The Accuracy of Late Antenatal Screening Cultures in Predicting Intrapartum Group B Streptococcal Colonization

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Objective: *To determine the accuracy of late antenatal (35-37 weeks) screening cultures in predicting intrapartum group B streptococcal (GBS) colonization in Rajavithi Hospital (RH).*
Material and Method: *From the September 1st, 2006 to November 30th, 2006 at RH, 360 pregnant women who fulfilled the specified criteria were selected from antenatal clinic. Swabs were cultured from the lower vagina and anorectum for GBS using Todd-Hewitt broth with 15 mcg/ml nalidixic acid and 8 mcg/ml gentamicin. When they were admitted in the labor room (LR) for labor, the cultures were repeated in the same way.*
Results: *302 out of 360 cases had been cultured in LR. The prevalence of GBS in pregnant women at 35-37 weeks and delivery were 13.05% and 13.58% respectively. Fifty-three out of 302 cases were colonized with GBS from at least ANC and/or LR. So the overall prevalence of GBS colonization in pregnant women in this study was 17.55% (53/302). The sensitivity, specificity, positive and negative predictive values of late antenatal GBS culture were 70.73%, 95.40%, 70.73% and 95.40% respectively. There was no significant difference betweenPPV and NPV in any interval between antenatal and intrapartum cultures.*
Conclusion: *Late antenatal screening cultures were not sensitive in predicting intrapartum GBS colonization status.*

Keywords: *Group B streptococcus, Antenatal, Intrapartum, Accuracy*

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During the last two decades group B streptococci (GBS) has been mentioned as an important cause of perinatal death[1]. The Centers for Disease Control and Prevention (CDC), the American Academy of Pediatrics (AAP), and the American College of Obstetricians and Gynecologists (ACOG) recommended an universal antenatal culture-based screening at 35-37 weeks of gestation[2,3].

However, their recommendation based on only one study in USA in 1996[4]. In The Netherlands, Valkenburg-van den Berg AW et al[5] concluded that positive predictive value (PPV) of antenatal rectovaginal GBS cultures at 35-37 weeks' gestation for intrapartum GBS carriage (79%) is lower than previously reported in USA (87%)[4]. Therefore, the authors planned to determine the accuracy of late antenatal (35-37 weeks' gestation) anorectogenital cultures in predicting intrapartum colonization status in Thai pregnant women.

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Material and Method

The present study was conducted in antenatal clinic (ANC) and labor room (LR) at Rajavithi Hospital (RH) from September 1st, 2006 to November 30th, 2006. At the ANC the pregnant women with following inclusion criteria such as: gestational age between 35-37 weeks and desired to deliver in RH were enrolled. Those who had been treated with antibiotics within 2 weeks prior the study were excluded. The hospital's

ethic committee approved the study and written informed consent was obtained from the enrolled women.

Cultures were collected from two sites: vagina and anorectum. Vaginal samples were obtained by rotating a sterile cotton-tipped swab by 360 degrees after being inserted 1 inch into lower vaginal canal. Anorectal samples were taken from the perianal surface, going through the anal sphincter and by rotating a sterile cotton-tipped swab by 360 degrees after being inserted 1 cm beyond anal orifice. The samples were then inoculated within 24 hours into a selective broth culture medium (Todd Hewitt broth containing 15 mcg/ml of nalidixic acid and 8 mcg/ml of gentamicin). The broth was incubated for 18 to 24 hours at 35°C and subcultured onto a blood agar plate that was incubated for 24 hours. A gram stain was taken to confirm gram positive cocci in the chain. Staphylococcus was excluded by using the catalase test. Finally, a CAMP test (latex agglutination test) is used to identify beta-hemolytic streptococcal colonies. The combined vaginal-anorectal culture was defined true positive when any or both samples of culture were positive, and defined true negative when either sample of cultures were negative. The same procedures were repeated when these pregnant women came to LR during labor.

Test performance parameters of antenatal cultures were calculated with the cultures performed at delivery as reference standard. All data were computed with SPSS version 13.0. The effect of interval between antenatal and intrapartum cultures on test performance in both antenatal screened positive and negative groups were analyzed using logistic regression analysis.

Results

Three hundred and sixty cases were enrolled in the study. Three hundred and twelve cases have been delivered in Rajavithi Hospital. Ten cases could not be collected at the delivery period because of fully dilated cervix when admitted and forty-eight cases have been delivered in other hospital. Forty-seven out of 360 patients (13.05%) were positive for antenatal cultures and 41 out of 302 (13.58%) were positive for intrapartum cultures.

Only 302 cases who had been cultured completely at ANC and LR were analyzed. Fifty-three out of 360 cases were colonized with GBS from either ANC or LR. Therefore, the overall prevalence of GBS colonization in Thai pregnant women in the present study was 53/302 which equals 17.55%.

Clinical characteristics of both positive and negative groups for GBS are shown in Table 1. There was no statistical significant difference between each group. None of the neonates born to all the women in the present study had any signs or symptoms consistent with the early-onset group B streptococcal sepsis. The maternal and neonatal complications between positive and negative for GBS are shown in

Table 1. Clinical characteristics of parturients with positive and negative for GBS (n = 302)

Characteristics	GBS in pregnant women		p-value
	Negative (n = 249)	Positive (n = 53)	
Age (mean ± SD) (yrs)	26.38 ± 5.87	26.64 ± 7.79	0.783
Gestational age at delivery (mean ± SD) (wks)	39.03 ± 1.28	39.09 ± 1.19	0.754
Birth weight (mean ± SD) (gms)	3,069.52 ± 389.33	3,074.11 ± 333.69	0.936
Membrane rupture before admission			
No	246	51	0.138
Yes	3	2	
Route of delivery			
Spontaneous vagina	173	33	0.316
Forceps extraction	5	1	
Vacuum extraction	2	2	
Cesarean delivery	69	17	
Sexual intercourse (before delivery)			
< 1 week age	4	1	0.572
1-3 week age	3	2	
> 3 week age	1	0	
No sexual intercourse	241	50	

Table 2. There was no statistical significant difference between each group. The correlation between antenatal and intrapartum colonization status and test validity indices of late antenatal cultures in predicting colonization status at delivery are presented in Table 3. Table 4 and 5 show the effect of interval between antenatal and intrapartum cultures on test performance of positive and negative antenatal screen groups respectively. There was no significant difference in PPV and NPV in any interval between antenatal and intrapartum cultures by logistic regression analysis (p = 0.988) in positive and negative antenatal screened groups.

Table 2. Maternal and neonatal complications between positive and negative for GBS groups

Complications	GBS in pregnant women		p-value
	Negative (n = 249)	Positive (n = 53)	
Maternal complications			
Antepartum period			
No	235	51	0.813
Yes	14	2	
Intrapartum period			
No	210	42	0.551
Yes	39	11	
Postpartum period			
No	246	52	0.693
Yes	3	1	
Neonatal complications			
No	246	50	0.073
Yes	3	3	

Table 3. Correlation of late antenatal and intrapartum GBS culture results

	Intrapartum culture		Total
	Positive	Negative	
Antenatal positive	29	12	41
Culture negative	12	249	261
Total	41	261	302

CI = confidence interval
Sensitivity
29/41 = 70.73% (95% CI 56.77-84.6)
Specificity
249/261 = 95.40% (95% CI 92.86-97.94)
Positive predictive value (PPV)
29/41 = 70.73% (95% CI 56.77-84.6)
Negative predictive value (NPV)
249/261 = 95.40% (95% CI 92.86-97.94)

Discussion

In the present study, the prevalence of GBS colonization were similar during 35-37 weeks' gestation and delivery (13.05% and 13.58%). However, if both periods were combined, the overall prevalence of GBS colonization was 17.55%, which is similar to the previous study in Rajavithi Hospital in 2004 (18.12%)[6]. The sensitivity, as well as positive predictive value (PPV) in the present study (70.73%, both), was lower than those in Yancey et al's study [4] (87%, both).

Valkenburg-van den Berg AW et al[5] reported that prevalence of GBS colonization rate in pregnant women in The Netherlands collected at 35-37 weeks' gestation was 21%, and PPV and NPV were 79% and

Table 4. The effect of interval between antenatal and intrapartum GBS cultures on test performance

Antenatal screen (35-37 weeks) GBS positive			
Interval (wk)	Positive at delivery	Negative at delivery	PPV
1	3	1	75%
2	6	4	60%
3	9	3	75%
4	8	3	70%
5	3	1	72%
Total	29	12	70.73%

p = 0.988 by logistic regression analysis

Table 5. The effect of interval between antenatal and intrapartum GBS cultures on test performance

Antenatal screen (35-37 weeks) GBS negative			
Interval (wk)	Positive at delivery	Negative at delivery	NPV
1	2	48	96%
2	3	56	94%
3	2	63	97%
4	4	66	94%
5	1	12	92%
≥ 6	0	4	100%
Total	12	249	95.4%

p = 0.988 by logistic regression analysis

93% respectively. They suggested that loss of 941 of 1702 cases (55.30%) for intrapartum cultures should be one of the causes for their low PPV (79%). But the authors suggested that this high number of the intrapartum loss could either increase or decrease PPV as same as in the present study, i.e. there was only 16.1% loss for intrapartum cultures but PPV was still low (70.73%). Antibiotic usage between antepartum and intrapartum culture should also be suggested as one of the causes of low sensitivity and PPV in both present Thai's and The Netherlands's studies[5]. However, there was none of this information in both studies.

Boyer et al[7] reported that the PPV of GBS was 100% when the interval between antenatal cultures and delivery was within 5 weeks. But only 16 cases in the antenatal culture positive group were in these intervals, and 575 of 1,275 prenatal GBS carriers (45.20%) in all intervals came back for reculture at delivery. The PPV decreased from 100% to 42.8% when the interval between prenatal cultures and delivery increased from < 6 weeks to > 30 weeks. However they did not clearly make mention about the total number of prenatal GBS positive cultures in each interval range and PPV in each week from 1 to 5 weeks. Therefore the follow-up rate in each interval could not be determined. Yancey et al[4] also reported that the PPV and NPV of the shorter interval between antenatal and intrapartum cultures (1-5 wks) were better compared with those of longer interval ($\geq$ 6 wks). However, they did not clearly mention of the follow-up rate in each interval. The 100% follow-up rate in their study was an unbelievable data while the follow-up rate was 83.9% in the present study, and 44.7% and 45.2% in other studies[5,7].

In the present study, NPV were similar for all intervals between antenatal and intrapartum cultures (Table 5) while NPV was significantly worse for cultures collected within 5 weeks of delivery compared with those collected at longer intervals before delivery in Yancey et al's study[4]. Only 4 cases of the antenatal screened negative were in the interval of $\geq$ 6 wks and all were still negative culture at delivery. Among the positive antenatal screen group, the cultures collected within 2 weeks of delivery had the lowest PPV compared with those collected at shorter (1 week) and longer (3-5 weeks) intervals before delivery. The reason explaining these events suggested that between 14% and 25% of pregnant women might be continually, intermittently, or transiently colonized and approximately only one-third of bacterially colonized women are positive through out pregnancy[8]. However, there was no significance in PPV in any interval between antenatal and intrapartum cultures by logistic regression analysis (p = 0.988). Further study in a larger scale population should be performed in late antenatal to determine the accuracy of late antenatal cultures in predicting intrapartum colonization status.

In conclusion, late antenatal screening cultures was not sensitive in predicting intrapartum colonization status.

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ความแม่นยำของการคัดกรองขณะครรภ์ใกล้ครบกำหนดคลอดในการทำนายการพบเชื้อกรุ๊ปบีสเตรปโตคอคคัสขณะเจ็บครรภ์คลอด

เอกชัย โควาวิสารัช, พรธัช จารุพิศาลเลิศ, สุวัฒนา กาญจนหฤทัย

วัตถุประสงค์: *เพื่อประเมินความแม่นยำของการคัดกรองโดยการเพาะเชื้อในระยะหลังของการตั้งครรภ์ (35-37 สัปดาห์) ในการทำนายการพบเชื้อกรุ๊ปบีสเตร็ปโตคอคคัส ในขณะเจ็บครรภ์คลอดในโรงพยาบาลราชวิถี*

วัสดุและวิธีการ: *ได้สำรวจแนวตัดขวางในหญิงตั้งครรภ์ อายุครรภ์ 35-37 สัปดาห์ ในคลินิกฝากครรภ์ 360 คน ที่มีคุณสมบัติตามเกณฑ์ที่ได้กำหนดไว้ โดยทำการเพาะเชื้อกรุ๊ปบีสเตรปโตคอคคัสจากบริเวณช่องคลอดส่วนล่างและทวารหนักร่วมกับไส้ตรง โดยใช้น้ำยาเลี้ยงเชื้อ Todd-Hewitt ที่มียาปฏิชีวนะ (nalidixic acid 15 mcg/ml และ gentamicin 8 mcg/ml) ตั้งแต่ วันที่ 1 กันยายน พ.ศ. 2549 ถึงวันที่ 30 พฤศจิกายน พ.ศ. 2549 และเมื่อผู้ป่วยมาห้องคลอดเนื่องจากเจ็บครรภ์ก็จะได้รับการดำเนินการเพาะเชื้อแบบเดียวกันอีกครั้งหนึ่ง*

ผลการศึกษา: *หญิงตั้งครรภ์ 302 ใน 360 รายที่ได้รับการเพาะเชื้อในขณะเจ็บครรภ์ ความชุกของการพบเชื้อกรุ๊ปบีสเตร็ปโตคอคคัสในขณะอายุครรภ์ 35-37 สัปดาห์ และขณะคลอดเท่ากับร้อยละ 13.05 และ 13.58 ตามลำดับ หญิงตั้งครรภ์ 53 ราย ใน 302 ราย ที่ได้รับการเพาะเชื้อในขณะเจ็บครรภ์ด้วยพบอย่างน้อยหนึ่งครั้ง ไม่พบในคลินิกฝากครรภ์ก็พบในห้องคลอด คิดเป็นความชุกทั้งหมดของการพบเชื้อกรุ๊ปบีสเตร็ปโตคอคคัสเท่ากับร้อยละ 17.55 ความไวความจำเพาะค่าทำนายผลบวก และค่าทำนายผลลบเท่ากับร้อยละ 70.73, 95.40, 70.73 และ 95.40 ตามลำดับ ไม่มีความแตกต่างอย่างมีนัยสำคัญของค่าทำนายผลบวกและค่าทำนายผลลบในระหว่างกลุ่มที่มีระยะเวลา ตั้งแต่เริ่มเพาะเชื้อในช่วงฝากครรภ์จนถึงเพาะเชื้อในระยะเจ็บครรภ์ที่แตกต่างกัน*

สรุป: *การคัดกรองโดยการเพาะเชื้อกรุ๊ปบีสเตร็ปโตคอคคัสในขณะตั้งครรภ์ 35-37 สัปดาห์ ไม่แม่นยำพอที่จะทำนายการพบเชื้อในขณะเจ็บครรภ์คลอดได้*