Section: Obstetrics and Gynaecology

Original Research Article

PREVALENCE OF GROUP B STREPTOCOCCUS AND ANTIMICROBIAL RESISTANCE IN PREGNANT WOMEN APPROACHING TERM

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ABSTRACT

Background: Group B Streptococcus, also known as Streptococcus agalactiae (GBS), is newborns' primary cause of infections.1 GBS predominantly inhabits the genitourinary and gastrointestinal systems of humans; however, when pregnant women colonize it in their vaginal and rectal areas, it increases the risk of health problems for their newborns due to the potential for vertical transmission before, during, and after delivery. **Objectives:** 1. To study the prevalence of Group B streptococcus vaginal colonization in near-term pregnant women and the isolates' pattern of antibiotic sensitivity. 2. To determine which pregnant women are positive for GBS and to administer intrapartum antibiotic prophylaxis (IPA).

Materials and Methods: Study Design: Hospital-based case-control study. **Study area:** Department of Obstetrics and Gynaecology, Vinayaka Mission's Medical College. Karaikal, Vinayaka Mission's Research Foundation (DU), Karaikal, Puducherry, India. **Study Period:** 1 year. **Study population:** All pregnant women who meet the study requirements and attend the prenatal clinic with a gestational age between 35 and 38 weeks. **Sample size**: The study consisted of a total of 220 subjects. **Sampling Technique:** Simple Random technique.

Results: 3 pregnant women are sensitive to erythromycin and ampicillin, accounting for 1.4% of the study population. 2 pregnant women are sensitive to erythromycin, ampicillin, and penicillin, accounting for 0.9% of the study population. 4 pregnant women are sensitive to gentamicin, corresponding to 1.8% of the study population, and 2 patients are sensitive to penicillin, ampicillin, and cefazolin, corresponding to 0.9% of the study population.

Conclusion: Group B Streptococcus (GBS) can cause a range of infections in mothers and newborns, from mild to severe. In this study, 3.6% of pregnant women tested positive for GBS, with 62.5% of these cases occurring between 37-38 weeks of pregnancy.

Keywords: Group B Streptococcus, colonization, antibiotic prophylaxis.

INTRODUCTION

Group B Streptococcus, also known as Streptococcus agalactiae (GBS), is newborns' primary cause of infections.[1] GBS predominantly inhabits the genitourinary and gastrointestinal systems of humans; however, when pregnant women colonize it in their vaginal and rectal areas, it increases the risk of health problems for their newborns due to the potential for vertical transmission before, during, and after delivery. As a result, GBS can lead to various clinical conditions in newborns, including sepsis, meningitis, and pneumonia.[1]

The pathology of GBS can be categorized based on when symptoms of the disease first manifest. Early

onset disease refers to the onset of symptoms within the first week of a newborn's life and results from the transmission of GBS through the ascending route of the uterus or during delivery. Severe cases often present as sepsis, pneumonia, cardiovascular instability, or, though less commonly, meningitis, and are noted for a negative clinical progression.[2] Late-onset disease is defined by the emergence of symptoms from the eighth day of life to three months and can also involve other microorganisms beyond GBS, including coagulase-negative staphylococci, Escherichia coli, and various gram-negative bacteria.[2] Late-onset disease is primarily linked to meningitis, which may result in cognitive and neurological complications.[3] Invasive GBS-related diseases contribute to 5–20% of fatalities in premature newborns and 1–8.4% of deaths in full-term newborns.[4]

Epidemiological studies indicate that around 18% of women globally carry GBS during pregnancy, with regional variations ranging from 11% to 35%.1 GBS contributes to approximately 518,000 preterm births, 392,000 neonatal infections, and 91,000 neonatal deaths each year worldwide.[5] Alarmingly, low-income nations face greater risks of high morbidity and mortality rates related to GBS compared to high-income countries, largely due to insufficient systematic prophylactic measures, among other factors.[6]

In 2020, the American College of Obstetricians and Gynecologists revised the guidelines for Group B Streptococcus (GBS) prophylaxis. Universal GBS screening consists of testing for maternal colonization through rectal and vaginal cultures collected between 36 and 37 weeks of pregnancy. If the results are positive, intrapartum antimicrobial prophylaxis (IAP) is administered. Penicillin G is the preferred antibiotic for managing these cases. For pregnant women with a penicillin allergy, alternative options such as clindamycin and cefazolin are utilized. Most GBS strains continue to show susceptibility to penicillin and other β-lactams; however, there have been reports of resistance to antimicrobial agents that are usually used as alternatives, especially lincosamides.[7]

In developing nations, there is a lack of sufficient information regarding recto-vaginal colonization by GBS and its link to complications for mothers and newborns, despite the wealth of data available from developed regions. This study aims to facilitate the implementation of preventive measures by assessing the prevalence of GBS and its antibiotic resistance, as our hospital currently lacks a protocol for GBS prophylaxis or routine screening. The purpose of this study is to determine how common GBS colonization is among pregnant women and to evaluate the effects of chemoprophylaxis on lessening the incidence of disease during the perinatal period.

Objectives

1. To study the prevalence of Group B streptococcus vaginal colonization in near-term pregnant women and the isolates' pattern of antibiotic sensitivity.
2. To determine which pregnant women are positive for GBS and to administer intrapartum antibiotic prophylaxis (IPA).

MATERIALS AND METHODS

Study Design: Hospital-based case-control study.

Study area: Department of Obstetrics and Gynaecology, Vinayaka Mission's Medical College. Karaikal, Vinayaka Mission's Research Foundation (DU), Karaikal, Puducherry, India.

Study Period: 1 year.

Study population: All pregnant women who meet the study requirements and attend the prenatal clinic with a gestational age between 35 and 38 weeks.

Sample size: The study consisted of a total of 220 subjects.

Sampling Technique: Simple Random technique.

Ethical consideration: Institutional Ethical Committee permission was obtainedbefore the commencement of the study.

Study tools and Data collection procedure

The patient's informed written permission. A thorough history was gathered. Lower genital tract (low vaginal) samples are collected. Within two hours, swabs will be sent to clinical microbiology to be isolated for GBS Samples are injected into agar containing sheep blood. Antibiotic sensitivity testing will be performed on all GBS-positive isolates. Prevalence estimates from the entire research population are determined by statistical analysis. Pregnant women who test positive for GBS are identified and given the required medications.

Statistical Analysis

The mean, median, mode, and standard deviation are used to express numerical variables, such as age.With inferential statistics, continuous variables are tested using the ANOVA F test (three groups) and the unpaired t-test (two groups).The chi-square test (categorical variables) is used to calculate the difference in the primary result between the two groups.Statistical significance was defined as P-values less than 0.05 Data were input into an MS Excel spreadsheet, and SPSS version 16 was used for analysis.

RESULTS

Table 1: Distribution based on age groups

Age group(In years)	No. of Pregnant Women	Percentage
19-25	91	41.4%
26-30	109	49.5%

31-35	17	7.7%
36-40	3	1.4%
Total	220	100%

Range of age in patients = 19 – 39yearsMean age (in years) = 26.42± 3.303.

The pregnant women included in our study range in age from 19 to 39 years old. Out of the 220 participants, 41.4% were aged 19-25, 49.5% were aged 26-30, 7.7% were aged 31-35, and 1.4% were aged 36-40. The average age of the study population is 26.42 years, with a standard deviation of 3.303 years.

Table 2: Distribution based on gestational age

Gestational Age	No. of Pregnant women(n=220)	Percentage
36–37Weeks	45	20.5%
37Weeks1day-38weeks	82	37.3%
38Weeks1day–39 weeks	71	32.2%

Table 3: Distribution based on microbial colonisation among pregnant women

Microbial Colonisation	No. of Pregnant women(n=220)	Percentage
No growth	183	83.2%
Group B Streptococcus	**8**	**3.6%**
E.Coli	16	7.3%
Pseudomonas	2	0.9%
Klebsiella	2	0.9%
Candida	9	4.1%

Table 4: Distribution of drug sensitivity status among the pregnant women who tested positive

Drugsensitivity	No. of Pregnant Women (n=8of220)	Percentage
Amikacin,Gentamycin	11	5.0%
Amoxicillin	1	0.45%
Amoxicillin,Norfloxacin	1	0.45%
Augmentin,Ceftriaxone	1	0.45%
Cefazolin,Cefotaxime	3	1.4%
Erythromycin,Ampicillin	3	1.4%
Erythromycin,Ampicillin,Penicillin	2	0.9%
Gentamycin	4	1.8%
Penicillin,Ampicillin,Cefazolin	2	0.9%
No growth	192	87.25%

Range of age among the pregnant women with Group B streptococci Colonisation = 21 – 29 years. Mean age (in years) among the pregnant women with Group B streptococci Colonisation = 24.88 ± 2.997.

Table 5: Distribution of drug sensitivity status among pregnant women with Group B streptococcus colonisation

Drugsensitivity	No. of Pregnant women(n=220)	Percentage
Amikacin,Gentamycin	1	12.5%
Erythromycin,Ampicillin	3	37.5%
Erythromycin,Penicillin,Ampicillin	2	25.0%
Penicillin,Ampicillin,Cefazolin	2	25.0%

Table 6: Significance of group-B Streptococcus prevalence amongst the Age group

Frequency		GBS		Total	p-value
		Positive	Negative		
Age	16-25	4	87	91	0.824
	26-30	4	105	109	
	31-35	0	17	17	
	36-40	0	3	3	
Total		8	212	220	

P-value is 0.824 which is statistically Insignificant

Table 7: Significance of group-B Streptococcus prevalence amongst Gestational Age

Frequency		GBS		Total	p-value
		Positive	Negative		
	36-37	2	54	56	
	weeks				

	37wks				
	+				
	1day	2	87	93	
Gestational	—38				
					0.091
Age	wks				
	38wks				
	+				
	1day	0	71	71	
	—39				
	wks				
Total		8	212	220	

p-value is 0.091 which is statistically Insignificant

Table 8: Significance of group-B Streptococcus prevalence amongst Gravida

Frequency		**GBS**		**Total**	**p-value**
		Positive	**Negative**		
Gravida	Primi	3	98	111	0.544
	G2	5	94	99	
	G3	0	10	10	
Total		8	212	220	

P-value is 0.544 which is statistically Insignificant.

DISCUSSIONS

The pregnant women included in our study range in age from 19 to 39 years old. Out of the 220 participants, 41.4% were aged 19-25, 49.5% were aged 26-30, 7.7% were aged 31-35, and 1.4% were aged 36-40. The average age of the study population is 26.42 years, with a standard deviation of 3.303 years. Our findings are found to be consistent with those of OliyadHusen et al,[8] who studied 213 pregnant women and reported a mean age of 26.83 years. In our study, 50.5% of the participants were gravida 1, 45% were gravida 2, and 4.5% were gravida 3. The results closely align with those reported by Ojo et al,[9] who studied 140 pregnant women. The p-value of 0.544 indicates that there is no statistically significant difference. Based on gestational age, 20.5% of the study population is aged 36-37 weeks, 37.3% is aged 37 weeks 1 day to 38 weeks, and 32.2% is aged 38 weeks 1 day to 39 weeks. Our research results contradict the findings of OO Ojo et al,[9] regarding the prevalence of group B in 140 pregnant women.

Based on the distribution of gestational age, 45 pregnant women are aged 36-37 weeks, accounting for 20.5% of the study population. Additionally, 82 pregnant women are aged 37 weeks 1 day to 38 weeks, making up 37.3% of the study population, and 71 pregnant women are aged 38 weeks 1 day to 39 weeks, which corresponds to 32.2% of the study population. The findings of this study are in contrast to the research conducted by OO Ojo et al,[9] on the prevalence of group B streptococcal colonization among 140 pregnant women. Their study reported that 83 out of 140 pregnant women were between 35 and 37 weeks of gestation, representing 59.3% of the study population, while 51 pregnant women were between 37.1 and 39 weeks of age, representing 4.3% of the study population.

According to their study, the mean gestational age is 36.8±1.2 weeks. In our study, 5 out of 220 pregnant women had ruptured membranes, accounting for 2.3% of the study population, while 215 pregnant women, making up 97.7% of the study population, did not have ruptured membranes. Furthermore, our study found that 115 pregnant women were of moderate socioeconomic status, representing 51.5% of the study population, and 105 pregnant women were of poor socioeconomic status, accounting for 46% of the study. In terms of microbial colonization among pregnant women, no growth was observed in 183 pregnant women, representing 83.2% of the study population. Group B streptococcus colonization was observed in 8 pregnant women, making up 3.6% of the study population, while E. coli colonization was detected in 16 pregnant women, representing 7.3% of the study population. Additionally, Pseudomonas colonization was detected in two pregnant women, accounting for 0.9% of the study population, and Klebsiella colonization was detected in two pregnant women, also representing 0.9% of the study population. Candida colonization was detected in 9 pregnant women, making up 4.1% of the study population.

Based on the distribution of drug sensitivity among pregnant women, 11 pregnant women are sensitive to amikacin and gentamicin, accounting for 5% of the study population. 1 pregnant woman is sensitive to amoxicillin, which corresponds to 0.45% of the study population. 3 pregnant women are sensitive to cefazolin and cefotaxime, accounting for 1.4% of the study population. 3 pregnant women are sensitive to erythromycin and ampicillin, accounting for 1.4% of the study population. 2 pregnant women are sensitive to erythromycin, ampicillin, and penicillin, accounting for 0.9% of the study population. 4 pregnant women are sensitive to gentamicin, corresponding to 1.8% of the study

population, and 2 patients are sensitive to penicillin, ampicillin, and cefazolin, corresponding to 0.9% of the study population. Drug sensitivity was not tested in 192 pregnant women, which constitute 87.25% of the study population. These results contradict Oliyard et al,[8] with their study that found 36 of 213 women to be positive for group B strep colonization. Of 36 GBS colonization, penicillin sensitivity was found in 31 pregnant women, of which 86.1%, ampicillin sensitivity was found in 33 pregnant women, corresponding to 91.7%, clindamycin sensitivity was found in 30 pregnant women, corresponding to 83.3%, and chloramphenicol sensitivity in pregnant women 29, 80.6% of women, sensitivity to erythromycin was observed in 26% of pregnant women.

In our research, we found that 72.2% of pregnant women tested positive for sensitivity to cefepime, with a 41.7% sensitivity rate, and that 97.2% of them were sensitive to vancomycin, with an 82% rate. Our findings differ from those in Namibia and Burkina Faso, where every group B streptococcal (GBS) isolate was found to be sensitive to ampicillin in their research.[10]

Looking at the age distribution, among pregnant women with GBS colonization, there were 4 women aged 19-25, representing 50% of those colonized, and another 4 women aged 26-30, representing 50% of those colonized. The average age of pregnant women colonized with GBS was 24.88 years, with a standard deviation of 2.997 years, and the p-value was 0.824, indicating no significant difference.

Based on the spread of pregnancy conditions among women carrying group B streptococcal bacteria, 3 women are in the first trimester, which is 37.5% of the total, while 5 are in the second trimester, making up 62.5%. These figures are from a study of 220 pregnant women, with 115 in the upper middle class, 51% of whomare in this group, and 105 in the lower middle class, 46%. Among these women, 4 have group B streptococcal bacteria. Women with lower socioeconomic status make up 50% of those with group B streptococcal bacteria. The prevalence of group B streptococcus among different socioeconomic groups is statistically not significant (p-value = 0.544 and p-value = 0.091). When it comes to the timing of pregnancy, 12.5% of women with group B streptococcal bacteria are pregnant between 36 to 37 weeks, which is one in eight. Similarly, 62.5% of these women are pregnant between 37 weeks and 38 weeks. Regarding the stage of pregnancy when membranes rupture, all eight women in this study have not ruptured. A previously conducted study by Oliyard et al,[8] found that 8 out of 36 pregnant women with group B streptococcal bacteria experienced premature rupture of membranes, which is 8.1% of the total, with a p-value of 0.009, indicating no significant difference. In terms of drug sensitivity, one woman is sensitive to Amikacin, and another to Gentamicin, making up 12.5% of the group B pregnant women. Among these women, 3 have shown sensitivity to erythromycin and ampicillin, 37.5%, 2 to erythromycin, penicillin, and ampicillin, 25%, and 2 to penicillin, ampicillin, and cefazolin, 25%. This study aimed to provide postpartum antibiotic prophylaxis to women with group B streptococcal bacteria, with 3.6% of the total 220 women testing positive. Among these, 2 women had positive results but were born elsewhere, and 6 others were born to women in the study. These women received an injection of erythromycin at a dosage of 1 gram IV BD for 1 to 2 weeks. However, this study has its limitations, including a small sample size, the use of non-probability quota sampling, and a lack of data on newborns to compare infection rates with other studies. Additionally, the follow-up of pregnant women who received postpartum antibiotic prophylaxis was not comprehensive. Clinicians will be better able to comprehend the scope of the issue and create a cohesive regimen based on the antibiotic susceptibility model according to the study's findings.

CONCLUSION

Group B Streptococcus (GBS) can cause a range of infections in mothers and newborns, from mild to severe. In this study, 3.6% of pregnant women tested positive for GBS, with 62.5% of these cases occurring between 37-38 weeks of pregnancy. Most participants (97.7%) did not experience early amniotic sac rupture. Among GBS-positive women, 37.5% were sensitive to erythromycin and ampicillin. Culture testing remains the most reliable method for detecting GBS, and antibiotics are recommended 4 hours before delivery for positive cases.

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