

Comparison of Group B Streptococcal Colonization in the Pregnant Diabetic and Non-Diabetic Women

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Abstract- To Compare colonization of group B streptococcus (GBS) in diabetic and non-diabetic pregnant women. In this prospective study 50 pregnant women with diabetes mellitus (both pregestational and gestational) and 43 pregnant women without diabetes between 33 and 37 weeks' gestation were evaluated. Three samples for Group B streptococcal culture detection were obtained from each subject in the following order: perineal sample, vaginal sample, and an anorectal sample. All had singleton gestations, negative tests for human immunodeficiency virus, and intact membranes at enrollment. Pearson chi-square and Fisher's Exact test were used when appropriate. Most common site of GBS colonization in all women was vagina (11.8%). Colonization of group B streptococcus in control group included vagina (7%) perineum (0.3%) and rectum (0.3%) and in diabetic group included vagina (16%) perineum (16%) and rectum (16%). Although comparison was shown higher vaginal colonization rate in diabetic group (16% versus 7%) but difference was not significant ($P=0.154$). The prevalence of group B streptococcus colonization in gestational diabetes was 20% and higher than pregestational diabetic women. Among women with pregestational diabetes, the prevalence of group B streptococcus colonization was 15% in non-insulin dependent diabetic women and 10% in insulin dependent diabetic women ($P>0.05$). Comparison between two groups showed high rectal colonization in diabetic group and difference was significant ($P=0.027$). Pregnant diabetic patients have higher carriage rates of group B streptococcus (GBS) in rectum than non-diabetic pregnant women and diabetes is a risk factor for group B streptococcus colonization during pregnancy.

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Introduction

Group B streptococcus (GBS) is a main cause of prenatal infections and neonatal sepsis. GBS is also a major cause of bacterium in pregnant women. Colonization of the human rectovaginal tract with GBS is a risk factor associated with chorioamnionitis and transmission of the infection to the infant. Neonatal exposure to high concentrations of GBS, mainly during vaginal delivery, leads to colonization of the lung airways and subsequent onset of severe diseases like pneumonia, sepsis and meningitis. GBS is present in the genitourinary tract of 10% to 40% of pregnant women, about 50% of the newborns of these mothers will be colonized during delivery and of these neonates, 1% to 2% present a severe invasive disease (1).

GBS can induce early-onset neonatal disease (sepsis, meningitis or pneumonia) during the first week of life and late-onset neonatal infection within the first 12 weeks of life (2).

The early-onset disease, appear in the neonates within 7 days of life and more than 90% occur within the first day of life. Fatal infection is associated commonly with fulminate and overwhelming early-onset disease. Maternal-intrapartum chemoprophylaxis is able to prevent the transmission of GBS to the newborn and to reduce the frequency and the severity of early onset disease. Because of high colonization of GBS in normal pregnant women, we decided to evaluate the influence of maternal diabetes on the risk of group B streptococcus colonization during pregnancy.

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Table 1. Frequency of positive culture GBS based on site of culture in all of pregnant women

Groups	Negative culture		Positive culture	
	No	percent	No	Percent
Vaginal culture	82	88.2	11	11.8
Rectal culture	84	90.3	9	9.7
Prineal culture	84	90.3	9	9.7

Patients and Methods

We prospectively analyzed data on 50 pregnant women with diabetes mellitus, both pregestational and gestational, and a control group of 43 pregnant women without diabetes. All had singleton gestations, negative tests for human immunodeficiency virus, and intact membranes at enrollment. Culture specimens for group B streptococcus were obtained from the lower vaginal walls, perineal and anorectal. Two-tailed unpaired Student t test, Mann-Whitney U test, and chi 2 tests were used as appropriate. Multiple logistic regression analyses were performed to evaluate the independent influence of maternal diabetes on the rate of group B streptococcus colonization. In this evaluation 50 pregnant women who received prenatal care in diabetic research center and 50 normal pregnant women who was prenatally cared in midwifery clinic of zeinab hospital (Mashhad, Iran) participated. The age of pregnant women was 34-37 week. They filled a questionnaire for demographic characteristics, pregnancy date, history of previous pregnancies and type of diseases. Samples were obtained from vagina, perineal and anorectal region, and cultured in blood agar, TSB and moller-hinton agar mediums.

Results

Study was done for vaginal, perineal and anorectal culture of GBS colonization on the 43 normal pregnant women and 50 diabetic pregnant. Diabetic group include IDDM, NIDDM and GDM. 46.2% of all pregnant women were normal pregnant women and 21.5% NIDDM, 21.5% GDM and 10.8% IDDM. Mean age in normal group was 28.7 year and in study group was 31.7 year. Mean of gravid in normal group was 2.3±1.42 and in study group 3.3±1.88. Incidence of previous PROM in normal group was zero and in study group was 0.16%. Mean pregnancy age in normal group was 35.8 weeks and in study group was 35.2 weeks. In all women the positive culture of group B streptococcus (GBS) in vagina was 11.8%, in Rectum and in perineum was equal (9.7%) (Table 1). GBS colonization in normal group includes vagina (7%) perineum (2.3%) and rectum 2.3%). In study group include vagina (16 %) 0.027 (16 %) and rectum (16 %). Although comparison between two group was shown the vaginal colonization rate of GBS was higher in the diabetic population 16 %, than in the non-diabetic group 7% but difference was not significant (P=0.154). Perineum and rectal positive cultures in diabetic group was eight times than control group and differences were significant (Table 2).

Table 2. Comparison of positive culture GBS based on site of culture between diabetic and non-diabetic groups

Groups	Positive Vaginal culture		Positive Rectal culture		positive Prineal culture	
	Frequency	percent	Frequency	percent	Frequency	percent
Control group	3	7.0	1	2.3	1	2.3
Study group	8	16.0	8	16.0	8	16.0
P value	0.154		0.027		0.027	

Table 3. Comparison of positive culture GBS based on site of culture between different type of diabetic pregnant women

Groups	Positive Vaginal culture		Positive Rectal culture		positive Prineal culture	
	Frequency	percent	Frequency	percent	Frequency	percent
NIDDM	3	15%	3	15%	3	15%
IDDM	1	10%	1	10%	1	10%
GDM	4	20%	4	20%	4	20%
Total	8	16%	8	16%	8	16%
P value	0.197		0.197		0.197	

The vagina was the site most often positive in both diabetic and non-diabetic populations (11.8 %). The second and third site to culture positive was equal in perineum and rectum (9.7%). The two sites that were positive significantly more often in diabetics were the perineum and rectum ($P=0.027$). The prevalence of group B streptococcus colonization in gestational diabetes was 20% and higher than pregestational diabetic. Among women with pregestational diabetes, the prevalence of group B streptococcus colonization was 15% in none insulin dependent diabetic women and 10% in insulin dependent diabetic women ($P>0.05$). So in the diabetic groups include IDDM, NIDDM, and GDM difference of colonization in three sites was not significant (Table 3).

Discussion

Colonization of the human rectovaginal tract with GBS is a risk factor associated with chorioamnionitis and transmission of the infection to the infant we evaluated the influence of maternal diabetes on the risk of group B streptococcus colonization during pregnancy and compared with other studies.

Dr Ma studied on the GBS colonization rate and the relationship between vaginal colonization of GBS and the maternal and neonatal outcome. He found the GBS carrier rate in 1039 pregnant women was 11.07%. He conclusive GBS might be one of vaginal pathogens in Chinese women, but it is not severe enough to threaten the health of pregnant women and their newborns (3). The prevalence of group B streptococcal colonization in pregnant women was about 20% in the study of Dr Kowalska and co workers in Poland. They recommended for the prevention of newborns intrapartum infections a major thing is the prevalence of the transmission risk to newborns from mothers with a GBS coloni-

zation and the appropriate intrapartum management (4). Dr Tsolia and co workers evaluated the prevalence and risk factors of group B streptococcus (GBS) colonization among pregnant women and their neonates in Greece. The overall maternal and neonatal colonization rates were 6.6% and ½ colonization rate in our study. Although the rate and risk factors of maternal and neonatal GBS colonization may vary in different communities. These rates, as well as the incidence of neonatal disease, need to be thoroughly evaluated in each country to allow the most appropriate preventive strategy to be selected (5). Stapleton and co workers to study about the risk factors for group B streptococcus (GBS) colonization in pregnancy, hypothesizing those health care workers may have increased risk. Their results showed that health care workers, black women, and women with high body mass index may be at greater risk of GBS colonization in pregnancy. However, any increases in risk are modest and the association between a health care occupation and GBS colonization needs to be investigated further (5). Dr El-Kersh and co workers detected group B streptococcal carrier state of Saudi females during 3rd trimester of pregnancy and assessed the type of specimens and the techniques used for the organism detection. Group B streptococci colonization rate among term Saudi pregnant women in comparative our study was relatively high (27.6%); and thereby constitutes a group of women whose infants are at great risk of early-onset invasive disease. They concluded that the modified agglutination test after growth amplification seems rapid and cost-effective to detect lightly or heavily group B streptococcal colonized women. Vaginal and rectal swab specimens at late pregnancy appeared necessary to accurately identify group B streptococcus maternal colonization (7). The study of Kowalska et al included the pregnant women and their newborns from Obstetric and Gy-

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necology Department of National Research Institute of Mother and Child during 2001 and 2002 years, and cervical, vaginal and perinea swabs were obtained. The prevalence of pregnant women group B streptococcal colonization in their study was 19.7% and greater than our results. 70 of 203 neonates from mothers with positive results of their screening had the GBS colonization confirmed. The prevalence of confirmed streptococcal colonization in neonates was 34.5% (8).

Barbaros et al determined the incidence of group B Streptococcus (GBS) colonization in pregnant women and newborns in the maternity ward of Cerrahpasa Medical Faculty and Bakirkoy SSK Hospital, Istanbul, Turkey. They isolated GBS from 24 women in a total of 300 pregnant women and the colonization rate was found to be 8% that was lower than our results. Two newborns were colonized with GBS (9).

Tor-Udom et al showed GBS colonization rate was 16% in pregnant women, receiving antenatal care at Thammasat Hospital (10). Of the 136 subjects, 26.5% of the control, vaginoperianal samples were positive for Group B streptococcal culture. In comparison, 27.2% of the anorectic specimens and 28.7% of the perinea specimens were positive for Group B streptococcal culture. There was no statistically significant difference in the detection of Group B streptococcal culture among the three sample sites. The Group B streptococcal detection rate was not different among the three sampling sites. Therefore, pregnant women do not need to be subjected to the additional pain of anorectic sampling to detect Group B Streptococcus (11), but we had high rectal colonization rate in diabetic women, which suggests diabetes as a risk factor for Group B streptococcal colonization in rectum. In 1996, the Centers for Disease Control and Prevention (CDC), the American College of Obstetricians and Gynecologists, and the American Academy of Pediatrics recommended that obstetrics providers should adopt either a culture-based or a risk-based approach for the prevention of this disease. The aim of this prospective study was to determine the colonization rate of GBS in the population of pregnant women between July 1st 2001 and December 31st 2002, and to introduce a culture-based strategy to prevent early onset neonatal GBS disease. From a population of 1756 pregnant women, 1228 were screened with rectal and vaginal swabs (69.9%). Maternal colonization rate was 1.4% and very lower compared to our study (11.8%). There was one case of early-onset neonatal sepsis consistent with GBS disease (0.6%) in a patient with negative cultures. From the colonized patients, only

one presented risk factors. Because most of the colonized women did not present intrapartum risk factors, the results of this study suggest that the culture-based approach should be used for the prevention of early-onset GBS disease in pregnant population (12). In many countries, in particular in US, several recommendations have been proposed to prevent the prenatal GBS infection. Intra-partum administration of ampicillin or penicillin is recommended for the women with one or more risk-factors (labor < 37 weeks of gestation, duration of ruptured membranes \geq 18 hours, intrapartum temperature \geq 38 degrees C, previous infant with invasive GBS disease, diabetes) and for women with collect vaginal and rectal swab for GBS culture at 36-38 weeks' gestation, positive for GBS. No treatment is required for the babies of women treated or with negative culture performed near term. Treatment with ampicillin is necessary only in the new-born of women with incomplete or unknown results or not done cultures and in those born from mothers with positive cultures, but not intrapartum treated. Collection of swabs for GBS is recommended before antibiotic administration. If the culture is negative, they suggest stopping the antibiotic therapy; otherwise the treatment must be continuities for 5-7 days (1). In their study, Bey and co workers cultured the posterior pharynx, endocervix, vagina, and rectum of 101 diabetic pregnant women and 100 non-diabetic grava patients. The colonization rate of GBS was higher in the diabetic population, 31.7%, than in the non-diabetic group 19.0%, ($P < 0.039$). The vagina was the site most often positive in both diabetic and non-diabetic populations (23.8% and 17.0%, respectively, $P = NS$). The second site to culture positive overall and the only individual site that was positive significantly more often in diabetics was the rectum (16.9% versus 7.0%, $P < 0.05$) (13). In comparison to our study, their results of colonization rate were two fold but the positive culture sites were similar our results. Raimer et al. compared the incidence of group B Streptococcus colonization in diabetic and non-diabetic patients, were cultured at the vaginal introitus using a standardized technique. No significant difference was found in the group B Streptococcus colonization rates between these two groups of patients. In addition, no significant difference was found in the group B Streptococcal colonization rates between gestational and pregestational diabetics. The results of the present study suggest that there is no substantial evidence to consider diabetes mellitus as a higher risk criterion for group B Streptococcus screening (14). Piper *et al* determined whether gestational diabetes increases the

risk of maternal and neonatal morbidity from group B streptococcal colonization. They found, over all 12% were colonized with group B streptococcus, with no difference in colonization rates between gestational diabetic (12%) and non-diabetic (12%) women and gestational diabetes does not alter the perinatal morbidity associated with group B streptococcal colonization in pregnancy (15).

Ramos and colleagues evaluated the influence of maternal diabetes on the risk of group B streptococcus colonization during pregnancy. They prospectively analyzed data on 105 pregnant women with diabetes mellitus, both pregestational and gestational, and a control group of 300 pregnant women without carbohydrate intolerance. The prevalence of group B streptococcus colonization in pregestational diabetic women was 54.1% and in women with gestational diabetes it was 35.1% that was greater than our result (16). Matorras *et al* investigated the influence of maternal diabetes on Group B Streptococcus (GBS) colonization and GBS urinary infection. A higher prevalence of GBS colonization was found among diabetics (20% versus 10.9%). The rate of colonization was not correlated to the severity of the diabetes condition. The possible etiological implications are commented on, and vaginal and rectal cultures are recommended for GBS screening in the pregnant diabetic patient (17).

In conclusion, the results of the present study suggest that there is evidence to consider diabetes mellitus as a higher risk criterion for group B Streptococcus screening, and we can recommend antibiotic in 34-37 weeks of pregnancy date in diabetic women for prophylaxis of maternal and neonatal complications of GBS colonization.

References

1. Bevilacqua G. Prevention of perinatal infection caused by group B beta-hemolytic streptococcus. *Acta Biomed Ateneo Parmense* 1999; 70(5-6): 87-94.
2. Dani C, Martelli E, Rubaltelli FF. Prophylaxis of group B beta-hemolytic streptococcal infections. *Acta Biomed Ateneo Parmense* 2000; 71 Suppl 1: 541-5.
3. Ma Y, Wu L, Huang X. Study on perinatal group B Streptococcus carriers and the maternal and neonatal outcome. *Zhonghua Fu Chan Ke Za Zhi* 2000; 35(1): 32-5.
4. Kowalska B, Niemiec KT, Drejewicz H, Polak K, Kubik P, Elmidaoui A, et al. Prevalence of group B streptococcal colonization in pregnant women and their newborns based on the results of examination of patients in the Obstetric and Gynecology Department of the National Research Institute of Mother and Child: a pilot study. *Ginekol Pol* 2003; 74(10): 1223-7.
5. Tsolia M, Psoma M, Gavriili S, Petrochilou V, Michalas S, Legakis N, et al. Group B streptococcus colonization of Greek pregnant women and neonates: prevalence, risk factors and serotypes. *Clin Microbiol Infect* 2003; 9(8): 832-8.
6. Stapleton RD, Kahn JM, Evans LE, Critchlow CW, Gardella CM. Risk factors for group B streptococcal genitourinary tract colonization in pregnant women. *Obstet Gynecol* 2005; 106(6): 1246-52.
7. El-Kersh TA, Al-Nuaim LA, Kharfy TA, Al-Shammary FJ, Al-Saleh SS, Al-Zamel FA. Detection of genital colonization of group B streptococci during late pregnancy. *Saudi Med J* 2002; 23(1): 56-61.
8. Kowalska B, Niemiec KT, Drejewicz H, Polak K, Kubik P, Elmidaoui A, et al. Prevalence of group B streptococcal colonization in pregnant women and their newborns based on the results of examination of patients in the Obstetric and Gynecology Department of the National Research Institute of Mother and Child: a pilot study. *Ginekol Pol* 2003; 74(10): 1223-7.
9. Barbaros I, Murat C, Mehmet V, Ismet TA, Can K, Sukufe D, et al. The colonization incidence of group B streptococcus in pregnant women and their newborns in Istanbul. *Pediatr Int* 2005; 47(1): 64-6.
10. Tor-Udom S, Tor-Udom P, Hiriote W. The prevalence of streptococcus agalactiae (group B) colonization in pregnant women at Thammasat Hospital. *J Med Assoc Thai* 2006; 89(4): 411-4.
11. Orafu C, Gill P, Nelson K, Hecht B, Hopkins M. Perianal versus anorectal specimens: is there a difference in Group B streptococcal detection? *Obstet Gynecol* 2002; 99(6): 1036-9.
12. Larcher JS, Capellino F, De Giusto R, Travella C, Balangione FG, Kreiker G, et al. Group B streptococcus colonization during pregnancy and prevention of early onset of disease. *Medicina (B Aires)* 2005; 65(3): 201-6.
13. Bey M, Pastorek JG 2nd, Miller JM Jr. Group B streptococcal colonization in the diabetic gravida patient. *Am J Perinatol* 1992; 9(5-6): 425-7.
14. Raimor K, O'Sullivan MJ. Influence of diabetes on group B Streptococcus colonization in the pregnant patient. *J Matern Fetal Med* 1997; 6(2): 120-3.
15. Piper JM, Georgiou S, Xenakis EM, Langer O. Group B streptococcus infection rate unchanged by gestational diabetes. *Obstet Gynecol* 1999; 93(2): 292-6.

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16. Ramos E, Gaudier FL, Hearing LR, Del Valle GO, Jenkins S, Briones D. Group B streptococcus colonization in pregnant diabetic women. *Obstet Gynecol* 1997; 89(2): 257-60.
17. Matorras R, Garcia-Perea A, Usandizaga JA, Omeñaca F. Recto-vaginal colonization and urinary tract infection by group B Streptococcus in the pregnant diabetic patient. *Acta Obstet Gynecol Scand* 1988; 67(7): 617-20.