or earlier if they wish. Amniotic fluid index and anomalies at diagnosis was also noted.

The main maternal outcomes assessed were latency, oligohydraminos, chorioamnionitis and abruption. Fetal and neonatal outcomes assessed were length of hospital stay, 5-min APGAR score, RDS, sepsis, jaundice, anaemia, retinopathy of prematurity, IVH, Intrauterine fetal death(IUFD), neonatal death(NND).Of these neonatal outcomes sepsis, NND, RDS and IVH were assessed individually and in composite.

Two groups, that is cephalic and non cephalic at time of diagnosis of PPROM was identified. The statistical analysis was done using IBM SPSS Statistics 20. All continuous parameters are presented as Mean ± SD or median (Range). All categorical parameters are presented as percentage. Comparing the averages of parameters between two groups, those that are following normal distribution independent sample t-test was used. Those that are not following normal distribution Mann Whitney U-test were used. Chi–Square test was used to find the association between two categorical variables. A probability value of <0.05 was considered statistically significant.

RESULTS

Of the 4789 patients delivered in Amrita Institute of Medical Sciences between January 2008- December 2012, 58 patients satisfied our criteria, which accounts for 1.2% of the total deliveries. Of these, 46 cases were cephalic presentation (79.3%) and 12 were breech (20.7%) at the time of diagnosis of PPROM. The cephalic and non cephalic group were almost similar with respect to age, gravidity and parity [Table/Fig-1].

Risk factors like history of preterm delivery or PPROM, cervical incompetence or polyhydraminos were present in 32.6% in cephalic and 50% in noncephalic (p=0.32) which was not statistically significant. History of preterm delivery /PPROM was present in 8% in both groups.

Variable	Cephalic (n=46)	Noncephalic (n=12)	p-value
Oligohydraminos, n(%)	12(26.1)	4(33.3)	0.72[e]
Abruption, n(%)	2 (4.3)	2 (16.7)	0.19[e]
Chorioamnionitis n(%)	2(4.8)	1 (8)	0.58[e]
Maternal composite,n (%)	5(10.9)	3 (25)	0.342[e]

[Table/Fig-3]: Association between foetal presentation and maternal outcomes, Data are given as mean ± SD: [c]Calculated with t test; [b] Data given as median (Range); [d] Calculated with Mann Whitney test; [e] Calculated with Chi –Square test

Variable	Cephalic (n=46)	Noncephalic (n=12)	p- value
Birth weight (kg) [a]	1.61 ± 0.472	1.01 ± 0.413	<0.001
APGAR at 5' [b]	8 (5-9)	7.5 (4-9)	0.543 [d]
Hospital stay (days) [a]	22.7 ± 20.1	26.3 ± 17.7	0.814 [c]
O_2 requirement (hours) [b]	48 (0-2064)	36 (0-480)	0.914 [d]
Coagulopathy ,n(%)	5 (10.9)	5 (41.7)	0.024 [e]
RDS,n(%)	24(52.2)	4(33.3)	0.402 [e]
Need for surfactant ,n(%)	2 (4.3)	3 (25)	0.055 [e]
‡ROP ,n(%)	7 (15.2)	1 (9.1)	1.000 [e]
IVH, n(%)	5 (10.9)	1 (8.3)	1.000 [e]
Sepsis ,n(%)	10 (21.7)	36 (78.3)	1.000 [e]
Jaundice,n(%)	34(79.9)	7(58.3)	0.307 [e]
Phototherapy,n(%)	27 (58.7)	6 (50)	0.745 [e]
Neonatal death ,n(%)	4 (8.7)	4(33.3)	0.049 [e]
Neonatal composite, n(%)	35(76.1)	8 (66.7)	0.493 [e]

[Table/Fig-4]: Association between foetal presentation and neonatal outcome, Data are given as mean ± SD: [c]Calculated with t test; [b] Data given as median (Range); [d]Calculated with Mann Whitney test; [e] Calculated with Chi –Square test,‡ Retinopathy of Prematurity

Gestational age at PPROM diagnosis was approximately 4 wk earlier in noncephalic than cephalic (31.3vs27.4), p=0.001which was statistically significant. The mean AFI at diagnosis was 6.99 in cephalic and 7.09 in non cephalic group, not reaching statistical significance. Oligohydraminos was present in 26% of cephalic and 33.3% of non cephalic (p=0.72).

Both groups were comparable in terms of cervical length at diagnosis, administration of steroids, latency antibiotics and use of tocolytics [Table/Fig-2]. The mean cervical length in both groups were same, being 2.7 cm. At least 1 dose of betamethasone was given in 80.4%of cephalic and 83.3% of non cephalic group. (p=1). Latency antibiotic was administered in 71.7% of cephalic and 83.3 % of non cephalic. (p=0.71).Tocolytics was instituted for 34.8% of cephalic and 58.2% of noncephalic (p=0.18).

Mean latency was 72.4 h in cephalic and 92.5 h in noncephalic. The median latency in two groups (28vs33.5) also did not reach statistical significance (p=0.176) WBC count and CRP was also similar in the two groups [Table/Fig-2]. High vaginal swab (HVS) showed growth in 30.4% of cephalic and 50% in non cephalic. (p=0.33). The commonest organism grown on high vaginal swab was *Candida albicans* (15.5%), followed by *Klebsiella pneumonia* (10.3%). Group B *streptococci* were found only in 5.1%.

43.5% of cephalic and 58.3%(7/12) of non cephalic underwent caesarean section although it was not statistically significant (p=0.55). Of the 5 patients in non cephalic who had vaginal delivery, two had neonatal death.

Abruption was seen in four patients (6.8%), two being in cephalic and two in non cephalic group (4.3% vs. 16.7% p =0.18). Three patients had chorioamnionitis (5.2%). Of these two were in cephalic group (4.8%) and one in non cephalic (8%).We had only one case

of postoperative wound infection, that being in the non cephalic group. Considering the maternal complications in total (abruption, chorioamnionitis, wound infection), it was found to be more in the non cephalic group than the other (25% vs. 10.9%, p=0.34) [Table/Fig-3].

Lower birth weight was found in non cephalic group (non cephalic1008 ± 413g vs. cephalic group 1615 ± 471 g; p=<0.001). APGAR scores at 5' were found to be similar in both groups. Mean length of hospital stay was longer in non cephalic group than cephalic (26.33 ± 17.75 d vs. 22.74 ± 20.18d,p=0.81)

No difference in jaundice, IVH, neonatal sepsis, O_2 requirement or ROP between the two groups [Table/Fig-4]. Neonatal outcomes which were worse in non cephalic group were coagulopathy and need for surfactant. NND was also significantly higher in non cephalic group. (8.7%vs33.3%, p=0.04)

The neonatal composite of RDS, sepsis, IVH and NND was found to be higher in cephalic group, though not statistically significant (76.1%vs 66.7%; p=0.48)

DISCUSSION

PPROM causes definite maternal and neonatal morbidity and mortality. The non cephalic presentation at PPROM can pose an added risk compared with cephalic presentation [14]. Our intention was to evaluate the possible adverse maternal and neonatal outcomes in our selected PPROM population.

The incidence of PPROM in the study was 1.2%. The incidence of PPROM reported in literature being 3% [7]. The difference can be due to the fact that those with latency less than 24 h were excluded from our study. 20.7% were breech presentation which coincides with the study by Goodman J [18].

In a study by Mercer BM and Goldenberg RL [5] it was shown that patients with history of preterm labour have 13.5% subsequent risk of preterm delivery or PPROM. Analysis of data from the Collaborative Perinatal Project demonstrated that among women with a previous term delivery not complicated by PROM, the frequency of preterm PROM in a subsequent pregnancy is 4% [19]. In contrast, the frequency of preterm PROM is 21% if the first pregnancy resulted in a preterm delivery due to preterm PROM [19]. But in our study only 8% of the patients with previous history of preterm delivery or PPROM showed subsequent risk of PPROM. As previous history of preterm delivery and PPROM were taken together, this difference in subsequent risk would have occurred.

PPROM occurred at an earlier gestational age in non cephalic group than cephalic in our study which was the same in the literature [18]. It has been found that 50% of patients with PPROM will deliver within 24-48 h and 70-90% within a week [20]. In our study average latency was 3.19 d. A study by Dagklis of PPROM patients between 26- 36 wk showed a latency of 5.2 d [20]. Although latency was 20 h more in non cephalic group, it was not statistically significant. This was in accordance with the study by Goodman J [18]. This increased latency in non cephalic group may be due to the earlier gestation at which PPROM occurs as longer latency has been described for earlier gestation [21]. Sheer et al., [22] found significantly lower residual amniotic fluid volume within 24 h of delivery after PPROM when the presentation was breech. Association of malpresentation with oligohydraminos has been documented by Goodman J [18]. In our study, presentation did not have a significant influence on the incidence of oligohydraminos although non cephalic group had slightly more oligohydraminos.

58.3% of non cephalic underwent caesarean section. RCOG does not recommend routine caesarean for preterm breech. Kayem G et al., [23] in his study showed that neonatal death was not associated with any particular mode of delivery. Hence in very early preterm after counselling, the patients were kept for vaginal delivery.

Abruption is a catastrophic condition with increased risk of maternal and perinatal morbidity and mortality. PROM itself is an independent significant risk factor for abruption which increases with increasing latency [21]. Ananth et al., [9] reported that intrauterine infection and PPROM were independent risk factors for abruption. It has been postulated that acute reduction in uterine volume and intrauterine surface area that follows PPROM may be the cause of disruption of the site of placental attachment and hence abruption. The reported abruption rate in literature for PPROM is 4-12% [14]. In our study abruption rate is 6.8%, consistent with the literature.

The incidence of chorioamnionitis is reported to be 13-60% [10], But chorioamnionitis was found only in 5.2%-in our study. Clinically evident chorioamnionitis was found to be significantly less in breech presentation in their study. But in our study chorioamnionitis was more in noncephalic, which was the same case in the study by Goodman J [18] although numbers were less in our case. The maternal complications like abruption, chorioamnionitis, postoperative wound infection when taken together was more in non cephalic group which was in accordance with the studies by Goodman J [18].

In a study by Lewis et al., he compared the outcomes for PPROM occurring between 23- 34 wk in different presentations. His main finding was increased risk of cord prolapse in non cephalic gestation (11%vs 1%) [12]. They also reported lower 5-min Apgar scores. But in our study there were no cord prolapse and Apgar scores were comparable in both groups.

The length of hospital stay in our study was more in non cephalic group than cephalic, but was not statistically significant. The study by Goodman J showed a significant difference in the length of hospital stay between two groups [18].

As in the study by J Goodman, our study also did not show any difference in jaundice, IVH, RDS, ROP and sepsis between two groups. Neonatal composite outcome was also not altered by the presentation of fetus. But NND was found to be significantly high in non cephalic group (p=0.49) which was comparable with the literature [18]. The overall rate of NND was 13.8%. In a study by Tavassoli F [24] involving PPROM of same gestation the overall NND rate was 8.8%.

To the best of our knowledge there have not been any Indian studies comparing the outcome of PPROM based on fetal presentation. This was an effort from our side to know whether fetal presentation at time of PPROM affects the pregnancy outcome. A potential weakness of our study was the relatively small number of cases in each group. Many outcomes might not have reached statistical significance because of the small numbers as ours is a tertiary care centre catering predominantly to high risk patients, with an average of 1000 deliveries per year.

Cephalic presentation has a favourable influence over non cephalic, in terms of abruption, oligohydraminos and chorioamnionitis, with low statistical significance. The neonatal survival, need for surfactant and coagulopathy was significantly better in cephalic, rather than non cephalic group. These factors can be taken into account while counselling the patients with PPROM, although further large multicenter trials are needed before a consensus can be reached about the definite impact of fetal presentation on pregnancy outcome and management of PPROM.

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