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Original Research Article

Spectrum of High Vaginal Swab Isolates and Ultrasound for Evaluation of Cervical Factors in Prediction of Preterm Prelabour Rupture of Membrane

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Abstract

Background: PROM can cause significant maternal and fetal morbidity and mortality. PROM is an obstetric enigma and several other risk factors in addition to cervical factors and genital tract infection, have been implicated in its causation. Prediction and prevention of prelabour rupture of membrane would offer the best opportunity to prevent its complications.

Objectives: The current study was undertaken to determine the spectrum of high vaginal swab isolates and ultrasound for evaluation of cervical factors in prediction of preterm prelabour rupture of membrane.

Materials and Methods: This observational study was conducted in the department of Obstetrics and Gynaecology, AGMC Agartala, Tripura among 230 pregnant women attending the Obstetric OPD, based on certain inclusion and exclusion factors. All patient particulars and risk factors for PPROM like previous history of preterm birth or prelabour rupture of membrane were collected using a preformed questionnaire. High vaginal swab and USG to know cervical length was done once in each trimester. All patients were followed up to delivery. Associations between high vaginal swab findings and ultrasound findings and PPROM was looked into.

Results: The mean (standard deviation) of age of the study population was 25.1 (4.2). History of preterm birth and history of abortion were present in 13.9% and 22.2% of the mothers respectively. The mean gestational age of the study population at PPROM, and at delivery were 29 and 29.6 weeks respectively. PPROM was seen in 6.5% of the study population. Thirty-five (15.2%) of the study population had chorioamnionitis. Neonatal sepsis was seen in 18.3% of the study population. Funnelling of the cervix is seen in 35.2% of the study population. It was present in only a third (30.7%) of mothers with no PPROM, while it was seen in all (100%) of patients with PPROM. The difference in the proportions were statistically significant. The mean cervical length in mothers with PPROM was significantly shorter than in mothers without PPROM. Cervix length less than 25 mm is seen in two-thirds of mothers with PPROM and Cervix length more than 25 mm one third of mothers with PPROM. The difference in the proportions were not statistically significant. Positive HVS are associated with PPROM in 93.3% of cases while a positive HVS was associated with no-PPROM in 89.3% of cases. All the HVS positive patients received conventional treatment as per departmental protocol. The difference between the proportions were not statistically significant. The most common organisms isolated in the no PPROM and PPROM groups were Staphylococcus aureus, (42.2 versus 40%) and E coli (23.9% versus 26.7%) respectively.

Conclusion: This study has shown no significant difference in the spectrum of high vaginal swabs in mothers with and without PPROM. Significantly shorter length of cervix and presence of funnelling is seen in patients with PPROM as compared to mothers with no PPROM.

Introduction

Rupture of membrane before the onset of labour is called as prelabour rupture of membrane (PROM). When it occurs before 37 completed weeks, it is called preterm prelabour rupture of membrane (PPROM). One of the most important determinant factors for outcome of PROM is the period of gestation. PROM occurs in 5-10% of pregnancies of which 80% occurs at term.[1] PPROM complicates

3% of pregnancies but leads to one third of preterm births. [2]

PROM can cause significant maternal and fetal morbidity and mortality. Fetal complications include pulmonary hypoplasia, skeletal deformities due to oligohydramnios, sepsis, asphyxia, prematurity and its related problems like respiratory distress syndrome, intraventricular haemorrhage, necrotising enterocolitis, cerebral palsy, periventricular leucomalasia[3] and fetal and neonatal death.

Maternal complications seen with PPROM are chorioamnionitis, placental abruption, increased need for caesarean section, postpartum sepsis, amnionitis [4], cord prolapse, cord compression etc. Amniotic fluid has certain bacteriostatic properties which protect against infection. That is the reason why prelabour rupture of membrane and loss of amniotic fluid makes both mother as well as the fetus vulnerable to infection.

There is growing evidence associating upper genital tract infection with PROM.[2,5] One possible mechanism by which infection might act is through adhesion from the cervical/ vaginal area and replication in the placenta, the decidua and the membranes. Another hypothesis is that several organisms that are commonly present in the vaginal flora, including group B streptococcus, Staphylococcus aureus and microorganisms that cause Bacterial vaginosis secrete proteases that degrade collagen and weakens the fetal membranes leading to PROM.[3,6]

Several studies have shown transvaginal ultrasound of the cervix to be useful in the prediction of spontaneous preterm delivery preceded by either PTL or PPROM[7,8,9].

Transvaginal sonography for cervical evaluation in PPROM is a simple and safe method to predict time interval between rupture and delivery[12]. So high vaginal swab (HVS) and TVS can be used together in high-risk pregnant women to predict the occurrence of PPROM.

The current study was, therefore, undertaken, to determine the spectrum of high vaginal swab isolates and ultrasound for evaluation of cervical factors in prediction of preterm prelabour rupture of membrane.

Methodology

An observational longitudinal study was conducted in the department of Obstetrics and Gynaecology, AGMC Agartala, Tripura over a period of 18 months (from January 2021 to June 2022) among all pregnant women in the early weeks (up to 14 weeks) attending Obstetrics OPD excluding multiple pregnancies, polyhydramnios, congenital anomalies, Intra uterine fetal demise, Placenta previa, Gestational diabetes and seriously ill pregnant women. The sample size calculated was 230. All consecutive mothers fulfilling the inclusion and exclusion criteria was included in the study till the sample size is reached.

All patient particulars like age, parity, socioeconomic status, obstetric history etc were noted using case study proforma. The risk factors for PPROM like previous history of preterm birth or prelabour rupture of membrane, low BMI, anaemia, cigarette smoking, urinary or sexually transmitted infections, bleeding PV of the patients were collected using a preformed questionnaire.

High vaginal swab was taken to know vaginal colonisation once in each trimester. Ultrasound to know cervical factors, amniotic fluid index and biophysical profile was also done once in each trimester.

All patients were followed up to delivery. Associations between high vaginal swab findings and ultrasound findings and PPROM was looked into. Proper monitoring of delivery and mode of delivery was noted. After delivery detailed evaluation of neonate was done to evaluate apgar score, gestational age, birth weight, birth asphyxia, respiratory distress, IUGR and evidence of sepsis. NICU admission if required was noted. Still born and neonatal deaths was noted.

Collected data from all participants were checked for consistency and completeness. Data were entered in Microsoft Excel data sheet for analysis. Data were organized and presented using the principles of descriptive statistics as tables and diagrams. Mean and standard deviations (SD) were calculated for continuous data. IBM statistical package for Social Sciences (SPSS) version 21.0 was used for data analysis. A significance value (p value) < 0.05 was considered as significant.

Results

out of 230 patients, 15 developed PPROM,206 patients showed positive HVS, funnelling was present in 81 patients and 113 patients had cervical length less than 25 mm.

Table 1: Distribution of study population based on the age groups(n=230)

Age group (years)	Frequency	Percent
<25	44	19.1
25-35	147	63.9
≥ 35	39	17.0
Total	230	100.0

Table 2: Distribution of study population based on past history of preterm birth (n=230)

Past H/O preterm birth	Frequency	Percent
Absent	198	86.1
Present	32	13.9
Total	230	100.0

Table 3: Distribution of study population based on past history of abortion (n=230)

Past H/O abortion	Frequency	Percent
Absent	179	77.8
Present	51	22.2
Total	230	100.0

Table 4: Distribution of study population based on mode of delivery(n=230)

Mode of delivery	Frequency	Percent
Vaginal	66	28.7
LSCS	164	71.3
Total	230	100.0

The mean (SD) gestational age of the study population at PPROM was 29 (2.8) weeks with a minimum of 24 and a maximum of 36 weeks. The mean (SD) gestational age of the study population at delivery was 29.6 (2.9) weeks with a minimum of 24 and a maximum of 37 weeks.

Table 5: Distribution of study population based on PPROM (n=230)

PPROM	Frequency	Percent
Absent	215	93.5
Present	15	6.5
Total	230	100.0

Table 6: Distribution of study population based on high vaginal swabs (n=230)

High Vaginal swab	Frequency	Percent
NEGATIVE	24	10.4
POSITIVE	206	89.6
Total	230	100.0

Table 7: Distribution of study population based on chorioamnionitis (n=230)

Chorioamnionitis	Frequency	Percent
Absent	195	84.8
Present	35	15.2
Total	230	100.0

Table 8: Distribution of study population based on neonatal sepsis (n=230)

Neonatal sepsis	Frequency	Percent
Absent	188	81.7
Present	42	18.3
Total	230	100.0

Table 9: Distribution of study population based on interval to delivery (n=230)

Interval to delivery (hours)	Frequency	Percent
≤48	164	71.3
>48	66	28.7
Total	230	100.0

Table10: Descriptive of gestational age (n=230)

Gestational age	No PPROM	PPROM	Independent sample t test	p value
Gestational age at PROM		29.4 (3.4)		
Gestational age at delivery	29.6 (2.9)	29.8 (3.4)	-0.207	0.836

The mean gestational age at PPROM was 29.4 weeks with a standard deviation of 3.4 weeks.
The mean gestational age at delivery in the no PPROM group was 29.4 (2.9) weeks and the PPROM group was 29.8 (3.4) weeks, with no statistically significant difference between the groups.

Table 11: Distribution of study population based on funnelling of cervix(n=230)

Funnelling	Frequency	Percent
Absent	149	64.8
Present	81	35.2
Total	230	100.0

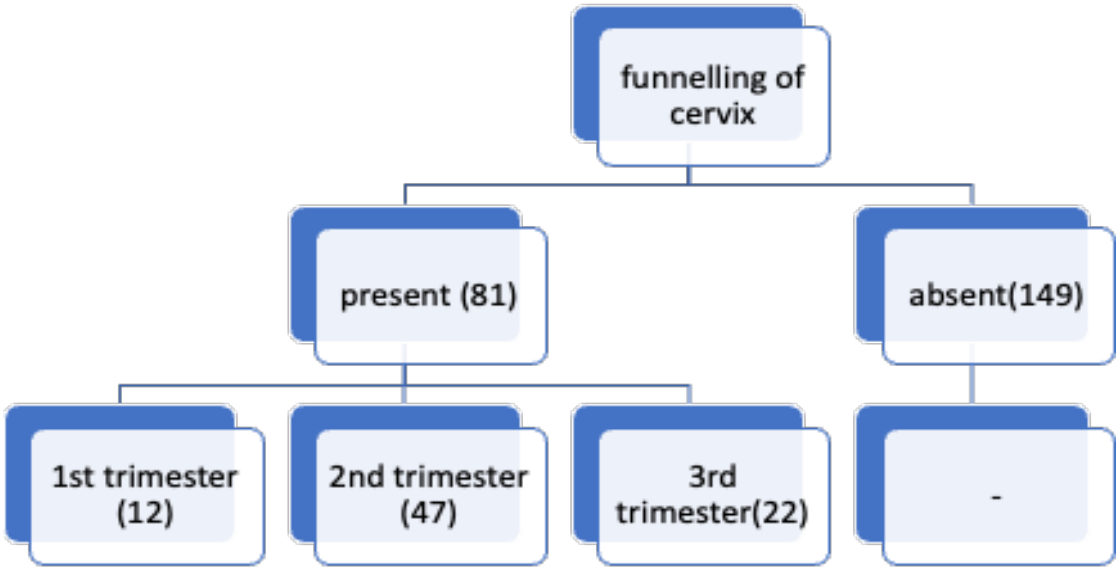

Figure 1:

Table 12: Association between development of PPROM and funnelling of cervix (n=230)

Funnelling of cervix	Total (n=230)	No PPROM (n=215)	PPROM (n=15)	Chi square	p value
Absent	149 (64.8)	149 (69.3)	0	29.518	0.0001*
Present	81 (35.2)	66 (30.7)	15 (100)		
Total	230 (100)	215 (100)	15 (100)		

Funnelling of the cervix was present in only a third (30.7%) of mothers with no PPROM, while it was seen in all (100%) of patients with PPROM. The difference in the proportions were statistically significant.

Table 13: Association between development of PPROM and cervical length (n=230)

Cervix length	Total (n=230)	No PPROM (n=215)	PPROM (n=15)	Chi square	p value
<25 mm	113 (49.1)	103 (47.9)	10 (66.7)	1.974	0.16
≥ 25 mm	117 (50.9)	112 (52.1)	5 (33.3)		
Total	230 (100)	215 (100)	15 (100)		

Cervix length less than 25 mm is seen in two-thirds of mothers with PPROM and Cervix length more than 25 mm in one third of mothers with PPROM. The difference in the proportions were not statistically significant.

Table 14: Comparison of mean cervical length between PPROM and non-PPROM(n=230)

PPROM	Cervical length Mean (SD)	Independent sample t test	p value
Absent	25.3 (7.9)	2.006	0.046*
Positive	21.2 (5.4)		

*Statistically significant

Table 15: Association between development of PPROM and high vaginal swab(n=230)

High vaginal swab	Total (n=230)	No PPROM (n=215)	PPROM (n=15)	Chi square	p value
Negative	24 (10.4)	23 (10.7)	1 (6.7)	0.244	0.621
Positive	206 (89.6)	192 (89.3)	14 (93.3)		
Total	230 (100)	215 (100)	15 (100)		

Table 16: Micro-organisms isolated on HVS in PPROM and non-PPROM cases (n=230)

Organism detected	Total (n=230)	PPROM (n=15)	No PPROM (n=215)
None	23 (10.7)	1 (6.7)	24 (10.4)
E coli	51 (23.7)	4 (26.7)	55 (23.9)
Enterobacteria	0	1 (6.7)	1 (0.4)
Enterococcus	9 (4.2)	1 (6.7)	10 (4,.3)
Klebsiella	15 (7)	2 (13.3)	17 (7.4)
Mycoplasma	12 (5.6)	0	12 (5.2)
Staphylococcus aureus	91 (42.3)	6 (40)	97 (42.2)
Staphylococcus saprophyt-icus	14 (6.5)	0	14 (6.1)
Total	215 (100)	15 (100)	230 (100)

Discussion

The mean (standard deviation) of age of the study population was 25.1 (4.2) years with a range of 17 to 32 years. The most common age group in the study population was 25-35 years (63.9%), followed by < 25 years (19.1%) and ≥ 35 years (17%). Singh et al[11], also reporting from a tertiary care setting in New Delhi, reported a mean age of 30.5 years, with the majority of them (60%) belonging to the 25-34 years age group. Most mothers in the study population were primigravida (46.5%) while among the multigravida most were third gravida (24.8%). In her study from a Medical College in New Delhi, Bej[12] reported that 40.74% mothers admitted were primigravidae, while a study from another medical college in South India, reported that 38% of the admitted mothers were primigravidae, indicating a fairly similar distribution of mothers throughout the country. Approximately a quarter (28.7%) of the study population had normal vaginal delivery, while 71.3% deliveries were instrumental/ lower segment caesarean section. The proportion of normal deliveries in the present study is somewhat lower than those reported in a group of pregnant mothers from a similar tertiary care hospital in Madhya Pradesh, where 89.8% of the deliveries were normal and 10.2% were LSCS. In the absence of uniform guidelines in India regarding LSCS, gynaecologist's preferences may be responsible for the wide difference in the caesarean rates.

In the present study the proportion of patients with PPROM was seen in 6.5%, similar to the study conducted by Pandey et al[13], that revealed an incidence of 7.7%. Much lower values of PPROM prevalence has been reported as by Mohan et al[14] (2.2%), Jayaram et al[15] (3.8%) and Canavan[16] et al (3%). The present study was a hospital based prospective cohort in the urban setting. Health facility-based studies usually overestimate the incidence due to referral cases, including from rural settings. The mean gestational age at delivery in the no PPROM group was 29.4 (2.9) weeks and the PPROM group was 29.8 (3.4) weeks, with no statistically significant difference between the groups. Studies by Gahwagi[17] et al, in Libya and Boskabadi and Zakerihamidi[18], in Iran showed no significant association between gestational age with PROM.

Recent reports have shown the usefulness of performing a cervical scan in the prediction of preterm labor without PPROM[7,19,20]. Iams et al,[7] showed that a cervical length measurement of below 30 mm was significantly associated with premature delivery. Odibo et al[21], has previously shown that in patients with a CL < 25 mm, transvaginal ultrasound of the cervix predicts PPROM and that PPROM may be the major pathway by which these patients develop PTD. In the present study, funnelling of the cervix was present in only a third (30.7%) of mothers with no PPROM, while it was seen in all (100%) of patients with PPROM, the difference in the proportions being statistically significant.In the present study, lengthening of the cervix beyond 25 mm was present in a slightly higher proportion (52.1%) of mothers with no PPROM, than PPROM (33.3%).

The study failed to identify any significant association between the cervical length < 25 mm and the development of PPROM. Assefa et al[64], in Ethiopia and Seema et al[23], in India, were also unable to establish any significant association between cervical length and PPROM. In the series by Gire et al,[19] multiparous women tended to have significantly longer cervices. As in most publications [24,25], if there was a difference, it is usually small. This is probably due to the fact that spontaneous PPROM in multiparous women occurs mainly because of chorioamnionitis, whereas in nulliparous women the underlying cause is mainly cervical incompetence (and most of them have spontaneous delivery).

Positive high vaginal swabs were associated with PPROM in 93.3% of cases while a positive high vaginal swab was associated with no-PPROM in 89.3% of cases. All the HVS positive patients received conventional treatment as per departmental protocol. The difference between the proportions were not statistically significant. Bahar et al[26],

identified microorganisms (91.7%) in the HVS samples of preterm labur patients, while organisms were isolated in 87.5% of samples collected from term mothers, findings similar to the present study. No specific organism was isolated in preterm deliveries and no differences were seen in the microorganism profile of the preterm and term pregnancies in either study.

In a prospective observational study, Shivaraju et al[27], performed lower genital tract culture in pregnant women with PPROM, PROM and threatened preterm and preterm labour and studied the vaginal infection and their antibiotic sensitivity and maternal and neonatal outcome. Most common isolated bacteria were CONS followed by candida. E coli has been isolated as the most organism isolated in the study done by Sharma[28], Das et al[29], (44%), Raunt et al[72], and Shivaraju et al,[27] reported CONS to be the most common (23.4%) organism isolated in the samples. In the present study, the most common organisms isolated in the PPROM and no PPROM groups were Staphylococcus aureus, and E coli. The patterns of microorganism isolated in both the groups were similar.

Conclusion

This study has shown no significant difference in the spectrum of high vaginal swabs in mothers with and without PPROM. Significantly shorter length of cervix and presence of funnelling is seen in patients with PPROM as compared to mothers with no PPROM. Slightly higher positive high vaginal swabs are associated with PPROM, although the differences are not statistically significant.

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