The Prevalence of Group B Streptococcus (GBS) Colonization in Pregnant Women

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Objective: *To identify the prevalence of group B streptococcus (GBS) colonization in pregnant women.*

Material and Method: *Pregnant women, gestational age 35 to 37 weeks, who attended antenatal care clinic at Maharaj Nakorn Chiangmai Hospital between May 2015 and March 2016, were prospectively recruited into the study. Lower vaginal and rectal swab specimens were collected to identify the colonization of GBS using standard laboratory technique.*

Results: *One hundred pregnant women with median age of 30 years (range 14 to 42) were recruited. The prevalence of GBS colonization was 19% (19 in 100 cases). All of the colonized cases were susceptible to penicillin, whereas 26% (5 cases) and 42% (8 cases) surprisingly resisted to erythromycin and clindamycin, respectively. Most of them (16 cases, 84%) had positive culture for vaginal samples but negative for rectal samples. Nevertheless, no case of neonatal GBS infection was observed in the two groups.*

Conclusion: *The prevalence of GBS colonization in pregnant women was 19%, which was susceptible to penicillin in every case. Most of the cases had culture-positive in vaginal swab specimen. No evidence of GBS-related morbidities was observed in the present study.*

Keywords: *Group B streptococcus (GBS), Colonization, Pregnant women*

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Group B streptococcus (GBS) is beta-hemolytic gram positive bacteria, which is a major cause of neonatal morbidity and mortality[1]. The fatality rates for early-onset GBS disease range from 2% to 20%[2,3]. GBS colonizes in the gastrointestinal tract and genital tract of 10% to 30% of pregnant women[4], which are usually asymptomatic, and can cause urinary or genital tract infection[2]. Maternal intrapartum GBS colonization is the primary risk factor of vertical transmission during labor or delivery, which may result in early-onset GBS infection in neonates[4]. In the absence of antibiotics intervention, 1% to 2% of infants of the colonized mothers develop early-onset GBS infection[5-7]. To prevent early-onset GBS disease, the Centers for Disease Control and Prevention (CDC) and the American College of Obstetricians and Gynecologists (ACOG) have recommended culturing for GBS colonization from all vaginal-rectal specimens of pregnant women at 35 to 37 weeks of gestation to screen the women who should receive intrapartum antibiotic prophylaxis[4,8]. However, because of high expense and labor intensive burden, most centers in Thailand have used risk-based instead of culture-based strategy to guide intrapartum antibiotic prophylaxis[1]. To adopt the international guideline, the extent of GBS-associated problems must be assessed before a cost-benefit analysis. In our practice, we have used a risk-based strategy for decades. In the strategy, intrapartum prophylaxis is given in cases of unexplained maternal fever, preterm birth, prolonged rupture of membranes, and neonatal GBS infection in previous pregnancies. The prevalence of neonatal GBS was very low in our center, approximately less than 1 in 1,000 live births. However, we have never known the true effectiveness of the strategy or even the necessity of prophylaxis since the exact prevalence of GBS among our obstetric population has never been studied. Moreover, in Thailand, only few studies on prevalence of GBS colonization in pregnant women have been published, which vary between 6.2% and 18%[9-11]. Therefore, we conducted the present study to identify the true prevalence of GBS colonization in women attending the antenatal clinic at Maharaj Nakorn Chiang Mai Hospital.

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Material and Method

A prospective descriptive study was conducted on the first consecutive 100 pregnant women who

attended the antenatal care clinic at Maharaj Nakorn Chiang Mai Hospital between May 2015 and March 2016, with ethical approval of the Institute Review Board. The sample size of 100 pregnant women was calculated from standard formula by using reference from previous study of Srinagarind Hospital, which had prevalence of GBS colonization at 6.22%[10]. The participants were enrolled with written informed consent. The inclusion criteria were 1) pregnant women at 35 to 37 weeks of gestation based on reliable menstrual period and fetal sonographic biometry in the first half of pregnancy, and 2) no history of GBS infection in the current pregnancy. The exclusion criteria were 1) pregnant women received antibiotics within one week before specimen collection, and 2) inability to properly collect the specimen such as ruptured of membrane, mucous bloody show, or antepartum hemorrhage. Relevant information such as maternal characteristics, gestational age at delivery, and neonatal outcome was collected using questionnaire. The main outcome measure was the prevalence of GBS colonization in pregnant women. The analysis in the present study using descriptive statistic such as percentage, mean ± SD or median (range) or frequencies, and student t-test, Fisher's exact test and Chi-square test for data comparison as appropriate. In cases of positive result of GBS culture, attending physicians will be notified and the patient will be received intrapartum antibiotic prophylaxis as CDC and ACOG guideline[4,8].

Specimen collection[1]

The specimens in the present study were collected by OB-GYN residents. For each pregnant woman, two swab specimens were collected from the lower vagina and the rectum. Each swab was inoculated into Todd-Hewitt broth with 10 micrograms of Colistin per mL and 15 micrograms of Nalidixic acid per mL at room temperature. The specimens were sent to the laboratory within eight hours after collection.

Culture method[1]

The specimens in selective broth were incubated at 37°C in ambient air of 5% CO_2. After 18 to 24 hours of incubation, the specimens were sub-cultured onto sheep blood agar plate (tryptic soy agar with 5% defibrinated sheep blood) then incubated at 37°C in 5% CO_2. Inspected agar plates and identified both beta-hemolytic and non-hemolytic colonies morphologically suggestive of GBS were tested with Gram's stain, CAMP test, catalase test, and Streptococcal grouping latex agglutination test. If GBS was not identified after incubation for 18 to 24 hours, the plates were re-incubated overnight and re-examined for suspected GBS colonies. If the GBS colonies had been confirmed either from vaginal swab or rectal swab specimen, the woman was defined as GBS colonization and antimicrobial susceptibility of GBS would be processed thereafter.

Results

During the study period, 100 pregnant women were recruited into the study. The median maternal age was 30 years (range 14 to 42). The prevalence of pregnant women who had GBS colonization was 19% (19 in 100 cases). Of the pregnant women with GBS colonization, 31.6% (6 in 19 cases) were positive for GBS culture in both vaginal and rectal swab specimens. Most of them (16 cases, 84%) had positive vaginal swab culture but only 47% (9 in 19 cases) had positive GBS culture in rectal swab specimen.

Maternal and neonatal characteristics of the cases with or without GBS colonization were shown in Table 1. However, there were some cases delivered in other hospitals and the data about neonatal outcome were incomplete. Notably, the mean maternal age was significantly higher in the colonized group, and accordingly, the percentage of women with multiparity was also higher significantly.

Testing of antibiotic susceptibility among 19 cases of GBS colonization revealed that every case was susceptible to penicillin but only 60% of the cases were susceptible to either erythromycin or clindamycin, whereas the percentage of resistance to these two drugs was 20% to 40%. The result of susceptibility testing was shown in Table 2.

Discussion

This is the first study from our center that could determine the prevalence of GBS colonization among pregnant women. The 19% prevalence of GBS colonization in the present study was comparable to the rate of 15% to 30% reported previously[4]. However, the prevalence in our center is relatively high when compared to the previous studies from other parts of Thailand that reported the prevalence of 6% to 16%[9,10]. In spite of the high prevalence of colonized mothers, the incidence of neonatal GBS sepsis in our center has been extremely rare for a long time, indicating that our conventional or risk-based strategy for intrapartum GBS prophylaxis might probably

Table 1. Maternal and neonatal characteristics of the cases that had GBS colonization and no evidence of GBS colonization

Maternal & neonatal characteristics	GBS colonization (19 cases)	No colonization of GBS (81 cases)	*p*-value
Maternal age, mean ± SD	33.9±5.6	29.05±5.9	0.002*
Primigravida, cases (%)	4 (21.1)	38 (48.7) (78 cases)	0.04**
Previous preterm birth, cases (%)	1 (5.3)	2 (2.6) (78 cases)	0.48**
Vaginal delivery, cases (%)	8 (42.1)	58 (78.4) (74 cases)	0.002***
Birth weight, mean ± SD	3,064.2±465.4 (18 cases)	3,123.7±396.5 (74 cases)	0.58*
Small for gestational age, cases (%)	3 (17.6) (17 cases)	4 (5.4) (74 cases)	0.118**
Neonatal complications, cases (%)	0 (17 cases)	0 (74 cases)	NA
Chorioamnionitis or postpartum wound infection, cases (%)	0	9 (12.2) (74 cases)	0.2**

GBS = group B streptococcus; NA = not applicable
* Student t-test, ** Fisher-Exact test, *** Chi-square test

Table 2. Antibiotic susceptibility testing among the cases with GBS colonization (19 cases)

Antibiotic	Susceptibility, cases (%)		
	Susceptible	Intermediate susceptible	Resistant
Penicillin	19 (100)	0	0
Erythromycin	12 (63)	2 (11)	5 (26)
Clindamycin	11 (58)	0	8 (42)

effective. Accordingly, such a policy for prophylaxis of neonatal GBS sepsis is still necessary.

The results of our study showed that GBS colonization was more prevalent among women of higher parity and higher age. Though the explanation of these findings is unclear, they are partly consistent with the findings in some previous studies that reported a higher incidence of GBS colonization in older women[12,13]. Moreover, the cesarean rate was unexpectedly found to be significantly higher in the colonized group. The reason of such a high rate was unexplained but it possibly occurred by chance associated with small sample size of the colonized group. In the present study, there was no incidence of neonatal sepsis from GBS, and all of the neonates who were born from GBS-colonized women were healthy. However, only 8 of 19 cases in colonization group had vaginal delivery, the remaining 11 cases underwent pre-labor cesarean delivery. Therefore, only eight fetuses will be at risk for GBS sepsis and this number was too low to conclude that the incidence of neonatal GBS sepsis in high risk mothers is very low. Three of eight fetuses at risk did not receive antibiotic prophylaxis unintentionally because the result of GBS culture was reported after delivery. However, these three fetuses were healthy after birth.

Of 19 colonized mothers, 80% were detected from vaginal swab specimen but only 40% of rectal swab specimen had positive culture. A possible mechanism may be related to the degree of contamination from normal bacterial flora, which is perhaps more prominent in the rectum compared to in the vagina, thus growth of GBS colony during the culture process might be less disturbed in vaginal swab specimen. Therefore, if the specimen collection can be obtained from only one site, vaginal swab is preferred to rectal swab specimen due to its higher detection rate. In addition, our results confirmed that the most appropriate antibiotic prophylaxis for GBS sepsis is penicillin and it should be recommended as the first-line drug because of its 100% susceptibility, whereas one-fourth and almost half of the cases were resistant to erythromycin and clindamycin, respectively.

According to the ACOG and CDC recommendation for prevention of early onset neonatal GBS sepsis[1,4], universal screening of GBS colonization in pregnant women at 35 to 37 gestational week is preferred. Nevertheless, the effective culture process need high cost and specialized procedure, such as preparation of the selective broth medium containing Colistin and Nalidixic acid to inhibit the growth of normal vaginal and rectal flora without inhibitory effect and enhances growth of GBS, and confirmatory tests after the GBS colony isolation

from culture media, therefore the universal screening strategy in all pregnant women may not suitable in our country. In actual clinical practice, our center follows the risk-based strategy in which intrapartum antibiotic prophylaxis is indicated only in women with intrapartum risk factors to prevent neonatal GBS sepsis. This approach has been used for at least a decade and incidence of early onset of neonatal sepsis from GBS is very low in our center, in spite of its high prevalence as seen in the present study. Therefore, it may be assumed that risk-based strategy is successful. We hypothesize that the virulence of pathogen as GBS and immunity of people may different between developing and developed countries, therefore, the risk-based strategy is sufficient for prevention of neonatal GBS sepsis and universal screening as suggested by several western organizations may be not cost-effective in our region.

The strength of the present study included high reliability of the data derived from the qualified process according to CDC guideline[1], such as specimen collection from both lower vagina and rectum, using selective broth as transport medium to prevent contamination from normal flora, using sheep blood agar to subculture, using gram staining, catalase test, and GBS morphology on cultural agar plates as screening test of GBS identification, and performing confirmatory tests with latex agglutination and CAMP test in every case that is suspected for GBS colonization. Limitations of the present study included 1) the sample size might be too small to address some rare outcomes like neonatal GBS sepsis, 2) some colonized cases did not receive proper intrapartum antibiotic prophylaxis because of delayed results, and 3) effectiveness of prophylaxis could not be evaluated due to small number of the positive cases and many colonized cases underwent pre-labor cesarean section, which prevented neonatal GBS sepsis.

Conclusion

The prevalence of GBS colonization was 19% in our obstetric population and all cases were susceptible to penicillin. Most of them had positive cultures of the vaginal swab specimens. There was no evidence of GBS-related morbidities in the present study. Because of high prevalence, a prevention program of early neonatal GBS sepsis is still necessary, though, just risk-based strategy might be sufficient in our region. However, larger studies are needed to confirm the effectiveness of prevention program including cost-benefit analysis.

What is already known on this topic?

Intrapartum GBS colonization is the primary risk factor of vertical transmission during labor or delivery which may result in early-onset GBS infection among neonates. Only two studies in Thailand on prevalence of GBS colonization in pregnant women have been published and the prevalence varies between 6.2% and 16%.

What this study adds?

The prevalence of GBS colonization in pregnant women attending the antenatal clinic at Maharaj Nakorn Chiang Mai Hospital was 19%. All of the cases with GBS colonization were susceptible to Penicillin. Most of the cases had culture-positive in vaginal swab specimen.

Acknowledgement

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Potential conflicts of interest

None.

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ความชุกของสตรีตั้งครรภ์ที่ตรวจพบเชื้อสเตรปโตค็อกคัสกรุ๊ปบีจากช่องคลอดส่วนล่างและทวารหนัก

จิตรลดา คำจริง, อนุสรณ์ บุญธรรม, เกษมศรี ศรีสุพรรณดิฐ

วัตถุประสงค์: *ศึกษาความชุกของสตรีตั้งครรภ์ที่ตรวจพบเชื้อสเตรปโตค็อกคัสกรุ๊ปบีจากช่องคลอดส่วนล่างและทวารหนัก*

วัสดุและวิธีการ: *สตรีตั้งครรภ์ อายุครรภ์ 35-37 สัปดาห์ ผู้มาฝากครรภ์ที่โรงพยาบาลมหาราชนครเชียงใหม่ ตั้งแต่เดือนพฤษภาคม พ.ศ. 2558 ถึง มีนาคม พ.ศ. 2559 จะได้รับการเก็บสิ่งส่งตรวจจากช่องคลอดส่วนล่างและทวารหนักโดยใช้สำลีป้ายเพื่อเพาะเชื้อตามวิธีมาตรฐานเพื่อค้นหาเชื้อสเตรปโตค็อกคัสกรุ๊ปบี*

ผลการศึกษา: *สตรีตั้งครรภ์ทั้งหมด 100 ราย ที่เข้าร่วมการศึกษา มีอายุเฉลี่ย 30 ปี (14-42 ปี) และความชุกของผู้ที่ตรวจพบเชื้อสเตรปโตค็อกคัสกรุ๊ปบีจากช่องคลอดส่วนล่างและทวารหนัก คือ ร้อยละ 19 (19 ใน 100 ราย) โดยเชื้อร้อยละ 100 มีความไวต่อยาเพนนิซิลิน แต่ร้อยละ 26 (5 ราย) และร้อยละ 42 (8 ราย) ดื้อต่อยาอีริโทรมัยซิน และคลินดามัยซิน ตามลำดับ นอกจากนี้ร้อยละ 84 (16 ราย) ของผู้เข้าร่วมการศึกษามีการพบเชื้อจากสิ่งส่งตรวจจากช่องคลอดส่วนล่างแต่ไม่พบเชื้อจากสิ่งส่งตรวจจากทวารหนัก ในการศึกษานี้ไม่พบทารกที่มีการติดเชื้อสเตรปโตค็อกคัสกรุ๊ปบี*

สรุป: *ความชุกของสตรีตั้งครรภ์ผู้ตรวจพบเชื้อสเตรปโตค็อกคัสกรุ๊ปบีจากช่องคลอดส่วนล่างและทวารหนักคือ ร้อยละ 19 โดยเชื้อทั้งหมดไวต่อยาเพนนิซิลิน ซึ่งส่วนใหญ่เชื้อจะพบจากช่องคลอดส่วนล่าง และไม่พบหลักฐานว่ามีทารกติดเชื้อสเตรปโตค็อกคัสกรุ๊ปบีในการศึกษานี้*