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PREGNANCY OUTCOMES AND RISK FACTORS IDENTIFICATION WITH GROUP-B STREPTOCOCCUS INFECTION : A CLINICAL STUDY

Obstetrics & Gynaecology

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ABSTRACT

OBJECTIVE: The present study was undertaken to study the prevalence, risk factors and pregnancy outcomes of GBS colonization at their third trimester.

MATERIALS & METHODS: The present study was a prospective, hospital-based study conducted at the Third Affiliated Hospital of Zhengzhou University of China, between January 2018 to December 2018 and Mother & Child Community Hospital, Bogura, Bangladesh between June 2018 to September 2019. A total of 995 pregnant women from Bangladesh and 1090 pregnant women from China between their 35-37 weeks of gestation were consecutively included in the study. Rectovaginal swab was collected to determine whether they carry GBS or not. Then both groups of pregnant women (pregnant women with and without GBS) were prospectively followed to see the maternal outcomes. Immediately after delivery (within 1 hour), the aural swab from the neonates with GBS positive mothers were collected in delivery or room to see GBS positivity.

RESULTS: In the present study 15% of the Bangladeshi pregnant women and 50% of Chinese women had rectovaginal colonization of GBS. In multivariate analysis, GDM, PIH and oligohydramnios emerged as independent predictors of GBS colonization. Although Bangladeshi data demonstrated adverse pregnancy outcomes like PROM and clinical chorioamnionitis in pregnant women with GBS colonization, Chinese data did not prove so. About 16% and 19% of the Neonates with maternal GBS colonization in Bangladeshi and Chinese samples respectively were GBS positive.

CONCLUSION: The study concluded that rectovaginal colonization of GBS during pregnancy is no less and the risk factors for colonization of GBS are GDM, PIH and oligohydramnios. A sizable proportion of neonates (one in six) with maternal GBS positivity may have neonatal GBS positivity.

KEYWORDS

Maternal Gbs Colonization, Risk Factors, Pregnancy Outcome, Neonatal Gbs Positivity

INTRODUCTION:

Group-B *Streptococcus* (GBS), occurring naturally in the vagina and bowel in some women, is a commensal, gram-positive bacterium having special capacity to cause perinatal infections of the mother, fetus, and newborn. In recent decades, GBS may lead to serious maternal complications like PROM, preterm birth,[1] still-birth[2] and chorioamnionitis.[3] It is also widely recognized as a leading cause of perinatal morbidity and mortality worldwide. It hasbeen identified as one of the common causesof the early onset of neonatal sepsis (before 7 days of life)[4], pneumonia, meningitis[5], body rash etc. leading to higher rates of morbidity and mortality. Globally, the burden of GBS disease is estimated to be 0.49–0.53 per 1000 livebirths, with a case fatality rate of 8.4–9.6%.[6,7]

Maternal rectovaginal colonization of GBS is the most important risk factor for early-onset group B streptococcal (EOGBS) disease in newborn (younger than 7 days of age).[8] The neonates acquire this infection during pregnancy and delivery by direct mother to child transmission of the pathogen. Early onset GBS infection in the neonates most commonly manifests with respiratory symptoms and pneumonia, while late onset GBS infection is more likely to present with meningitis and septicemia.[9]

A few studies have so far been done in Asian countries on pregnancy outcome of genital infection with GBS. So, studies are required to establish an ideal treatment protocol to prevent maternal, fetal and neonatal complications of GBS infection. The study was therefore undertaken to find the prevalence of maternal colonization with group B Streptococcus in pregnancy, to know the risk factors as well as to determine maternal and neonatal outcome in women with GBS. The findings obtained from the study might useful for the obstetricians to formulate a protocol for the prevention and treatment of Group-B *Streptococcal* infection in mothers and their newborns.

MATERIAL & METHODS:

Present study was a prospective, hospital-based study conducted at the Third Affiliated Hospital of Zhengzhou University of China, between January 2018 to December 2018, Mother & Child Community Hospital, Bogra, Bangladesh between June 2018 to September 2019. All pregnant women who attended for antenatal check-up at these hospitals between 35-37 weeks of gestation were included in the study. Swab for Group B- Streptococcus was collected either during antenatal checkup or if not done than during labor. Pregnant women with management of PROM, antepartum hemorrhage, pre-eclampsia, clinical and laboratory evidences of sexually transmitted infection were excluded from the study. Based on the predefined eligibility criteria, a total of 995 pregnant women from Bangladesh and 1090 pregnant women from China between their 35-37 weeks of gestation were consecutively included in the study.

METHODOLOGY:

After taking written informed consent and ethical clearance from the respective hospitals of Bangladesh and China, rectovaginal swab (single swab- first from lower vagina and then with the same swab from anal region) was collected from pregnant women to determine whether a woman carries GBS or not. In Bangladesh, trained paramedics collected the swab and in China attending Physician collected the swab. Study staff interviewed the enrolled women to collect other relevant data. Specimens collected using sterile swab were then placed in Stuart transport medium in China and Amine transport medium in Bangladesh and were sent to laboratory within 2 hours of obtaining the samples. The swabs were incubated in a selective enrichment broth medium (Todd Hewitt broth) containing nalidixic acid (15mg/L) and gentamicin(8mg/L) at 37^{0}Cfor 18-24 h.The broths were sub-cultured in 5% sheep bloodagar and incubated at 37 37^{0}C in 5% CO_2 for 18-24 h. Colonies were identified presumptively by colony morphology,gram stain,catalase reaction,hemolytic activity on sheep blood agar plates,(for GBS confirmation latex agglutination, CAMP test was done in Bangladesh and PCR in China).Records of these mothers were retrospectively reviewed to find the demographic and clinical factors associated with maternal GBS colonization. Then both groups of pregnant women

(pregnant women with and without GBS) were prospectively followed to see the maternal outcomes (PROM, premature labor, chorioamnionitis, septicemia etc.) Immediately after delivery (within 1 hour), the aural swab from the neonates with GBS positive mothers were collected in delivery or surgery room to see how many of them had GBS positivity.

STATISTICALANALYSIS:
Statistical analysis was done using SPSS version 25. The test statistics used to analyze the data were descriptive statistics and Chi-square (χ^2)Test. The risk ratio (either Odds Ratio or Relative Risk, as appropriate for a particular analysis) were calculated. P-value < 0.05 was considered significant.

RESULTS:
Result was separately prepared based on Bangladeshi and Chinese data.

1) RESULT BASED ON BANGLADESH DATA:
Of the 995 pregnant women recruited from Bangladesh, 150 (15.1%) were found harboring GBS in their anogenital region. Retrospective review of the records of the subjects revealed that majority were <30 years old (83.5%), multigravida (52.7%) and belonged to middle class (87.8%) family. Gestational diabetes mellitus was found in 7.8% cases, PIH in 12.8% and oligohydramnios in 8.7% cases. UTI and vaginitis each was found in 17.2% of the cases. Gestational Diabetes Mellitus (GDM), PIH, oligohydramnios, UTI and Vaginitis were found to be significantly associated with the development of maternal GBS infection (Table 1). GBS infection was found to be significantly associated with higher chances of PROM (RR=1.7) and choriamnionitis (RR=1.6). Out of 150 mothers who were GBS positive, 24 (16%) neonates were found to be GBS positive.

2) RESULT BASED ON CHINESE DATA:
Over half of the women (54.8%) were 30 or > 30 years old and 63.7% were multigravida. GDM was found in 18.7% cases, PIH in 4.8% and oligohydramnios in 16.1% cases. Mycoplasma and vaginitis were found in 1.7 and 1.9% cases respectively. GDM, oligohydramnios and mycoplasma were significantly associated with more risk of maternal GBS infection (Table 2). GBS infection was found to be significantly associated with higher chances of PROM. Out of 545 neonates with GBS positive mothers, 104(19%) were GBS positive.

Of the 5 variables with which the regression model was formed, GDM, PIH and oligohydramnios emerged as independent predictors of maternal GBS in multivariate analyses. The mothers with inadequate GDM, PIH and oligohydramnios were 3.6(95% CI = 2.1 – 6.3),4.7(95% CI = 3.0 – 7.5) and 6.2 (95% CI = 3.7 – 10.5) times more likely to have GBS colonization ($p < 0.001$, $p < 0.001$ and $p < 0.001$) respectively.

DISCUSSION:
In the present study 15% of the Bangladeshi pregnant women had rectovaginal colonization of GBS. Consistent with this finding, a 2016 meta-analysis estimated mean global prevalence of maternal GBS colonization to be 17.9% (95%CI: 16.2–19.7%)[10]. The highest prevalence was found in Africa (22·4%, 95% CI: 18·1–26·7%) while studies from southeast Asia had the lowest estimated mean prevalence (11·1%, 95% CI: 6·8–15·3%).[11]

In our study, three obstetric conditions, GDM, PIH and oligohyd ramnios emerged as independent determinants of GBS colonization in pregnant women. A study from Brazil also reported similar prevalence of GBS colonization (20.4%) in pregnant women but did not found any significant risk factors.[12] However, Dechen and associates[13] reported gestational age, PROM and preterm labor as risk factors. In another study, conducted in Thailand revealed a prevalence of colonization of 18% with associated risk factors for the condition being a higher mean maternal age and a lower mean gestational age.[14]

An association between age and gravidity and GBS colonization has been reported in some studies but not others; several studies[15] found no significant differences in colonization rates by age or parity, while others report associations with increasing gravidity.[16] A study conducted in Korea demonstrated that pregnant women in their first pregnancy, and women with premature rupture of membranes (PROM) (18 hours+) are at high risk of GBS colonization.[17] Sharply contrasting with these findings, a Jordanian study conducted in 2015 on 200 pregnant women with a median age of the participants 27 years and median gestational age 38 weekswith obstetric complications like gestational hypertension (9.5%), gestational diabetes (6.0%) and UTI (53.5%) noted no demographic or clinical differences between GBS+ and GBS-negative women.[11]

Although Bangladeshi data demonstrated adverse pregnancy outcomes like PROM and clinical chorioamnionitis in pregnant women with GBS colonization, Chinese data did not reveal so. GBS has been implicated in adverse pregnancy outcomes, including premature rupture of membranes (PROM), preterm labor and clinical and subclinical chorioamnionitis.[18]

In the present study, 16% and 19% of the Neonates with maternal GBS colonization in Bangladeshi and Chinese samples respectively were GBS positive. Neonatal sepsis usually develops within 3 days after birth, and the most frequent causative organism is GBS.[19] GBS is transmitted vertically during labor and delivery, and colonization occurs in up to 80% of neonates born to colonized mothers.[20] Maternal streptococcal colonization is also associated with increased risk of urinary tract infection and pregnancy complications, such as endometritis[20], chorioamnionitis[21], preterm birth and intrauterine death[22].

Following CDC recommendations, the United States adopted routine screening for GBS in women between 35-37 weeks of gestation, followed by antibiotic prophylaxis 4h prior to delivery for colonized patients.[23] This screen-and-treat paradigm, however, has not been widely accepted outside of the United States. Rather policy decisions have been challenged by the absence of solid estimates of the number of at-risk mothers and babies in many parts of the world.[24] Before concluding the findings, some limitations deserve mention. The study could follow GBS positive neonates to see their outcomes. Besides, GBS negative neonates were not examined for GBS positivity to exclude other sources neonatal GBS infection.

CONCLUSION:
Based on the findings, the study concluded that rectovaginal colonization of GBS during pregnancy is no less and the risk factors for colonization of GBS are GDM, PIH and oligohydramnios. The pregnancy outcomes of maternal GBS are PROM and clinical chorioamnionitis. Every one in six neonates with maternal GBS positivity may have GBS positivity.

Table I. Determinants of maternal colonization with GBS in Bangladeshi Women

Maternal characteristics*	Maternal GBS colonization		P-value	Odds Ratio (95% CI of OR)
	Positive (n = 150)	Negative (n = 845)		
Age (years)				
< 30	127(84.7)	704(83.3)	0.681	-
≥ 30	23(15.3)	141(16.7)		
Gestational age (weeks)				
< 37	177(78.0)	684(78.6)	0.873	-
≥ 37	33(22.0)	181(21.4)		
Gravida				
Primi	26(48.7)	398(47.1)	0.723	-
Multi	77(51.3)	447(52.9)		
GDM				
Yes	26(17.3)	52(6.2)	<0.001	3.9(1.9 – 5.3)
No	124(82.7)	793(93.8)		
PIH				
Yes	45(30.0)	82(9.7)	<0.001	3.9(2.6 – 6.1)
No	105(70.0)	763(90.3)		
Oligohydramnios				
Yes	33(22.0)	54(6.4)	<0.001	4.1(2.5 – 6.6)
No	127(78.0)	790(93.6)		
UTI				
Present	41(27.3)	130(15.4)	<0.001	2.1(1.4 – 3.1)
Absent	109(72.7)	715(84.6)		
Vaginitis				
Present	40(26.7)	131(15.5)	0.001	1.9(1.3 – 2.9)
Absent	110(73.3)	713(84.5)		

Table II. Determinants of maternal colonization with GBS in Chinese women

Maternal characteristics*	Maternal GBS colonization		p-value	OR (95% CI of OR)
	Positive (n = 545)	Negative (n = 545)		
Age (years)				
< 30	259(47.6)	234(42.9)	0.12	-
≥ 30	286(52.5)	311(57.1)		
Gravida				
Primi	206(37.8)	13(37.9)	0.31	-
Multi	339(62.9)	355(65.1)		
GDM				
Yes	119(21.8)	85(15.6)	<0.01	1.5(1.1 – 2.1)
No	426(78.2)	460(84.4)		
PIH				
Yes	32(5.9)	20(3.7)	0.05	1.6(0.9 – 2.9)
No	513(94.1)	725(96.3)		
Oligohydramnios				
Yes	101(18.5)	74(13.6)	0.02	1.4(1.0 – 2.0)
No	444(81.5)	471(86.4)		
Mycoplasma				
Yes	16(2.9)	2(0.4)	<0.001	8.2(1.8 – 35.8)
No	529(97.1)	543(99.6)		
Vaginitis				
Present	6(1.1)	15(2.8)	0.001	0.39(0.15 – 1.02)
Absent	539(98.9)	530(97.2)		

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