

# Microbiological Surveillance in Antenatal Care to Prevent Preterm Labor

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## ABSTRACT

An intrauterine infection is a major cause of preterm labor with or without intact membranes. A present study was undertaken to evaluate if there were any association between genital tract infections in pregnant women, premature rupture of the membranes, and adverse fetal outcome. A total of 100 women were enrolled in the study. The test group, group A, comprised of 50 women hospitalized at the labor room with spontaneous preterm labor (less than 37 weeks of pregnancy). The control group, group B, comprised of 50 normal full-term pregnant women who came in labor. High vaginal swabs from all women were cultured for bacteria and fungi. Bacterial cultures were positive in 35 women (70%) of group A and 12 women (24%) of group B. Neonatal morbidity including respiratory distress syndrome (8%), hyperbilirubinemia (8%), and septicaemia (6%), as well as mortality (14%) were more common in group A, compared to group B. (*J Infect Dis Antimicrob Agents* 2008;25:19-24.)

## INTRODUCTION

The birth weight of preterm babies is an important determinant of fetal outcome. These days, preterm birth is no longer defined solely by gestational age (less than 37 weeks of pregnancy), but also in terms of birth weight below 2,500 g. The main attention is focused on preterm infants with the birth weight below 2,000 g,

who bear the greatest burden of morbidity and mortality.<sup>1</sup>

The preterm labors account for majority of the neonatal deaths, unrelated to congenital anomalies and are also responsible for more than one half of nursery costs. Many associated morbidities are reported in the premature infants who survive, including chronic lung

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disease, necrotizing enterocolitis, retinopathy of prematurity, intraventricular hemorrhage, and developmental delay.<sup>2</sup>

By identifying and treating the underlying cause of preterm labor, the perinatal morbidity and mortality can be decreased but unfortunately the etiology in most cases of preterm labor remains unknown. However, some factors that have been identified include anatomic abnormalities of the uterus and cervix, premature rupture of the membranes, placenta previa or abruption, trauma, excessive uterine enlargement as in multiple gestation, polyhydramnios, and infection.<sup>3</sup> An intrauterine infection is a major cause of premature labor with or without intact membranes. Intrauterine infection is present in approximately 25 percent of all preterm births and the earlier the gestational age at delivery, the higher the frequency of intra-amniotic infection. The organisms may gain access to the fetus before delivery. A fetal inflammatory response syndrome elicited in response to infection is associated with the impending onset of preterm labor and also with multi-systemic organ involvement in the fetus and a higher rate of perinatal morbidity.

The present study was undertaken to evaluate if at all there existed any association between genital tract infections in pregnant women, premature rupture of the membranes, and adverse fetal outcome.

#### **MATERIAL AND METHODS**

The present study was conducted by the Department of Microbiology as well as Obstetrics and Gynecology, Pt. Bhagwat Dayal Sharma Post Graduate Institute of Medical Sciences, Rohtak (Pt. B.D. Sharma), Pandit Bhagwat Dayal Sharma Post Graduate Institute of Medical Science (P.G.I.M.S.), Rohtak, Haryana, India. A total of 100 women divided equally into two groups were enrolled in the study.

The first group, group A, comprised of 50 women hospitalized at the labor room with spontaneous preterm labor (less than 37 weeks of pregnancy). The second group, group B, comprised of 50 normal full-term pregnant women who came in labor. This group served as a control group.

After thorough clinical examination of the cases, three high vaginal swabs were taken under full aseptic technique with the help of colposcopy. With the first swab, wet mount preparation, KOH preparation for Whiff-test, and Gram-stained smear (Kopeloff's modification) were prepared, and the scoring system proposed by Nugent was used for an evaluation. The second swab was immediately inoculated into an anaerobic transport medium (thioglycollate broth, HIMEDIA, Mumbai) for anaerobic culture, and inoculated on neomycin brain heart infusion agar and *Bacteroides* bile esculin agar (HIMEDIA, Mumbai) for anaerobic bacteria. The third swab was inoculated on blood agar and Mac-Conkey agars for culturing aerobic organisms. The organisms were isolated and identified following the standard protocols.<sup>4</sup> The diagnosis of bacterial vaginosis was made if three of the following four criteria were met including: a) a thin dark or dull gray homogenous malodorous discharge that adheres to the vaginal walls, b) an elevated vaginal pH level ( $\geq 4.5$ ), c) a positive Whiff test (fishy odour is noted on adding KOH to the discharge), and d) a presence of clue cells (epithelial cells with adherent organisms) on wet mount on microscopic evaluation.

At the time of delivery, the information recorded in both groups included the gestational age, birth weight of the newborn, Apgar score (at 1 and 5 minutes), and perinatal complications. A preterm delivery was defined as a delivery occurring before 37 weeks of pregnancy, and the criteria of low birth weight was babies with the birth weight of less than 2,500 g.

## RESULTS

High vaginal swabs from all the subjects screened, bacterial cultures were positive in 35 patients (70%) of Group A and 12 patients (24%) of group B. The incidence of aerobic bacterial flora was 60 percent in cases of group A subjects and 24 percent in Group B subjects (p-value < 0.05). The predominant aerobic isolate in both the groups was *Escherichia coli* (Table 1). The incidence of colonization by anaerobes in group A patients was 54 percent and 22 percent in group B patients. The commonest anaerobic isolate was *Bacteroides* species in both the groups, 19 cases (70.4% in group A) and 7 cases (58.3% in group B, Table 1). Mixed colonization with both aerobes and anaerobes were encountered in 36 percent of group A cases and 16 percent of group B cases. *Trichomonas vaginalis* was present in 8 percent of group A cases

and 6 percent of group B cases. Evidence of bacterial vaginosis was found to be in 12 percent and 6 percent of subjects of both the groups respectively. Infection with *Candida* species was evident in 16 percent and 14 percent of subjects belonging to the group A and group B, respectively. About 95 percent of babies born to mothers of group A were < 2,500 g in weight whereas 8 percent of babies born to mothers belonging to group B were < 2,500 g in weight (Table 2). The distribution of cases according to Apgar score in both the groups is summarized in Table 3. The Apgar score was < 7 at 1 minute in 17 newborns (34%) falling in group A and there was no such newborn in group B. No perinatal complication was observed in newborns of group B whereas respiratory distress syndrome and hyperbilirubinemia was observed in 4 (8%) each and septicemia was observed in 6 (12%) newborns in group

**Table 1. Frequency of various isolates from cases of two groups.**

Organism	Group A	Group B	P-value
<b>Aerobes</b>	<b>30</b>	<b>12</b>	<b>&lt; 0.05</b>
<i>E. coli</i>	15	7	
<i>Staphylococcus aureus</i>	5	2	
<i>Klebsiella pneumoniae</i>	6	1	
<i>Pseudomonas aeruginosa</i>	2	0	
Group B <i>Streptococcus</i>	2	1	
<i>Proteus mirabilis</i>	0	1	
<b>Anaerobes</b>	<b>27</b>	<b>11</b>	
<i>Bacteroides</i>	19	7	< 0.01
<i>Peptostreptococcus</i>	5	7	> 0.05
<i>Veillonella</i>	2	1	
<i>Fusobacterium</i>	1	0	
<b>Others</b>			
<i>Lactobacilli</i> (commensal)	30	39	< 0.05
<i>Trichomonas vaginalis</i>	4	3	
<i>Candida</i> species	8	7	

**Table 2. Distribution of newborns according to birth weight.**

Birth weight (g)	Group A	Group B
1,000-1,500	22 (44%)	0
1,600-2,000	13 (26%)	0
2,100-2,400	13 (26%)	4 (08%)
2,500-3,000	2 (04%)	27 (54%)
3,100-3,500	0	17 (34%)
3,600-4,000	0	02 (04%)
Mean SD	1.845 0.39	2.93 0.39

**Table 3. Distribution of cases of two groups according to Apgar score at 1 and 5 minutes.**

Apgar score	Group A (n = 50)		Group B (n = 50)	
	1 minute	5 minutes	1 minute	5 minutes
<4	5 (10%)	0	0	0
5-7	12 (24%)	02 (04%)	0	0
8-10	33 (66%)	48 (96%)	50 (100%)	50 (100%)

A (Table 4). Neonatal mortality was 14 percent in group A whereas it was nil in group B. The distribution of newborns according to outcome is summarized in Table 5.

## DISCUSSION

It is estimated that approximately 40 percent of spontaneous premature births are thought to be caused by infection.<sup>5</sup> One mechanism by which microorganisms might cause preterm labor is through ascension from cervical/vaginal area and replication in the placenta, deciduas and membranes.<sup>6</sup> In our present study, the incidence of lower genital tract infections in preterm labor cases (group A) was significantly higher (70%, p value < 0.05) than in term pregnancy (group B) cases (24%). Carroll et al in

their study reported the incidence of lower genital tract infection in preterm pregnancies to be 71 percent which is comparable to our study. Previous workers have reported that rate of preterm birth was higher in women who had lower genital tract infection.<sup>7</sup> We isolated various microorganisms, both aerobes as well as anaerobes associated with genitourinary infections.<sup>3</sup> The important ones being *E. coli*, *K. pneumoniae*, *S. aureus*, and GBS among aerobes, which are important agents of asymptomatic bacteria as well; and *Bacteroides fragilis*, *Peptostreptococcus* among anaerobes. Among anaerobes, *Bacteroides fragilis* was the most common organism in both groups, the incidence being 38 percent and 14 percent in groups A and B, respectively. In some other studies, a higher incidence of *Bacteroides* spp. is reported as compared

**Table 4. Perinatal complications of cases of two groups.**

Type of complication	Group A (n = 50)	Group B (n = 50)
No complication	36 (72%)	50 (100%)
Respiratory distress syndrome	4 (8%)	0
Hyperbilirubinaemia	4 (8%)	0
Septicemia	6 (6%)	0

**Table 5. Distribution of cases of two groups according to outcome.**

Outcome	Group A (n = 50)	Group B (n = 50)
Discharged	32	50
Expired	7	0
Shifted to ASN	10	0
LAMA	1	0

to our study.<sup>8,9</sup> Various studies indicate that there is decrease in *Lactobacilli* spp. with increase in *Bacteroides* spp., *Gardenella* spp. and *Streptococcus* spp.<sup>8,10</sup> Anaerobes were isolated from group A patients in a statistically significant correlation (p-value <0.01). These are associated with bacterial vaginosis, a noninflammatory overgrowth of anaerobic species. In the present study, bacterial vaginosis was diagnosed in 12 percent of group A and 6 percent of group B subjects. Some previous studies have concluded that bacterial vaginosis is diagnosed more frequently in women with preterm labor and predict adverse pregnancy outcome.<sup>8,11,12</sup> In some studies, the treatment of bacterial vaginosis has been shown to reduce the preterm delivery rates.<sup>13,14</sup> In our study, 48 percent of the newborns born to group A patients were < 2,500 g at birth. There was also higher rate of complications in babies born to group A patients than to group B patients. These findings are supported by many studies which suggest that low birth infants

are at a higher risk of neurodevelopmental morbidity and incur significant social and healthcare costs related not only to acute neonatal intensive care but also to the long term sequelae arising from preterm birth.<sup>15-17</sup> In our study, a total of 17 newborns had an Apgar score of < 8 at 1 minute among which 5 babies had an Apgar score < 4 at one minute. Seven newborns of group A mothers had a fatal outcome whereas no such newborn was seen in group B subjects.

Therefore, it can be concluded that lower genital tract infection has a significant role in the etiology of preterm birth and increased morbidity and mortality of newborn. Evaluation of vaginal smear and routine culture of the high vaginal swabs can be considered as a regular screening procedure in all antenatal cases for early detection of lower genital tract infections. Timely treatment of such infections can be very helpful in prevention of the preterm labor and the perinatal morbidity and mortality.

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