Research Article

Role of bacterial vaginosis in preterm labor - a prospective study

Renu Jain[1]

[1]Renu Jain, Assistant Professor, Department of Obstetrics and Gynaecolgy, Gajra Raja Medical College, Gwalior, M.P, India.

Address for correspondence: Dr Renu Jain, Email: renujain_1979@rediffmail.com

Abstract

Objective: To study the incidence of bacterial vaginosis in pregnant women in preterm labor and in labor at term and the relation of bacterial vaginosis with preterm delivery, neonatal birth weight and puerperal sepsis. **Material and Methods:** This prospective case control study included 150 pregnant women. 100 pregnant women with singleton pregnancy between 28 to 36 weeks of pregnancy with preterm labor pains were selected randomly in study group and 50 pregnant women in labor at term (>37 weeks) were enrolled in control group. Diagnosis of bacterial vaginosis was made by clinical criteria (Amsel's criteria). The two groups were compared in regard to the presence of bacterial vaginosis. Pregnancy outcome variables assessed included gestational age at delivery, neonatal birth weight and puerperal sepsis. **Results:** In study group 38% women, while in the control group 16% women had bacterial vaginosis. This difference is statistically highly significant. ($p < .001$). Out of 30 women with bacterial vaginosis in study group, 27 (90%) women delivered before 37 completed weeks, while only 10% delivered at term. Bacterial vaginosis was associated with low birth weight and was significantly associated with puerperal sepsis. **Conclusion:** Bacterial vaginosis in pregnancy is associated with adverse pregnancy outcomes including preterm labor, preterm delivery, low birth weight and puerperal sepsis. Thus screening for bacterial vaginosis in all pregnant women complaining of vaginal discharge and also in all patients with preterm labour is justifiable.

Key words: Preterm Birth, Bacterial Vaginosis, Amsel's criteria.

Introduction

Preterm birth is the leading cause of perinatal morbidity and mortality. Preterm birth may be defined as birth between age of viability and 37 completed weeks of pregnancy [1]. The incidence of preterm birth ranges from 5% to 8% in most developed and developing countries, but it is still increasing worldwide [1]. The World Health Organization estimates that about 15 billion babies were born preterm in 2010[2]. Preterm birth accounts for 75% neonatal deaths and 50% of long term morbidity, including respiratory disease and neurodevelopmental impairment [3]. Consequently preterm birth contributes to a large burden of disease, including high immediate and long term medical care costs, the need for special education services and institutional care for physically and mentally disabled infants. Etiology of preterm birth is complex, multifactorial and not completely understood. Bacterial infection is recognized as a major factor in the induction of preterm birth and neonatal morbidity and mortality [2]. A percentage of 40-50% is often given as the fraction of cases of premature delivery that may be due to infection [2].

Bacterial vaginosis refers to an alteration in the composition of vaginal flora whereby lactobacilli are greatly reduced in number or totally absent and there is a large increase in concentration of anaerobic and facultative bacteria, most commonly Gardnerella vaginalis, Prevotella and Bacteroides spp., and Mycoplasma hominis [2].

It has been associated with variety of obstetric complications including amniotic fluid infection, chorioamnionitis, preterm birth and puerperal endometritis, independent of other known risk factors [4,5,6].

Manuscript received: 4th March 2016
Reviewed: 18th March 2016
Author Corrected: 27th March 2016
Accepted for Publication 14th April 2016

Bacterial vaginosis is a number one cause of vaginitis among both pregnant and nonpregnant women. Prevalence of bacterial vaginosis is 15-30% among nonpregnant women and upto 50% among pregnant women [7, 8]. Considering the probable relationship of bacterial vaginosis and the risk of preterm labour, this study was designed to investigate this relationship with the aim of decreasing preterm labour rate by screening and treatment of pregnant women.

Material and Methods

This prospective case control study was carried out at Department of Obstetrics and Gynaecology, S.S. Medical College and Associated G.M.Hospital, Rewa (M.P.), during a period of 16 months from July 2005 to October 2006. This prospective case control study was carried out on 150 pregnant women. 100 patients were cases and 50 patients were control. Cases were patients admitted with idiopathic preterm labor as per the selection criteria mentioned below.

Inclusion Criteria

1. Gestational age between 28 to 36 weeks.
2. Singleton pregnancy.
3. With intact membrane.
4. In preterm labor, defined by regular uterine contractions at least 3 every 10 minutes, associated with cervical dilatation of at least 1cm but not more than 3cm and cervical effacement less than or equal to 50%.

Or

5. Threatened preterm labor, defined as patients in labor with intact membrane before 37 weeks with minimal change or without any change in cervical dilatation and effacement.

Exclusion Criteria

1. Premature rupture of membranes.
2. Preeclampsia.
3. Malpresentations.
4. Fetal malformations.
5. Polyhydramnios.
6. Placenta previa and abruptio placentae.
7. Severe anemia.
8. Intrauterine fetal death.
9. Intrauterine growth restriction.
10. Rh isoimmunisation.
11. Uterine and cervical anomalies.
12. Urinary tract infections.
13. Maternal medical disorders e.g. Diabetes mellitus, renal disorders and heart disease.

The control group included 50 pregnant women in labor at term (>37 weeks), who met none of the exclusion criteria and had no complications of pregnancy.

Detailed history was taken and a systematic general, systemic and obstetric examination was done including per speculum examination to exclude leaking membranes and to note the type of discharge. Women should not have douched within last 24 hours and no vaginal medication must have been taken during last 48 hours.

A clean and nonlubricated self retaining Cusco's speculum was inserted gently into the vagina and opened so that the cervix and vagina were thoroughly visualized for the presence of vaginal discharge-

- Gross features noted were- color, amount, consistency and smell of vaginal discharge.
- pH test - to avoid contact with cervical mucus and blood, vaginal fluid was collected from the mid vaginal lateral side walls with a sterile cotton swab. The swab was then touched to pH paper and matched immediately against the corresponding color chart.
- Whiff test or amine test- A second specimen of vaginal discharge was placed on a glass slide and few drops of 10% KOH solution were added to it. The Whiff test was positive if a "fishy" or "amine" odor was detected. The odor results from the liberation of amines and organic acids produced from the alkalization of anaerobic bacteria.
- Fixed smear examination by Papanicolaou Technique: Small amount of sample collected by Wooden Ayre's spatula was dropped on a glass slide and smeared gently evenly and quickly placed in 95% ethyl alcohol for fixation upto 42 hours. Later on these were stained by Papanicolaou Technique and examined under microscope to detect "clue cells", which are vaginal epithelial cells with serrated or unclear borders because of adherent bacteria.

Diagnosis of bacterial vaginosis was made by " Amsel's criteria" [9] which includes –

1. Thin homogeneous discharge.
2. Positive "whiff test".
3. Clue cells present on microscopy – at least 20% of epithelial cells.
4. vaginal ph >4.5

Three of four criteria must be met for the diagnosis of bacterial vaginosis. All the cases were followed till delivery. Preterm labor was subdivided into labor occurring prior to 34 weeks of gestation and between 34-37 weeks of gestational age. Pregnancy outcome variables assessed included gestational age at delivery, neonatal birth weight and puerperal sepsis.

A premature birth was defined as a birth before <37 weeks of gestational age. Newborn weighing less than 2.5 kg were considered as low birth weight infants. Maternal morbidity was considered to be present if there were clinical findings suggestive of endometritis and /or infection of a surgical wound. Statistical analysis of observations was made using chi-square test.

Results

A total of 100 pregnant women in preterm labor were selected as cases and 50 pregnant women in labor at term were selected as control on the basis of inclusion criteria. Cases in preterm labor were followed till delivery. Only 55 cases delivered in Gandhi Memorial Hospital, Rewa (M.P.) and 45 cases did not report back. (Table 1)

Table No 1: Cases on follow - up in the study group

S. No.	Bacterial vaginosis	Enrolled	Followed till delivery
1.	Present	38	30
2.	Absent	62	25
	Total	**100**	**55**

Statistically study and control groups were not different with respect to demographic factors (age, parity, gravidity, area of distribution and socioeconomic status), maternal weight and height, previous history of abortions and preterm delivery and previous history of sexually transmitted diseases, which are known risk factors for preterm labor.

Preterm labor was more common in unbooked cases (68%), women from rural areas (72%) and of lower socioeconomic class (58%). Preterm labor was more common in women between age group 20-30 years and in primigravidae (44%).

The incidence of bacterial vaginosis was 38% in study group and 16% in control group, this difference was statistically highly significant. (Table 2).

Table No 2: Incidence of bacterial vaginosis

S.No.	Bacterial vaginosis	Study group		Control group	
		No.	%	No.	%
1.	Present	38	38.0	8	16.0
2.	Absent	62	62.0	42	84.00
	Total	**100**	**100.0**	**50**	**100.0**

χ^2=12.28, p<0.001 Highly Significant

Bacterial vaginosis was more common among lower socio-economic class in both study and control group, 45% and 19% respectively. (Table 3)

Table No 3: Relation of bacterial vaginosis with socio-economic status

S.No.	Socio-economic status	Study group			Control group		
		Total	BV+	%	Total	BV+	%
1.	Lower	58	26	45.0	31	6	19.0
2.	Middle	33	10	30.0	15	2	13.0
3.	Upper	9	2	22.0	4	0	0
	Total	**100**	**38**		**50**	**8**	

χ^2=15.25, p<0.001 Highly Significant (Study Group)

Bacterial vaginosis was more common in patients with previous history of sexually transmitted diseases in both study (56%) and control group (17%).

On follow up of cases it was observed that majority of women with bacterial vaginosis (60%) delivered before 34 weeks, 30% delivered between 34-36weeks and 10% delivered at term, while 76% cases delivered at term who tested negative for bacterial vaginosis. Hence bacterial vaginosis was significantly associated with preterm birth. (Table 4)

Table No 4: Relation of bacterial vaginosis with preterm delivery

S.No.	Gestational age at delivery (in weeks)	BV present		BV absent	
		No.	%	No.	%
1.	≤ 33	18	60.0	2	8.0
2.	34-36	9	30.0	4	16.0
3.	≥ 37	3	10.0	19	76.0
	Total	30	100.0	25	100.0

χ^2=21.43, p<0.001 Highly Significant

In present study, women who delivered <34 weeks all had low birth weight babies, out of which 72.22% in the bacterial vaginosis group and 50% in non bacterial vaginosis group were very low birth weight babies, women who delivered between 34 to 36 weeks all had low birth weight babies out of which 33.33% in the bacterial vaginosis group and 25% in non bacterial vaginosis group were very low birth weight babies, while women who delivered at term 66.66% in the bacterial vaginosis group and 21.1% in non bacterial vaginosis group had low birth weight babies. (Table 5)

Table No 5: Relation of bacterial vaginosis with birth weight

Birth weight (kg)	≤ 33 weeks				34-36 weeks				≥ 37 weeks			
	B.V. + (n=18)		B.V. – (n=2)		B.V. + (n=9)		B.V. – (n=4)		B.V. + (n=3)		B.V. – (n=19)	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
≥2.5	0	0	0	0	0	0	0	0	1	33.3	15	78.9
1.5-2.4	5	27.8	1	50.0	6	66.6	3	75.0	2	66.6	4	21.1
< 1.5	13	72.2	1	50.0	3	33.3	1	25.0	0	0	0	0

Table 6 shows that bacterial vaginosis was significantly associated with puerperal sepsis.

S. No.	Puerperal sepsis	BV + (n=30)		BV – (n=25)	
		No.	%	No.	%
1.	Present	5	16.66	2	8.0
2.	Absent	25	83.33	23	92.0
	Total	**30**	**100.0**	**25**	**100.0**

χ^2=3.47, p < 0.01 Significant

Discussion

The etiology of preterm labor is multifactorial and can be found in fewer than half of all cases. With the development of "Intensive Neonatal Care" units, salvage rate of premature babies has increased considerably. In contrary to medical progress in neonatal care, there is almost an insignificant decrease in the incidence of idiopathic preterm labor. The accurate identification of at risk group for preterm labor is of immense importance for its prevention and treatment. Recently bacterial infection of genital tract is recognised as a major factor in the induction of preterm birth and neonatal morbidity and mortality. Goldenberg

and associates reported that earlier the onset of preterm labor, the greater the likelihood of the amniotic fluid infection [10].

In present study, in study group 38% women, while in control group only 16% women had bacterial vaginosis. This difference is statistically highly significant. McGreoger JA et al [7] and Holzman et al[8], reported prevalence of bacterial vaginosis in upto 50% of pregnant women.

A history of prior preterm birth strongly correlates with subsequent preterm labor [11]. In present study, higher frequency of previous preterm birth was found among women in study group than among women in control group, but this difference was statistically insignificant. In our study, none of the women with bacterial vaginosis had history of preterm delivery, thus eliminating preterm delivery as single best historical predictor of preterm delivery.

In present study, we found that bacterial vaginosis was more common in women with history of previous sexually transmitted diseases in both study group and control group. Moi M et al [12], reported that early sexual activity, a higher number of life time sexual partners, women with a new sexual partner and women with a prior history of sexually transmitted diseases are at an increased risk of bacterial vaginosis.

These circumstances also have a strong epidemiological association with preterm labor. Given these findings, identification earlier in pregnancy of women with the microbiological profile of bacterial vaginosis would create an opportunity for therapeutic intervention, which by modification of this profile, might result in reduction of preterm labor in this group.

In present study, women with bacterial vaginosis 60% delivered before 33 weeks, 30% delivered between 34-36 weeks and 10% delivered at term, while women without bacterial vaginosis 8% delivered before 33 weeks, 16 % delivered between 34-36 weeks and 76% delivered at term.

By statistical analysis bacterial vaginosis is significantly associated with preterm delivery.

Although the role of bacterial vaginosis in preterm labor is poorly understood, several reports [13] found that the relative risk of preterm birth is doubled if the mother has bacterial vaginosis. Hay PE et al [14] and McGregor JA et al [15], reported that women with bacterial vaginosis are upto 4 times more likely to have preterm birth than women without bacterial vaginosis. Kurki et al [5], and Gratacos et al [16], reported a 2 fold risk of preterm delivery among women with bacterial vaginosis. Purwar M et al [17], reported that bacterial vaginosis accounted for 83% of the attributable risk for preterm birth.

Leitich and associates [6] performed a metaanalysis to evaluate the risk of preterm delivery associated with bacterial vaginosis, reported that bacterial vaginosis increased the risk of preterm delivery with an odds ratio of 2.19.

Donders GG, Van Calasteren C, Bellen G et al [18], reported that bacterial vaginosis and intermediate flora is associated with an increased risk of preterm birth.

This study showed that bacterial vaginosis is associated with low birth weight. Gravett et al [19], E Holst et al [20] and Rodrigo Pauperio et al [21], showed similar results.

In study group, 16.66% women with bacterial vaginosis had puerperal sepsis while only 8% women without bacterial vaginosis had puerperal sepsis. Newton ER et al [22], reported that bacterial vaginosis is the strongest predictor of postpartum endometritis irrespective of mode of delivery. Rodrigo Pauperio et al [21], reported similar result. Jacobson and colleagues reported that the risk of puerperal infection was tripled in a group of Swedish women with bacterial vaginosis in early pregnancy [23].

Conclusion

Idiopathic preterm delivery still remains the most important cause of perinatal mortality and morbidity. No effective means exist to predict and prevent idiopathic preterm delivery. Bacterial vaginosis is an important genital syndrome, accounting for majority of cases of vaginitis, is asympyomatic in more than half of cases. It represents a potentially preventable cause of prematurity.

This study proves the association of bacterial vaginosis and preterm labor, low birth weight and puerperal sepsis.

Funding: Nil,
Conflict of interest: None.
Permission of IRB: Yes

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How to cite this article?

Renu Jain, Role of bacterial vaginosis in preterm labor - a prospective study : *Int J Med Res Rev* 2016;4(4):543-549. doi: 10.17511/ijmrr.2016.i04.12.

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