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Original Research Article

## Antibiotic susceptibility pattern of group B streptococcal isolates from maternal genital tract

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### ABSTRACT

**Background:** Group B streptococcus (GBS) is one of the important cause of early onset neonatal sepsis in developed countries leading to increased neonatal morbidity and mortality. Penicillin and Ampicillin are the drugs of choice for prevention of GBS infections. Antibiotic resistance amongst GBS isolates is an emerging health problem affecting neonates. Hence, this study was performed to determine the antibiotic susceptibility pattern of Group B Streptococcus (GBS) in a population of pregnant women.

**Methods:** A prospective study was done to screen pregnant women for vaginal and rectal GBS colonization during their regular visits to antenatal clinic. Todd-Hewitt broth, an enrichment medium for GBS was used for isolation. The antibiotic susceptibility pattern of the isolates were studied.

**Results:** A total of 300 pregnant women were screened for GBS colonization. GBS colonization rate in our study was 2.3%. The antibiotic susceptibility pattern of the isolates revealed that none of the isolates were resistant to penicillin or clindamycin, while resistance was noted to erythromycin (14.3%) and tetracycline (71.4%).

**Conclusions:** GBS continues to remain sensitive to Penicillin which is the drug of choice for prevention and treatment of GBS. Consistent surveillance of antibiotic sensitivity pattern of GBS as well as for other organisms implicated in new born sepsis and maternal infections is required to formulate guidelines for prevention and treatment.

**Keywords:** Antibiotics, Genital tract, Group B streptococci, Resistance, Susceptibility

### INTRODUCTION

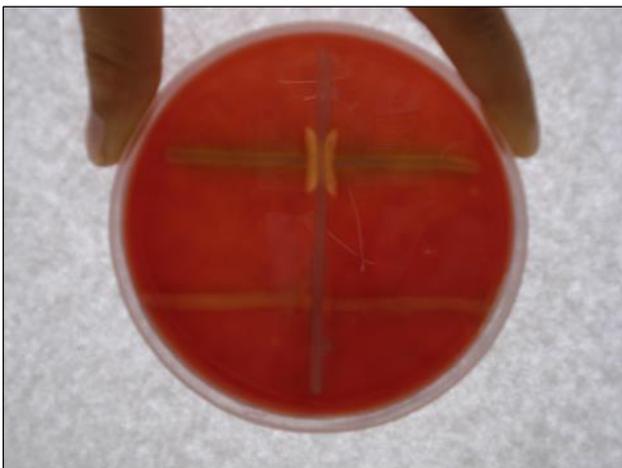
Group B Streptococcus (GBS) is a leading cause of early onset neonatal infections and associated morbidity and mortality in developed countries.<sup>1</sup> The organisms are transmitted to the new born during intrapartum period from mothers whose genital tracts are colonized with GBS.<sup>2</sup> Centers for Disease Control and Prevention (CDC) has recommended screening- based strategies that has resulted in a significant decline in the prevalence of neonatal GBS infections.<sup>3</sup> CDC recommends Universal screening for maternal group B streptococcus (GBS) infection and intrapartum antibiotic prophylaxis of all

colonized women. Penicillin and ampicillin are the drugs of choice for prevention and treatment of GBS infections. Clindamycin and erythromycin are recommended as alternative drugs for patients who are allergic to Penicillin.<sup>2</sup> Widespread use of these antibiotics in various clinical conditions has resulted in the emergence of antibiotic resistance.<sup>4</sup> In India, GBS screening during pregnancy is not routinely done and hence, there is limited data about the maternal GBS genital tract colonization and the antibiotic sensitivity pattern of the isolates. We performed this study to determine the antibiotic susceptibility pattern of the GBS isolates from maternal genital tract.

**METHODS**

This prospective observational study was done in a tertiary care teaching hospital in South India over a period of 20 months on pregnant women attending the Outdoor Patient Department (OPD) services. Informed consent was obtained before enrollment. The study protocol was approved by Institutional Ethics Committee. Vaginal and rectal swabs were collected from pregnant women and the swabs were immediately placed in separate Todd-Hewitt broths-an enrichment medium for GBS, and then sent to the Microbiology laboratory. The Todd-Hewitt broth was initially incubated for 24 hours at 37°C in 5% CO<sub>2</sub> atmosphere, followed by subculture upon 5% Sheep blood agar, which was further incubated for 18 to 24 hours at 37°C in a candle jar.

The blood agar plates were examined at 24 hours and 48 hours for the presence of GBS. GBS was identified based on the colony morphology, beta hemolysis, characteristic biochemical reactions (catalase negative, sodium hippurate hydrolysis positive, CAMP test positive (Figure 1), bacitracin resistance (Figure 2) and was confirmed by latex agglutination test. Antibiotic Susceptibility Testing (AST) was performed on the GBS isolates using Kirby-baur disc diffusion test according to the Clinical Laboratory Standards Institute (CLSI) guidelines. Antibiotic susceptibility pattern of the GBS isolates was determined for antibiotics that are routinely used against gram positive cocci i.e. penicillin, clindamycin, erythromycin and tetracycline. Inducible clindamycin resistance was detected by disk diffusion using the D-zone test. *Streptococcus pneumoniae* ATCC 49619 was used for quality control of antibiotic susceptibility testing.

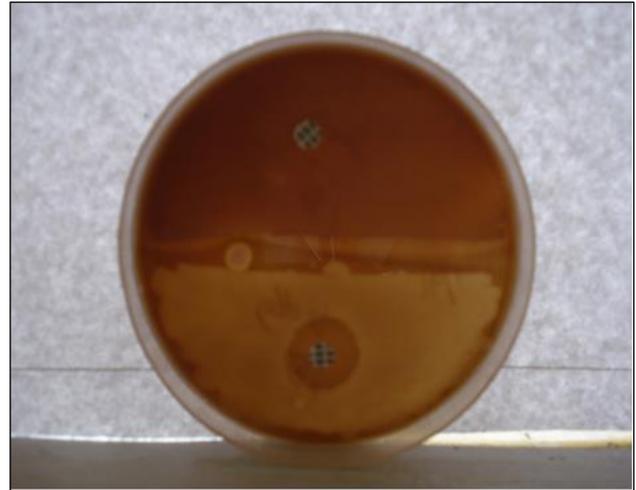


**Figure 1: CAMP reaction (Christie, Atkins and Munch-Peterson)-demonstrated as an accentuated zone of hemolysis when *Streptococcus* is inoculated perpendicular to a streak of *staphylococcus aureus*.**

**Statistical analysis**

Data entry and analysis were done using Statistical software SPSS for Windows Version 16.0 (SPSS Inc,

Chicago, IL, USA). Percentages were calculated for categorical variables. Means and standard deviations (SD) were calculated as required for numerical variables. P value < 0.05 was considered statistically significant.



**Figure 2: Bacitracin sensitive to GBS.**

**RESULTS**

A total of 300 pregnant women were included in the study. Majority of women in the study population belonged to the age group of 21 to 25 years, with the minimum and maximum age being 18 and 39 years respectively. GBS colonization rate was 2.3%. In our study, multigravida constituted five out of the seven GBS positive women (Table 1). The difference in colonization between primigravida and multigravida was not statistically significant (p = 0.053). Majority of women (84%) recruited for the study were from class IV socio economic status (Table 2). Most women who were GBS positive belonged to Class IV socioeconomic status. However, the isolation was not significantly different in the higher socio economic group (p value= 0.747).

**Table 1: Gravidity status and GBS isolation rates.**

Gravidity	Number of Women	Percentage (%)	GBS isolation rates (n=7)
Primigravida	195	65	2
Multigravida	105	35	5

**Table 2: Socio economic status (SES) and GBS isolation rates.**

Class-SES	Number of women	Percentage	GBS isolation rates (n=7)
I	0	0	0
II	9	3	1
III	34	11.3	2
IV	252	84	4
V	5	1.7	0

In vitro antibiotic susceptibility testing (Table 3) revealed that all isolates were sensitive to penicillin, and clindamycin (100%). Resistance to erythromycin and tetracycline was observed in 14.2% and 71.4% respectively. One isolate that was resistant to erythromycin was negative for inducible clindamycin resistance, but was resistant to tetracycline.

**Table 3: In vitro antibiotic susceptibility testing of GBS isolates.**

Antibiotic	Percentage of resistant GBS isolates (n=7)
Penicillin	0
Clindamycin	0
Erythromycin	14.2
Tetracycline	71.4
Erythromycin + Tetracycline	14.2

## DISCUSSION

GBS is an important cause of infection among pregnant women and neonates in developed countries. Universal screening for maternal GBS infection and administration of intrapartum antibiotic prophylaxis of colonized women has been recommended by Centers for Disease Control (CDC). The antibiotic susceptibility pattern of the isolates in developing countries such as India has not been adequately studied.<sup>5,6</sup> Our study analyzed the antibiotic susceptibility pattern of GBS isolates from genital tract of pregnant women.

The Centers for Disease Control (CDC) recommends the use of selective enrichment broth (Todd- Hewitt broth) to maximize GBS isolation.<sup>2</sup> However, in the present study, despite using selective enrichment broth, GBS isolation rate was low (2.3%), which implies low prevalence of GBS in our population. GBS isolation rates in our study were higher among multigravida and in the lower socioeconomic group but these results were not found to be statistically significant. Regan *et al* stated that socio economic status as a variable was only weakly associated with GBS colonization.<sup>7</sup>

The CDC has recommended monitoring for emergence of antibiotic resistance among GBS, which may serve as a signal to revise the current guidelines on prevention and treatment of GBS infection. Our study showed the antibiotic susceptibility profile of GBS namely, penicillin, clindamycin, erythromycin and tetracycline against the GBS isolates from genital tract of pregnant women. It was observed that all isolated GBS strains were sensitive to penicillin and clindamycin. Resistance was observed for erythromycin (14.2%) and tetracycline (71.4%).

Studies conducted in different patient population, indicated that GBS was uniformly sensitive to penicillin,

similar to our study.<sup>8-11</sup> Joachim *et al* from Tanzania found 98% strains were sensitive to penicillin and 20% strains were resistant to erythromycin.<sup>12</sup> A study done at Thammasat Hospital reported that all GBS isolates were susceptible to ampicillin, penicillin, vancomycin, followed by clindamycin (96.9%) and erythromycin (98.5%).<sup>13</sup> A study carried out in United States reported no resistance to penicillin while higher resistance was observed to erythromycin (29%) which is similar to our results.<sup>14</sup> In two different studies, 8% and 22% resistance to erythromycin was observed, while in other studies no resistance to erythromycin was observed, suggesting that GBS shows variable resistance to erythromycin.<sup>8-10</sup> We also detected high percentage (71.4%) of tetracycline resistant GBS strains. Our results were similar to those reported in Argentina<sup>15</sup> and in several studies performed in other countries.<sup>16,17</sup>

As reported in the present study as well as in other studies, GBS is universally sensitive to penicillin. Therefore, penicillin continues to be the first choice antibiotic for intrapartum prophylaxis. Erythromycin and clindamycin are drugs of choice in women with penicillin allergy. An increase in GBS resistance to erythromycin and tetracycline has been observed. The resistance pattern of GBS to these antimicrobial agents strongly indicates that antibiotic susceptibility testing should be performed if erythromycin therapy is needed to prevent neonatal GBS infection.<sup>18</sup> The results of antibiotic susceptibility testing of GBS isolates will be useful for implementation of prevention and treatment of GBS infections.

## CONCLUSION

All the GBS isolates were sensitive to penicillin and clindamycin, while resistance was observed for erythromycin and tetracycline. With widespread use of antibiotics, antibiotic resistance may continue to increase. Hence, continuing surveillance of antibiotics susceptibility pattern of GBS is indicated, in order to determine the optimal drugs for prevention and treatment of GBS.

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*Ethical approval: The study was approved by the Institutional Ethics Committee*

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