Risk Factors Related to Group B Streptococcal Colonization in Pregnant Women in Labor

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Objective: *To determine the risk factors related to group B streptococcal (GBS) colonization in pregnant women on admission in labor.*
Material and Method: *From the 1st-30th October 2004, at the Rajavithi Hospital, 320 pregnant women, who fulfilled the specified criteria, were selected for a cross-sectional descriptive study. Swabs were cultured from the lower vagina and anorectum for GBS using Todd-Hewitt broth with nalidixic acid 15 □g/ml and gentamicin 8 □g/ml only.*
Results: *Colonization was present in 58 cases (18.12%). The risk factor for GBS colonization was an older mean maternal age and a lower mean gestational age. No mothers or neonates during the study period developed a clinical infection from GBS.*
Conclusion: *The risk factors for GBS colonization in pregnant women were older maternal age and lower gestational age.*

Keywords: *Risk factors, Group B streptococcus, GBS, Colonization*

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During the last two decades group B streptococci (GBS) has been mentioned as an important cause of perinatal morbidity and mortality[1]. Many previous international studies reported a prevalence rate of GBS colonization varying from 5-40%[2-4]. However, Thai studies reported a GBS colonization varying from 0.9-14.5%[5-9]. The type of culture media and sites of culture such as vagina or rectum have been suggested for a better colonization rate[3,10]. The present study was conducted to determine the risk factors related to GBS colonization using both vaginal and anorectal cultures in pregnant women in labor on admission at Rajavithi Hospital.

Material and Method

The present study was conducted between 1st-30th October 2004 at Rajavithi Hospital. The inclusion criterion was a gestational age between 28-42 weeks with true labor pain. Patients having received antibiotic treatment within 2 weeks before admission were excluded. The hospital's ethics committee approved the present study and written informed consent was obtained from the women. Two cotton swabs were used to collect specimens from the lower third of the vagina and anorectum and were inoculated within 24 hours into a Todd-Hewitt broth culture media containing 15 □g/ml of nalidixic acid and 8 □g/ml gentamicin. The broths were incubated at 35□C for 18-24 hours and were then subcultured onto a blood agar plate and incubated for a further 24 hours. Gram staining was done to confirm gram positive cocci in chains. The streptococci were excluded using a catalase test. Finally, beta hemolytic streptococcal colonies were identified using a CAMP test (latex agglutination test). All parturients were attended throughout delivery by nurses, externs (the sixth year medical students), obstetric-gynecologic residents, and medical staff on duty. After delivery, all parturients received routine postpartum care.

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Table 1. Association between various factors and positive GBS culture in pregnant women

Characteristics	GBS culture		p-value
	Negative (n = 262)	Positive (n = 58)	
1. Age (years)			
10-20	54	11	0.953
21-30	145	31	
31-40	59	15	
>40	4	1	
mean ± SD (yrs)	24.27±5.87	26.36±6.64	0.017*
2. Occupations			
Merchant	28	3	0.269
Government office	9	-	
Employee	133	32	
Housewife	92	23	
3. Education levels			
Primary education	87	18	0.260
Secondary education	121	22	
Undergraduate	32	8	
Bachelor degree	21	10	
Master degree	1	-	
4. Smoking			
Never	259	58	0.413
Quit > 3 month	3	-	
5. Alcoholic Drinking			
No	260	58	0.504
Yes	2	-	
6. Parity			
0	130	22	0.365
1	82	26	
2	38	7	
≥ 3	12	3	
7. Gestational age			
< 34 weeks	9	1	0.632
34-42 weeks	251	57	
> 42weeks	2	-	
mean ± SD (weeks)	39.67±1.95	37.76±2.18	<0.001*
8. Membrane Rupture			
None	209	46	0.300
< 18 hour before admit	44	12	
≥ 18 hour before admit	9	-	
9. Sexual intercourse (before delivery)			
1 < week ago	6	-	0.356
1-3 week ago	5	-	
> 3 week ago	3	-	
No sexual intercourse	248	58	
10. Ever treated with antibiotic after admission			
No	254	57	0.580
Yes	8	1	
11. Route of delivery			
Normal delivery	168	44	0.276
Forceps extraction	5	1	
Vacuum extraction	6	2	
Cesarean delivery	83	11	

GBS = Group B Streptococcal

Table 1. Association between various factors and positive GBS culture in pregnant women (Cont.)

Characteristics	GBS culture		p-value
	Negative (n = 262)	Positive (n = 58)	
12. Birth weight (grams)			
< 1,000	-	1	0.290
1,000-1,999	14	1	
2,000-2,499	17	4	
2,500-2,999	89	22	
3,000-4,000	136	29	
> 4,000	6	1	
13. Mean birth weight (grams)			
Mean ± SD	2,950.85±564.23	2,924.26±468.72	0.738
14. Sex of newborn			
Female	134	30	0.936
Male	128	28	
15. Newborn			
Term	234	55	0.199
Preterm	28	3	
16. Maternal complications			
16.1 Antepartum period			
No	223	49	0.903
Yes	39	9	
16.2 Intrapartum period			
No	237	50	0.335
Yes	25	8	
16.3 Postpartum period			
No	242	50	0.133
Yes	20	8	
17. Neonatal complications			
No	243	56	0.290
Yes	19	2	
18. Intrapartum fever			
No	261	58	0.999
Yes	1	0	
19. Episiotomy (Total vaginal delivery n = 237)	(n = 191)	(n = 46)	
No	23	6	0.852
Yes	168	40	

GBS = Group B Streptococcal
* Statistical significant difference ($p < 0.05$)

Usually all neonates delivered in Rajavithi Hospital were attended by pediatric residents and neonatologists. As the Rajavithi Hospital has no universal antenatal culture-based screening at 35-37 weeks of gestation, all the neonates were observed for signs of sepsis. If sepsis was suspected, a full diagnostic evaluation and empiric therapy was performed. After being notified of any positive culture results (2-4 days after collection of specimen) babies were observed by the neonatologists and antibiotics were not offered to the culture-positive mothers who had no clinical signs and symptoms of GBS infection. Uneventful intra- and postpartum mothers and their babies were discharged on the 4th day postpartum. They were scheduled to return in 6 weeks for postpartum check up. The data were subsequently analyzed for mean, standard deviation, frequency and percentage, unpaired t-test or Chi-square test or Fisher's exact test by using SPSS computer program. The level of statistical significance was set at $p < 0.05$.

Results

During the present study period, fifty-eight pregnant women from 320 cases or 18.12% were colonized with GBS from at least one site of collection. GBS colonization in parturients and risk factors were analyzed as shown in Table 1. When maternal and gestational age was compared by interval classification, there was no significant difference between the GBS positive and negative group, but when maternal and gestational age was compared using the mean, a significant difference was found. During the present study period, no cases of mothers and babies developed a clinical infection from GBS.

Discussion

The prevalence rate of positive GBS culture in pregnant women was similar to those of previous international studies of 5 to 40%[2,4], but was the highest of all the Thai studies[5-9]. It was postulated that this might be because of the difference between the culture medium and sites of specimen collection. A selective broth culture medium (Todd Hewitt) containing 15 □g/ml nalidixic acid and 8 □g/ml gentamicin was used and specimens were also taken from two sites: vaginal and rectum in each case while the other studies took specimens from either only vaginal or cervical sites only.

In the previous study[5] at Rajavithi Hospital, although there was not an exact prevalence of GBS in pregnant women, there was quite a low detection rate (0.9%) 20 times lower than that of the present study. In the previous study only non-selective, blood agar and culture from the cervix was used. Thinkhamrop et al[8] reported a similar higher prevalence rate of positive culture in Thai pregnant women between 20 to 32 weeks gestation (12-14.5%) using similar selective media and a lower prevalence rate by blood agar (3-8%). The higher prevalence rate (18.12%) of positive cultures obtained in the present study was possibly from more specimens being collected from the anorectum.

Todd-Hewitt media was recommended as a selective media of choice for GBS colonization[11]. However, in 2001 Werawatakul et al[9] reported a similar prevalence rate (6.2%) of GBS colonization, as did the study of Pengsa et al[7] (6.0%) in 1982 in the same hospital (Srinagarind). Werawatakul et al[9] used Todd-Hewitt media while Pengsa et al[7] used non-selective media (blood agar, chocolate, and Mc Conkey agar). Nearly two decades between both studies was suggested to be one of the reasons explaining these similar prevalence rates while different culture media was used. CDC[11] recommended that the risk-based approach is no longer an acceptable alternative except in circumstances where culture results are not available before delivery. Due to the high costs of the screening process and low prevalence of neonatal GBS infections, almost all the hospitals in Thailand, especially Rajavithi Hospital, do not perform routine culture screening between 35 and 37 weeks' gestation. Some women did not attend the antenatal clinic before delivery.

Regan et al[12] reported that the risk factors for cervicovaginal GBS colonization at 23-26 weeks' gestation were older maternal age, lower parity, living alone, extreme increases in sexual activity, including both frequent intercourse and multiple partners, concurrent colonization with Candida sp, higher education, external genital erythema, purulent vaginal discharge and pH greater than 5. A decreased risk of colonization was seen in those who were currently smoking. Liampongsabhuddhi et al[6] also reported the non-significant difference of risk factors such as drinking, sexual intercourse during pregnancy and the woman's educational level. Older maternal age was the only significant risk factor. However, the very low prevalence of GBS colonization (1.24%) reported in their study was possibly because of the inappropriate specimen site (cervix). The culture media was not mentioned, and an ordinary culture media may have been used in their study. Werawatakul et al[9] reported the significant risk factors for GBS colonization in mothers were intrapartum fever and episiotomy. However, CDC suggested that in the unknown GBS status, intrapartum antibiotic prophylaxis was indicated if there were any of the following criteria: delivery at < 37 weeks of gestation, amniotic membrane rupture ≥ 18 hours and intrapartum temperature $\geq 38.0^{\circ}C$.

Of all the risk-factors recommended by CDC[11] and Werawatakul et al[9] there was no significant difference between GBS positive and negative-culture cases in the present study. The significant risk factors in the present study i.e. older mean maternal age, was confirmed by Regan's[12], Liamponsabhuddhi's[6] and Gilbert's[4] studies. Although the mean gestational age in the GBS positive group was significantly lower than those in the GBS negative group the mean gestational age in both was more than 37 weeks. Lower numbers of some cells in each interval could be suggested as one of the causes of why there were no significant differences between groups when maternal age and gestational age were compared using interval, but a significant difference was found when they were compared using

mean only. However, mean maternal age should not show any clinical significant difference as there was only a 2 year difference of mean maternal age with both of them in the 2nd decade. Mean gestational age should also have no clinically significant difference as there was only a 2 week difference of mean gestational age with both of them more than 37 weeks. It was proposed that the non-significant difference of the risk factors recommended by the CDC study may have been from the low prevalence of each of the risk factors such as preterm labor (10.7%), amniotic membrane rupture ≥ 18 hr (3.4%) and intrapartum temperature ≥ 38.0 ℃ (0.3%). Therefore, further investigation to analyze the significance of each risk factor should be studied in a larger number of Thai parturients. It may be ascribed that as routine culture for neonates of maternal positive culture for GBS were not routinely taken, asymptomatic GBS infection may be undetected.

In conclusion, older mean maternal and lower mean gestational age were the significant risk factors related to GBS colonization in pregnant women on admission in labor using Todd-Hewitt broth and both vaginal and anorectal cultures.

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ปัจจัยเสี่ยงของการพบเชื้อ สเตร็ปโตค็อคคัส กรุ๊ปบี ของหญิงตั้งครรภ์ที่เจ็บครรภ์คลอด

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วัตถุประสงค์: *เพื่อหาปัจจัยเสี่ยงของการพบเชื้อเสตร็ปโตค็อคคัส กรุ๊ปบี ในหญิงตั้งครรภ์ขณะเจ็บครรภ์คลอด*

วัสดุและวิธีการ: *ศึกษาในระหว่างวันที่ 1-30 ตุลาคม พ.ศ. 2547 โดยวิธีการสำรวจแนวตัดขวาง (cross-sectional) ในหญิงตั้งครรภ์ที่มีคุณสมบัติตามเกณฑ์ที่กำหนดไว้ 320 ราย จะได้รับการเพาะเชื้อจากบริเวณช่องคลอดส่วนล่างและทางทวารหนักร่วมกับไส้ตรง โดยใช้น้ำยาเลี้ยงเชื้อ Todd-Hewitt ที่มียาปฏิชีวนะ nalidixic acid 15 □g/ml และ gentamicin 8 □g/ml*

ผลการศึกษา: *ผลการเพาะเชื้อ พบเชื้อสเตร็ปโตค็อคคัสกรุ๊ปบี ในมารดา 58 ราย หรือร้อยละ 18.12 ปัจจัยเสี่ยงของการพบเชื้อสเตร็ปโตค็อคคัสกรุ๊ปบี คือ อายุมารดาเฉลี่ยที่มาก และอายุครรภ์เฉลี่ยที่น้อย ไม่พบภาวะการติดเชื้อสเตร็ปโตค็อคคัส กรุ๊ปบี ในมารดาและทารกเกิดในระหว่างการศึกษานี้*

สรุป: *ความชุกของการพบเชื้อสเตร็ปโตค็อคคัสกรุ๊ปบี ในหญิงตั้งครรภ์ในโรงพยาบาลราชวิถี ใกล้เคียงกับรายงานในต่างประเทศ ปัจจัยเสี่ยงของการพบเชื้อสเตร็ปโตค็อคคัส กรุ๊ปบี คือ อายุมารดาที่มากกว่า และอายุครรภ์ที่น้อยกว่า*