SURVEY ON THE SITUATION OF GROUP B STREPTOCOCCUS INFECTION IN PREGNANT WOMEN OVER 35 WEEKS AT MEDLATEC GENERAL HOSPITAL

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Group B Streptococcus (GBS) is still considered as leading cause of early neonatal infections. Vertical transmission from mother to child may occur when a pregnant woman was infected with GBS in vaginal - rectum at the time of labor or the water breaks of delivery. Therefore, early screening for GBS in pregnant women over 35 weeks is essential to prevent neonatal infection due to GBS.

Objectives: 1) Determine the prevalence of GBS exposure in the vaginal rectum of pregnant women over 35 weeks using cultural and Realtime PCR techniques. 2) Evaluation of the sensitivity of the isolated GBS to antibiotics.

Subjects and methods: Prospective study in 243 pregnant women over 35 weeks who visited and/or had a culture test for Group B Streptococcus at Medlatec General Hospital. Samples of vaginal - rectum fluid were paralelly tested by 2 methods of culture and Realtime PCR. GBS-isolated strains were tested for their susceptibility to antibiotics.

Results: The rate of GBS infection in pregnant women over 35 weeks by culture method is 16.9%, Realtime PCR is 18.9%. The rate of group B Streptococcus sensitive to ampicillin, ceftriaxone, cefotaxime, vancomycin, linezolid are 100%; with levofloxacin at 95.0%, erythromycin at 29.0% and clindamycin at 25.0%.

Conclusions: The rate of Group B Streptococcus infection in pregnant women over 35 weeks as determined by culture method (16.9%), is lower than Realtime PCR (18.9%). Group B Streptococcus is sensitive to most of the first-line antibiotics such as penicillin, ampicillin, ceftriaxone, cefotaxime and is high resistance to erythromycin (68.4%) and clindamycin (72.5%).

Keywords: *GBS, Streptococcus, over 35 weeks, culture, Realtime PCR.*

INTRODUCTION

Group B *Streptococcus* (GBS), scientifically known as *Streptococcus agalactiae*, is a Gram-positive coccus that can be found in the normal respiratory and digestive tracts. Normally GBS does not reside in the vagina and urethra, but in some cases, it has been found in the vagina and urinary tract. The rate of women carrying bacteria ranges from 5 - 40%, most of them have no symptoms and are not considered sexually transmitted diseases[1]. About 1 - 2% of cases carrying bacteria will cause disease, often secondary infections. Local or hospital-related infections, commonly skin and soft tissue infections, urinary tract, respiratory, bone, joint infections, endocarditis, meningitis and sepsis[2]. In Vietnam, the rate of pregnant women carrying GBS according to studies is about 4.5 - 18%[3,4,5,6].

Since the 1970s, Group B *Streptococcus* is still considered the leading cause of early neonatal infectious disease. Vertical transmission from mother to child can occurs when pregnant women have vaginal-rectal GBS infection at the time of labor or rupture of membranes. This infection is an important risk factor for early neonatal infectious disease[7].

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In 1996, the US Centers for Disease Control and Prevention (CDC) recommended a GBS prophylactic treatment strategy based on the risk factors of pregnant women. Since 2002, prophylactic treatment has been based on culture screening, usually performed at 35 to 37 weeks' gestation[8].

Pure vaginal specimens will have a lower positive rate than combined specimens taken from the urethra - anus - rectum. In fact, GBS infection for children is not simply of the vagina due to birth, but all surrounding locations can cause infection because they are close to the vagina: urethra, anus, vulva.

In 2010, CDC updated recommendations for screening and prophylactic antibiotic use and was popularized by the World Health Organization (WHO) as a global screening strategy[8]. In Vietnam, there have been many researches on Group B *Streptococcus* in pregnant women. However, very few studies have applied Realtime PCR technique to give results after a few hours, practically serving the right plan of using prophylactic antibiotics before birth. Based on the actual situation and the urgency of that problem, we conducted the project: "Survey on the situation of group B *Streptococcus* infection in pregnant women over 35 weeks at Medlatec General Hospital", with 2 objectives:

1. Determine the rate of group B *Streptococcus* infection in the vagina - rectum in pregnant women over 35 weeks using culture and Realtime PCR techniques from August 2022 to July 2023.

2. Assess the sensitivity of group B *Streptococcus* to some antibiotics.

SUBJECTS AND METHODS

Subjects: All pregnant women with over 35 weeks come for examination and or have a culture test for group B *Streptococcus* at Medlatec General Hospital.

- Selection criteria: Pregnant women with a gestational age over than or full 35 weeks, do not use vaginal medication within 48 hours before the test.

- Exclusion criteria: Pregnant women with a gestational age of less than 35 weeks, using vaginal medication within 48 hours before the test, or not providing enough research information.

Methods: Cross-sectional descriptive study.

Research period: One year, from August 2022 to July 2023.

Research location: Testing Center - Medlatec General Hospital.

Implementation process:

- Information collection and sample collection: collect information from the pregnant women and fill in the test order form. The swab sample is a vaginal-rectal sample, taken 2 sticks, each stick taken from 2 locations at the same time.

- Isolation culture for GBS identification and antibiogram (using 1 sample): Sample grows in Todd Hewitt broth with antibiotics incubated for 18 - 24 hours, cultured on selective medium and tested for catalase, CAMP test[8]. Isolated strains were subjected to antibiograms on a Vitek 2 machine using the ST03 card.

- Detection of GBS using Realtime PCR technique (using 1 sample): process samples, extract DNA, perform Realtime PCR reaction and analyze results.

Data collection and processing: After collected data is processed using a number of statistical algorithms.

Research Ethics: The study was conducted after clearly explaining the purpose of the study and obtaining consent from the pregnant women. Data collected honestly and for research purposes only.

RESULTS

Rate of group B *Streptococcus* infection in the vagina - rectum in pregnant women in the study group using culture and Realtime PCR techniques.

Table 1. Prevalence of group B *Streptococcus* infection

Group	Culture		Realtime PCR	
	Number of pregnant women	Rate (%)	Number of pregnant women	Rate (%)
GSB (+)	41	16.9	46	18.9
GSB (-)	202	83.1	197	81.1
Total	243	100	243	100

Comment: With 243 pregnant women in the study, the proportion of pregnant women positive for GBS corresponding to the applied methods was: culture 16.9%, Realtime PCR 18.9%.

Assess the sensitivity of group B *Streptococcus* to some antibiotics

Table 2. Results of antibiogram

Antibiotic name	Sensitive (S)		Intermediate (I)		Resistance (R)		Total
	n	%	n	%	n	%	
Ampicillin	39	100	0	0	0	0	39
Ceftriaxone	39	100	0	0	0	0	39
Cefotaxime	39	100	0	0	0	0	39
Erythromycin	11	29.0	1	2.6	26	68.4	38
Clindamycin	10	25.0	1	2.5	29	72.5	40
Vancomycin	41	100	0	0	0	0	41
Linezolid	41	100	0	0	0	0	41
Levofloxacin	38	95.0	0	0	2	5.0	40

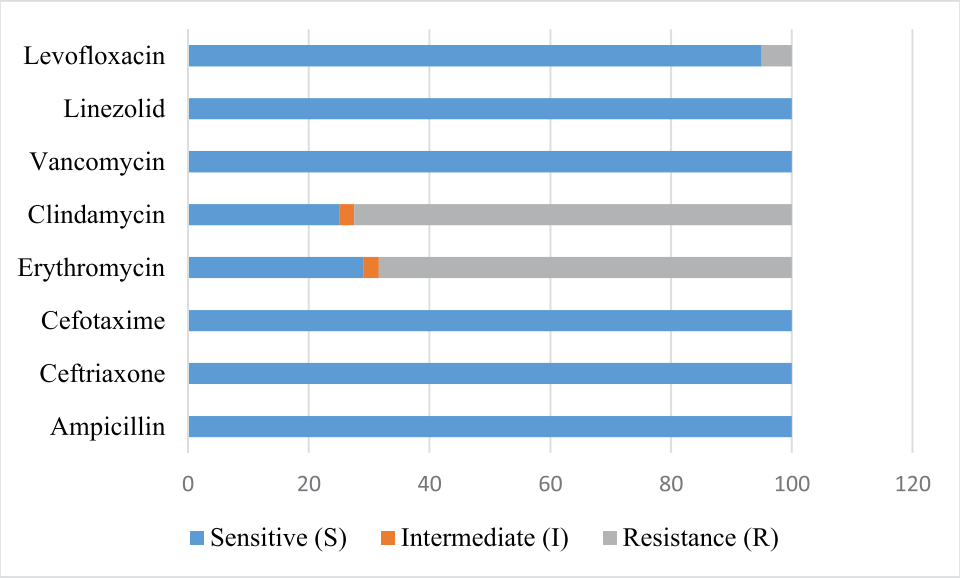

Figure 1. Antibiotic resistance level of group B *Streptococcus* strains isolated in the study

Comment: Samples positive for GBS were subjected to antibiograms, in which the sensitivity rate was 100% to antibiotics such as: ampicillin, ceftriaxone, cefotaxime, vancomycin, linezolid. Next is levofloxacin 95.0% and the antibiotics with the lowest sensitivity are erythromycin 29.0%, clindamycin 25.0%.

DISCUSSIONS

Prevalence of Group B *Streptococcus* (GBS) infection by culture and Realtime PCR methods

The study was collected on rectal vaginal swab samples from pregnant women over 35 weeks who visited Medlatec General Hospital from August 2022 to July 2023 to perform culture and Realtime PCR techniques. Among the 243 observed cases, 41 cases were cultured positive for GBS, accounting for 16.9%, this research result is consistent with the research results of Tran Bich Ngoc and colleagues (2021) at the Thuan Kieu general clinic is 15.4%3 and that of Nguyen Thi Them (2017) at Bach Mai Hospital is 15.8%[4].

Although, our research has a much higher rate of GBS infection than the study of Tran Quang Hiep (2011) at Bach Mai Hospital is 6.5% [5] and the study of Tran Quang Hanh (2018 - 2019) at Bach Mai Hospital Nghe An Obstetrics and Pediatrics Hospital is 9.2%[6]. In addition, according to a systematic review and meta-analysis by Gauraw Kwatra (2016), the estimated average rate of group B *Streptococcus* infection in the rectum is 17.9%, highest in Africa 22.4%, followed by America 19.7% and Europe 19.0% and the lowest is Southeast Asian countries only 11.1% and Vietnam is located among them[7].

Our study was carried out in accordance with the recommendations of the Centers for Disease Control and Prevention (CDC) with sample collection time being pregnant women over 35 weeks, vaginal-rectal swab sampling location, and vaginal proliferation, broth culture for 18 - 24 hours, cultured on selective medium and tested with CAMP test[8]. Thus, we believe that technical factors are unlikely to be the cause of differences in GBS infection rates between studies. Given the gap between these studies of up to 12 years, we speculate that socioeconomic changes may influence the bacterial spectrum in the vagina and rectum of women and contribute to explaining the differences in GBS infection rates in the above domestic and foreign studies.

There was a difference in the rate of GBS infection in the study group when comparing the two screening culture methods and Realtime PCR. If in the culture method the GBS infection rate is 16.9%, then in the Realtime PCR method it is 18.9%. Compared to Quan's research at Ho Chi Minh City University of Medicine and Pharmacy Hospital, the rate of GBS infection screened by culture at 35 - 37 weeks is 11.8% and PCR method in labor is 27.5%[9], my research has a big difference. There are hypotheses to explain this difference. First, in Quan's study, the PCR method performed GBS screening for pregnant women in labor. It is possible that during the period over 35 weeks, the pregnant woman was not infected but near the time of giving birth, the pregnant woman was infected with GBS leading to a much higher rate of pregnant women infected with GBS (27.5%). Second, the PCR or Realtime PCR method does not only detect the intact GBS bacteria but also detects the existence of the bacteria's genetic materials. Dead GBS still gives a positive PCR, so in some cases even though pregnant women GBS self-cleared and GBS culture test showed negative results but bacterial DNA fragments still existed and were detected by PCR/ Realtime PCR technique. These cases are unlikely to cause early neonatal sepsis due to GBS. This assumption is suitable for the difference between the two culture and Relatime PCR methods for GBS screening in this study.

Although there is a difference in infection rate between the two culture methods and Realtime PCR in our study, I found that the GBS identification culture method is still the gold standard for GBS screening for pregnant women over 35 weeks. Although this method takes longer time, but it allows the detection of intact live GBS bacteria and provides antibiogram results, serving for proper preventive treatment for pregnant women and

newborns. The Realtime PCR method is a method that helps make quick diagnosis, suitable for testing just right before giving birth (labour).

Sensitivity of group B *Streptococcus* to some antibiotics

According to recommendations of the World Health Organization (WHO), Penicillin and Ampicillin are the antibiotics of first choice for treating group B *Streptococcus*. Susceptibility testing of Penicillin and other β-lactams is approved by the Food Administration, and US Pharmacy approved group B Streptococcus infections do not need to be performed routinely, because non-susceptible isolates (Penicillin MIC > 0.12 µg/mL and Apmicillin MIC > 0.25 µg/mL) are extremely rare for any of the group B Streptococcus.[10] Our study confirmed the hight susceptibility rate of group B *Streptococcal* isolates to Ampicillin in the Penicillin groups. Results in Table 1 show that 100% of group B *Streptococcus* strains isolated were sensitive to β-lactam antibiotics: ampicillin, ceftriaxone, cefotaxime.

The group B *Streptococcal* antibiogram results in my study are similar to Hanh's study,[6] the sensitivity rate to penicillin, ceftriaxone, *cefotaxime*, vancomycin is all 100%. The effectiveness of the antibiotic vancomycin has been proven in many studies, however, it is still the last antibiotic of choice because vancomycin is a strong antibiotic that can affect the fetus.

When the patient is allergic to penicillin, erythromycin and clindamycin are two alternative antibiotics. However, according to our results and some other studies, the resistance rate of group B *Streptococcus* to these two antibiotics is is quite high. According to our research, the rate of group B *Streptococcus* resistant to erythromycin and clindamycin is 68.4%, 72.5%, respectively, and according to Huong study, it is 70.3%, 66.7% respectively,[11] and that of Naduri SA et al are 44.8%, 20.8%, respectively[12].

Therefore, to use erythromycin and clindamycin to treat GBS infection, culture and antibiogram are extremely necessary.

Our research is consistent with the research of Phuong (2022) at Hanoi Obstetrics Hospital13. In this study, the author found that group B Streptococcus is completely sensitive to lnezolid.

According to the results in Table 2, 95.0% of the isolated GBS strains were sensitive to levofloxacin.

The susceptibility rate of group B Streptococcus to levofloxacin in our study is similar to the results of Hiep's study at Bach Mai Hospital, which is 91% and higher than the study of Hanh's at the obstetrics Hospital of Nghe An Children is 76.8%5,6.

Although GBS still has a high susceptibility rate to Levofloxacin, but this is an antibiotic that is not usually prescribed for pregnant women and children, because quinolone group is not the group of choice for prophylactic treatment of GBS in fetuses, even though theỉ effectives are still very good.

CONCLUSIONS

The rate of group B Streptococcus infection in pregnant women over 35 weeks determined by culture method is 16.9% and Realtime PCR is 18.9%.

100% of GBS strains in the study were sensitive to Penicillins (Ampicillin) and Cephalosporins (Ceftriaxone, Cefotaxime) antibiotics.

The isolated GBS strains were highly resistance to erythromycin (68.4%), clindamycin (72.5%). the last recommended antibiotics such as levofloxacin linezolid, vancomycin, the GBS strains in this study were still highly sensitive: 95.0%, 100%, 100% respectively.

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