Antibiotic Susceptibility Pattern of Anovaginal Isolates of *Streptococcus agalactiae* from Pregnant Women in Their Late Third Trimester

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Group B streptococcus (GBS) neonatal sepsis is a serious disease causing newborn mortality and long-term neurologic sequelae. The Centers for Disease Control and Prevention (CDC) recommend third-trimester GBS screening and intrapartum antibiotic prophylaxis for high-risk women. The aim of our study was to identify colonized pregnant women and assess the prevalence of GBS in pregnancy and the susceptibility pattern of GBS in southern Taiwan. We performed the study at the Department of Obstetrics and Gynecology, Kaohsiung Women and Children's Hospital, between January and December 2002. Distal vaginal and anorectal swabs were obtained from pregnant women at 35 or more weeks' gestation. Swabs were used to inoculate selected medium, which was subcultured onto sheep's blood agar after 24 hours. Sensitivity to azithromycin, clindamycin, erythromycin, ofloxacin, penicillin G, tetracycline, trimethoprim/sulfamethoxazole, and vancomycin was tested using the disc diffusion method. Of the 374 pregnant women enrolled in the study, 56 (15%) had positive cultures for GBS. Antibiotic susceptibility was as follows: azithromycin 44.6%, clindamycin 66.1%, erythromycin 70.5%, ofloxacin 70.5%, penicillin G 60.7%, tetracycline 39.3%, trimethoprim/sulfamethoxazole 35.7%, and vancomycin 100%. The CDC recommend penicillin as the first choice for intrapartum prophylaxis, with erythromycin and clindamycin as alternatives for penicillin-allergic patients. There has been increasing resistance to these antibiotics among GBS. Third-trimester GBS screening and susceptibility testing for pregnant women should be considered.

Key Words: group B streptococci, antibiotic resistance, anovaginal culture, neonatal sepsis
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Group B streptococcus (GBS) was first described as a human pathogen 60 years ago [1] and recognized as a major cause of neonatal sepsis in the 1970s [2]. GBS is the major infectious cause of illness and death in the newborn population. It is also a leading cause of early neonatal sepsis [3] and may cause chorioamnionitis, sepsis, and urinary tract infection during pregnancy [4,5]. Approximately 80% of GBS disease in newborns occurs during the first week of life and is referred to as early-onset disease to differentiate it from late-onset disease, which occurs after the first week of life [5]. Early-onset GBS disease is caused by the transmission of GBS from the mother, who carries GBS in her genital tract or anorectum, to the newborn during delivery or *in utero* just prior to delivery. Intrapartum penicillin administration to all women during labor and delivery is an effective way to reduce the risk of early-onset GBS infection [6]. However, there are contraindications to giving all women antibiotics during labor. Some methods have been developed to identify mothers at high risk of having a child with GBS disease. The emergence of strains of GBS resistant to commonly used antibiotics has caused great concern. The aim of our study was to determine the prevalence and antibiotic

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sensitivity of rectovaginal GBS in pregnant women in the third trimester.

Materials and Methods

We carried out a prospective observational study of susceptibilities of GBS from rectovaginal cultures between January and December 2002. Distal vaginal and anorectal swabs were obtained when pregnant women were at 35 or more weeks of gestation. Cases were collected from the prenatal care unit of Kaohsiung Women and Children's Hospital. Swabs were used to inoculate Todd-Hewitt broth supplemented with colistin (10 g/mL) and nalidixic acid (15 g/mL), which was then incubated for 24 hours. The broth was then subcultured onto a Muller-Hinton agar plate with 5% sheep's blood and incubated for 24 to 48 hours. GBS was identified by β-hemolytic, Gram-positive, and catalase-negative characteristics. All GBS isolated were tested for susceptibility to azithromycin, clindamycin, erythromycin, ofloxacin, penicillin G, tetracycline, trimethoprim/sulfamethoxazole, and vancomycin using the disc diffusion method. Minimal inhibitory concentration breakpoints for penicillin G were 0.12 μg/mL or less for sensitivity and at least 2.0 μg/mL for resistance. *Streptococcus pneumoniae* was used as the control, and sensitivity tests were conducted according to the National Committee for Clinical Laboratory Standards guidelines. Data were analyzed using descriptive statistics.

Results

Of the 374 pregnant women who had samples taken from the distal vagina and anorectum for GBS screening, 56 (15%) had positive cultures. All isolates were sensitive to vancomycin, while 60% were sensitive to penicillin G, the antibiotic recommended by the Centers for Disease Control and Prevention (CDC) as the first-choice treatment. Only 35% and 40% of samples were sensitive to tetracycline and trimethoprim/sulfamethoxazole, respectively (Table). None of the neonates delivered by carrier mothers developed neonatal streptococcal sepsis.

Discussion

Since the 1970s, in many industrialized countries, GBS has been the principal cause of sepsis and meningitis during the first week of life (i.e. early-onset disease). GBS also causes late-onset infections (> 7 days of age but rarely after the third month) [7]. The incidence of neonatal sepsis and meningitis due to GBS is 0.5 to 3 cases per 1,000 live births [8,9]. Several organizations, including the CDC [6], American College of Obstetricians and Gynecologists [10], and the American Academy of Pediatrics [11], have suggested that health care providers caring for pregnant women should implement a strategy for GBS prevention. The CDC recommends intravenous antibiotics during labor, until delivery. Although ampicillin is an acceptable alternative, the narrow spectrum of penicillin G is preferred [12]. We used a screening approach, obtaining vaginal and anorectal cultures from women at 35 to 37 weeks' gestation. GBS colonization is associated with neonatal sepsis, which leads to neonatal mortality and neurologic sequelae for survivors. The CDC recommends intrapartum prophylaxis with antibiotics for high-risk pregnant women. Intravenous or intramuscular injection of antibiotics after the onset of labor or rupture of the membranes is highly effective in reducing neonatal colonization with GBS [13]. Several clinical trials have demonstrated the efficacy of intrapartum antibiotic prophylaxis in colonized women against laboratory-

Table. Antibiogram of rectovaginal group B streptococcus isolates (N = 56)

Antibiotic	Sensitive, *n* (%)	Intermediate, *n* (%)	Resistant, *n* (%)
Vancomycin	56 (100.0)	0 (0)	0 (0)
Ofloxacin	42 (75.0)	9 (16.1)	5 (8.9)
Erythromycin	42 (75.0)	3 (5.4)	11 (19.6)
Penicillin G	34 (60.7)	0 (0)	22 (39.3)
Clindamycin	37 (66.1)	5 (8.9)	14 (25.0)
Azithromycin	25 (44.6)	11 (19.6)	20 (35.7)
Tetracycline	22 (39.3)	3 (5.4)	31 (55.4)
Trimethoprim/sulfamethoxazole	20 (35.7)	5 (8.9)	31 (55.4)

confirmed, early-onset GBS disease [6]. If maternal GBS is untreated in labor, the rate of invasive neonatal disease is 4% [10].

Samples taken from both the lower genital tract and the rectum increase detection rates by 10% to 15% over rates from either site alone [14]. Almost half of women colonized with vaginal GBS at the time of delivery have negative antenatal cultures in the third trimester [14]. The maximum predictive value of cultures is achieved 1 to 5 weeks before delivery; within this interval, the positive predictive value of vaginal and rectal cultures is 87%, and the negative predictive value is 96% [15]. Hence, we took rectovaginal samples at 35 to 37 weeks' gestation to improve the correlation between the status at the time of culture and the time of delivery.

A recent paper has proposed two strategies to decrease newborn GBS disease. The first strategy, including prenatal cultures for GBS at 35 to 37 weeks' gestation, would prevent 86% of early-onset GBS disease. The second strategy, without prenatal cultures but according to the presence of intrapartum risk factors to determine which women should receive intrapartum antibiotics, would prevent 69% of early-onset GBS disease [6].

Our study revealed that 15% of our pregnant patients were colonized with GBS in the vagina and anorectum. These findings are similar to other published GBS colonization rates during pregnancy of between 10% and 30% [16,17]. Specimen preparation using appropriate incubation and culture techniques affects the sensitivity and specificity of the results. All isolates were susceptible to vancomycin. When a patient is allergic to penicillin, the choices recommended by the CDC are erythromycin and clindamycin. Like other authors, we found that resistance to erythromycin and clindamycin was increasing among GBS [18], so it would be useful to test for antibiotic sensitivity, especially for penicillin-allergic women. Due to antibiotic abuse in the past, there has been an increase in resistant strains of microorganisms, which causes great concern about the restriction of antibiotics.

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懷孕第三期末陰道直腸B群鏈球菌之抗菌性形態

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B 群鏈球菌造成新生兒敗血症常導致新生兒死亡，幸存者中百分之三十有神經系統的後遺症，對新生兒之傷害非常大。美國疾病管制中心建議懷孕婦女在懷孕第三期接受 B 群鏈球菌篩檢，並使用抗生素於生產中預防新生兒感染。本研究的目的是找出帶菌者的孕婦，計算並了解帶菌者的比率，及找出最適合的抗生素以供將來生產時使用。我們自民國九十一年一月至十二月於婦幼綜合醫院婦產科門診，產前檢查的孕婦懷孕三十五週以上建議做 B 群鏈球菌篩檢。檢體自婦孕陰道外側及肛門直腸取出。檢體以特製之培養基培養 B 群鏈球菌。培養並分辨出 B 群鏈球菌後，檢體再做 azithromycin，clindamycin，erythromycin，ofloxacin，penicillin G，tetracycline，trimethoprim/sulfamethoxazole，vancomycin 等抗生素的敏感試驗。總共 374 位孕婦接受採樣檢查，56 位（15%）呈 B 群鏈球菌陽性反應。培養出菌種對各抗生素之敏感試驗結果如下：azithromycin 44.6%，clindamycin 66.1%，erythromycin 70.5%，ofloxacin 70.5%，penicillin G 60.7%，tetracycline 39.3%，trimethoprim/sulfamethoxazole 35.7%，vancomycin 100%。有愈來愈多的 B 群鏈球菌對抗生素產生抗藥性，美國疾病管制中心建議使用的抗生素 penicillin G，erythromycin，clindamycin 之抗藥性比率也不少。因此有必要對菌種做抗生素敏感試驗，找出最佳選擇之抗生素供產程中使用。對預防 B 群鏈球菌造成新生兒敗血症，孕婦第三期行 B 群鏈球菌培養，並做抗生素敏感試驗是有意義且有必要的。

關鍵詞：B 群鏈球菌，抗菌性，陰道肛門陪養，新生兒敗血症
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