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Vaginal Colonization and Antibiotic Susceptibility Pattern of Group B *Streptococcus* Isolated from Pregnant Women in Maternité de l'Hôpital Des Soeurs de Pauvres de Bergame de Kimbanseke, Kinshasa, Democratic Republic of Congo

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Abstract

Group B *Streptococcus* (GBS) is a Gram-positive bacterium which often colonizes maternal vaginal and rectal epitheliums and can be transmitted to the neonate during delivery. GBS infections may cause significant maternal and neonatal morbidity, including sepsis, pneumonia and meningitis. In Democratic Republic of Congo, few studies have been done on GBS colonization of pregnant women. This study was conducted in Kinshasa, Democratic Republic of Congo in order to determine the prevalence of GBS vaginal colonization among pregnant women at a gestational age of 35 - 37 weeks and the antibiotic susceptibility. Vaginal swabs of 104 pregnant women were inoculated onto Chromatic Strepto B medium. GBS isolates were identified by Gram staining, catalase test, blue-green colonies and confirmed to be GBS by Strepto B latex test kit. Antibiotic susceptibility test was done using the disc diffusion method. The prevalence of GBS vaginal colonization was 23.07%. Of the isolates studied 100%, 75%, 62.5%, 50% were sensitive to vancomycin, clindamycin, cefazolin, and erythromycin respectively. Our findings seem to suggest that maternal GBS colonization rate in this study was higher compared to a pre-

vious report from Bukavu in Democratic Republic of Congo. All isolates were found to be sensitive to vancomycin which was the most effective antibiotic for the treatment of GBS infections.

Keywords

Group B *Streptococcus*, GBS Prevalence, Antibiotic Susceptibility, Democratic Republic of Congo

1. Introduction

Group B *Streptococcus* (GBS) or *Streptococcus agalactiae* is a Gram-positive coccus with 10 known serotypes [1]. It often colonizes maternal vaginal and rectal epitheliums and can be transmitted to the neonate during delivery [2]. GBS colonization during pregnancy also leads to higher rates of intra-amniotic infection and postpartum endometritis. Pyelonephritis, bacteremia or sepsis, and bacteriuria are the most common clinical morbidities in pregnant women with GBS infection [3]. More than one half of infants born to untreated GBS-positive women become colonized and approximately 2% of these develop invasive disease [4]. Invasive neonatal disease often results in sepsis, pneumonia, and less commonly meningitis. GBS neonatal disease is classified as either early-onset disease (<7 days) or late-onset disease (>7 - 90 days). Early-onset GBS disease (EOD) is mainly caused by vertical transmission of GBS from colonized mothers to their infants during labor or delivery. Approximately 10% - 40% of pregnant women are colonized with GBS, and the incidence of EOD is 0.3 - 2 per 1000 live births in different geographical areas [5]. In 1996, the Centers for Disease Control and Prevention (CDC) published consensus guidelines for the prevention of neonatal GBS disease; these guidelines were revised in 2002 then in 2010 [5]. The revised guidelines recommended the screening of all pregnant women between 35 and 37 weeks of gestation for vaginal and rectal colonization with GBS. Further, the guidelines recommended intrapartum antibiotic prophylaxis (IAP) for colonized pregnant women. It has been shown that the screening approach and IAP rather than the identification of maternal clinical risk factors for early-onset neonatal GBS disease are more effective in preventing EOD [6]. In developed countries prenatal screening in pregnant women and IAP have been widely established and successfully reduced the incidence of GBS neonatal disease [7]. In low-income settings screening and IAP for prevention of invasive neonatal disease are mostly not implemented due to limitations in resources and infrastructure [8] [9]. Seeing the pathogenicity of GBS during pregnancy and after birth, preventive and treatment strategies should be taken into account in order to identify GBS colonizing women so as to offer them an efficient antibiotic treatment. Literature data have demonstrated that studies on prevalence and antibiotic resistance of GBS isolated on pregnancy women have been conducted is many Afri-

can countries [10] [11]. Nevertheless, few data from Democratic Republic of Congo (DRC) are available [12]. This study was conducted in order to evaluate the prevalence of vaginal colonization of GBS in pregnant women and to assess susceptibility of GBS isolates to different antibiotics.

2. Material and Methods

2.1. Sample Collection and Isolation

The clinical samples were collected for diagnostic purposes by the Maternité de l'Hôpital des Soeurs de Pauvres de Bargame de Kimbanseke in Kinshasa in 2019. All samples were from vaginal swabs of 104 pregnant women at a gestational age of 35 - 37 weeks. Samples were transported at room temperature using Stuart transport medium and were processed in the Laboratory of Experimental and Pharmaceutical Microbiology of the Faculty of Pharmaceutical Sciences, University of Kinshasa. Samples were then inoculated on Chromatic Strepto B medium (Liofilchem, Roseto degli Abruzzi, Italy) and incubated at 37˚C for 24 to 48 hours. On this chromogenic medium, GBS shows bright blue-green colonies and *Enterococcus faecalis* shows mauve colonies (based on the manufacturer's indication [13] [14]. After the incubation time, blue-green colonies were analyzed. GBS isolates were identified based on Gram staining (isolates formed pairs and chains), catalase test (with 10% hydrogen peroxide (H_2O_2) on a microscope slide glass: catalase-negative colonies), and Strepto B latex test kit (agglutination) (Liofilchem, Roseto degli Abruzzi, Italy).

2.2. Antibiotic Susceptibility Testing

All GBS isolates were tested for sensitivity to erythromycin (15 µg), clindamycin (2 µg), cefazolin (30 µg), and vancomycin (5 µg) (Liofilchem, Roseto degli Abruzzi, Italy) by using the Kirby–Bauer disk diffusion method on Mueller Hinton in accordance with the current guidelines of the Clinical and Laboratory Standards Institute (CLSI) [15]. Mueller–Hinton blood agar was prepared according to manufacturer's instructions (Liofilchem, Roseto degli Abruzzi, Italy). GBS colonies were picked from blood agar plates and suspended in 0.9% sterile saline to a turbidity of 0.5 McFarland. Afterwards, the suspension was brought on Mueller-Hinton agar plates using sterile cotton swabs. Antibiotic discs were dispended, and agar plates were incubated for 18 to 24 hours in normal atmosphere, followed by measurement of inhibition zone diameters.

3. Results

3.1. GBS Colonization Prevalence

Detection of GBS from vaginal specimens were done by direct plating onto Chromatic Strepto B medium. Among the 104 pregnant asymptomatic women at 35 - 37 weeks of gestation that were enrolled in the study, 24 (23.07%) were found to be GBS carriers. The blue-green colonies onto Chromatic Strepto B medium

(Figure 1 below) were confirmed to be GBS by Strepto B latex test kit (agglutination).

3.2. Antibiotic Susceptibility

Table 1 presents the antimicrobial susceptibility pattern of GBS isolates. The GBS isolates were all 100% sensitive to vancomycin, 75% to clindamycin, 62.5% to cefazolin, and 50% to erythromycin.

4. Discussion

In this study the GBS vaginal colonization prevalence was of 23.07%. The rate of GBS colonization observed in this study is high and in agreement with report from Bukavu/DRC (20%) [12]. High GBS colonization rates have been reported from Egypt (26.5%) [16], Jordan (19.5%) [17], South Africa (30.9%) [11], Tanzania (23%) [18], Nigeria (19.7%) [19], Gambia (33.7%) [20], Ghana (19.1%) [21], Egypt (25.3%) [22], Kenya (20.5%) [23], Ethiopian (25.5%) [24], and Mozambique (21.3%) [25]. Many risk factors such as maternal age, multiparity, gestational age of pregnancy, history of urinary infection during the pregnancy, history of premature childbirth or abortion, previous infection with Human Papilloma Virus (HPV), smoking, HIV-positive serology, ethnicity, and vaginal pH > 4.5 were associated with GBS colonization [12] [24] [26] [27] [28].

Figure 1. Strains V14 (left image), V11 and V59 (right image) grown on the Chromatic Strepto B medium. These strains are GBS isolated from our laboratory during study. After 24 h incubation, the Chromatic Strepto B medium (Liofilchem®) showed blue-green colonies.

Table 1. Antibiotic susceptibility profile of GBS isolates.

Antibiotics	Sensitive n (%)	Intermediate n (%)	Resistance n (%)
Cefazolin	15 (62.5%)	-	9 (37.5%)
Clindamycin	18 (75.0%)	1 (4.2%)	5 (20.8%)
Erythromycin	12 (50.0%)	1 (4.2%)	11 (45.8%
Vancomycin	24 (100.0%)	-	0 (0.0%)

Intrapartum antibiotic prophylaxis with penicillin or ampicillin is recommended by the Center for Disease Control (CDC) for women colonized by GBS in late pregnancy. These two antibiotics were not tested due to limited laboratory facilities. Second-line treatment comprises cephazolin, clindamycin, and vancomycin. In particular for women who report an allergy to penicillin, clindamycin and erythromycin are the antibiotics of choice [29]. The susceptibility testing was done on 24 GBS isolates against 4 antimicrobial agents. The results obtained showed that GBS isolates were 50% - 75% sensitive to erythromycin, cephazolin, and clindamycin. Studies conducted in Ghana and South Africa has demonstrated that GBS isolates from pregnant women showed higher sensitivity to erythromycin and clindamycin [11] [21] [30]. A report from Egypt demonstrated also that that 22.6% and 15% of isolates were resistant to erythromycin and clindamycin respectively [16]. In contrast to these reports, the results of the current study showed that 50% and 25% of GBS strains were resistant to erythromycin and clindamycin respectively. This may be due to the lack of antimicrobial-resistance surveys and the absence of adequate policies on antibiotics use in DRC, where antibiotics are purchased from pharmacies without prescription. These facts make the therapeutic options very limited and contribute to the emergence of multidrug resistance strains. The implication is that erythromycin may not be good antibiotic of choice against the GBS strains isolated from pregnant women.

All strains were 100% sensitive to vancomycin. Ours results are in agreement with those obtained in studies conducted in Gabon, South Africa and Egypt in which all GBS strains were sensitive to vancomycin [10] [11] [16]. But a report from Kenya demonstrated that 24.1% of GBS strains were resistant to vancomycin [23]. CDC recommends the use of vancomycin if resistance to erythromycin and clindamycin is observed [28]. According to our results, vancomycin is the drug of choice against GBS infections.

5. Conclusion

The prevalence of GBS colonization in pregnant women in Kinshasa/DRC is high as observed in Bukavu/DRC and in many African countries. The susceptibility profile suggests the use of vancomycin as the antibiotic of choice for the treatment of GBS infections. A multicentric study should be conducted in order to provide more data on the prevalence and risks factors of recto-vaginal GBS colonization, and the antibiotic resistance profile of isolates.

Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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