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Original Research Article

Group B Streptococcal infections among nonpregnant adults: A cross sectional study from a Tertiary care teaching hospital in South India

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ABSTRACT

Purpose: To understand the epidemiology of Group B Streptococcal infections among nonpregnant adults and to study the antibiotic susceptibility profile of GBS isolates.

Materials and Methods: A cross sectional study conducted in the department of microbiology in a tertiary care teaching hospital during December 2018 to May 2020. Group B Streptococcal (GBS) isolates from clinical samples of nonpregnant adults were included in the study. Identification and antibiotic susceptibility testing of GBS isolates were performed according to standard microbiology techniques. Patient's demographic features and clinical details were collected from medical records.

Results: A total of 58 GBS isolates were obtained from nonpregnant adults during the study period. There was a female (60.3%) predominance among the study group. Mean age of the study subjects was 51.4 years. In our study GBS were commonly isolated from urine 50% (n=29) and wound swabs 46.6% (n=27). One isolate each (1.7%) was obtained from blood culture, urethral swab and high vaginal swab. Common GBS infections noted in this study were Urinary tract infections (50%) and skin and soft tissue infections (46.6%). Diabetes mellitus (58.6%) was the most common risk factor noted in our study. All the isolates were sensitive to Penicillin, Linezolid and Vancomycin. Erythromycin and clindamycin resistance of 13.8% and 6.9% respectively were noted.

Conclusion: A shifting trend of GBS infections from pregnant women and neonates to non-pregnant adults was observed in the present study. In patients with diabetes mellitus GBS could be considered as causative agent of skin and soft tissue infections.

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1. Introduction

Group B streptococcus (GBS) is a leading cause of neonatal sepsis and has been identified as a cause of infection in pregnancy as well as post-partum.¹ GBS has now gained recognition as a significant and increasing cause of invasive infections in nonpregnant adults, especially elderly and those with underlying conditions, particularly diabetes.² Studies on distribution of GBS infections especially in pregnant adults and neonates and antimicrobial resistance have been performed worldwide,

but there is a paucity of information on GBS infections in nonpregnant adults, especially from India, where the epidemiology of GBS infections may be different. This study was conducted to understand the epidemiology of GBS infections among nonpregnant adults and also to know the pattern of antimicrobial resistance in GBS isolates.

2. Materials and Methods

The present study is a cross sectional study, conducted in the Department of Microbiology of a tertiary care teaching hospital during December 2018 to May 2020.

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Group B Streptococcal isolates obtained from various clinical samples received in the microbiology laboratory were included in the study. GBS isolates obtained from pregnant individuals, neonates and pediatric age group were excluded from the study. Patient's medical records were reviewed for details including the demographic features, clinical diagnosis, co morbidities, treatment and outcome.

2.1. Identification of the isolates

All GBS isolates were preliminarily identified based on the colony characteristics on sheep blood agar, Gram stain morphology, catalase test and CAMP test. Identification of GBS isolates were further confirmed by VITEK 2 system using VITEK®2 GP card (bioMerieux Pvt.Ltd). Serogrouping was also done by using STREP GROUPING KIT (Lab21 Healthcare Ltd).

2.2. Antimicrobial susceptibility testing

All GBS isolates obtained in the study were subjected to antimicrobial susceptibility testing. Susceptibility to penicillin G (10µg), tetracycline (30 µg), quinupristin-dalfopristin (15 µg), linezolid (30 µg), vancomycin (30 µg), clindamycin (2µg) and erythromycin (15µg) were performed on Mueller-Hinton agar supplemented with 5% sheep blood using commercially obtained antibiotic disks (Himedia). The isolates were considered susceptible or resistant according to the zone diameter recommended by the Clinical and Laboratory Standards Institute (CLSI).³ For all isolates D-zone test were also performed to determine the macrolide resistance phenotypes. D test positive indicated inducible clindamycin resistance (iMLS_B), resistance to both erythromycin and clindamycin indicated constitutive resistance (cMLS_B) and erythromycin resistant and clindamycin sensitive isolates considered as M phenotype.^{3,4}

3. Results

During the study period, a total of 78 isolates of GBS were obtained from various clinical samples received in the microbiology laboratory. Of the 78 isolates, 58 (74.3%) were obtained from non-pregnant adults, 16 (20.5%) from pregnant women, three (3.8%) from neonates and one (1.2%) from a pediatric patient. Among the non-pregnant adults there were 23 (39.6%) males and 35 (60.3%) females. The age wise distribution of subjects with GBS infection is given in Table 1. The mean age of the study subjects was 51.4±14.1 years (lowest 19 years and highest 83). Fifty percentage of GBS isolates were obtained from urine (n=29) followed by wound swabs (44.8 %, n=26). One isolate each (1.7%) was obtained from blood culture, urethral swab and high vaginal swab.

Clinical profile of study subjects given in Table 2. Predominant GBS infection noted in our study was Urinary

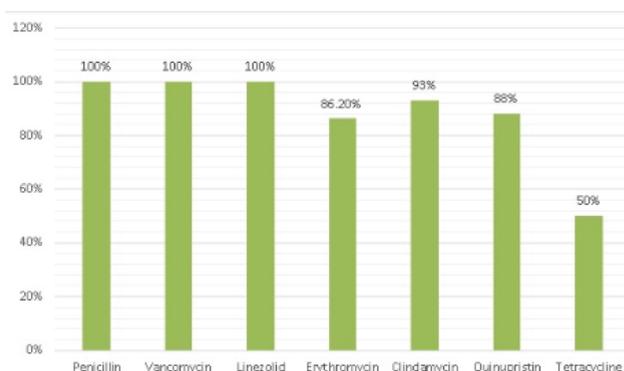


Fig. 1: Antibiotic sensitivity profile

Table 1: Age wise distribution of study group

Age group	Frequency (%)
Young adults (18 – 35)	7(12.1%)
Middle aged (36- 55)	27(46.6%)
Older adults (56 and above)	24 (41.3%)
Total	58 (100%)

Table 2: Clinical profile of study group

GBS infections	Number (%)
Skin and soft tissue infection	27(46.6%)
Urinary Tract Infection	29(50 %)
Sepsis	2 (3.4%)
Cervicitis/ PID	1 (1.7%)
Urethritis	1 (1.7%)

Table 3: Risk factors and comorbidities

Risk factors	Number (%)
Diabetes Mellitus	34(58.6%)
Peripheral Vascular Disease	5(8.6%)
Cerebral Vascular Disease	4(6.9%)
Coronary Artery Disease	5(8.6%)
Urological malformation	7(12%)
Renal disorder	8(13.8%)
Dyslipidemia	3(5%)
Other	15(25.9%)
None	12(20.7%)

Table 4: Comparison of demographic features and risk factors of GBS infections

	SSTI	UTI
Mean Age	53.8±13.0	49.7±15.3
Male	51.9%	27.6%
Female	48.2%	72.4%
Diabetes mellitus	70.4%	51.7%
Peripheral vascular disease	18.5%	0%
Renal disease	11.1%	17.2%
Urological malformations	3.7%	20.7%
Coronary artery disease	11.1%	3.4%
Dyslipidemia	3.7%	6.9%

tract infection (50%) followed by skin and soft tissue infections (46.6%). Among patients with urinary tract infections (UTI), five patients had complicated UTI which included hydronephrosis and recurrent pyelonephritis. Skin and soft tissue infections (SSTI) included cellulitis (12.1%), abscess (22.4%), infected ulcers (19%), suture site infection (3.4%), gangrene (5.2%) and necrotizing fasciitis (1.7%). Other diseases served in our study were sepsis, urethritis and pelvic inflammatory disease (PID). Among the two patients with sepsis, focus of infection was identified as infected ulcer in one case and UTI in another patient.

The risk factors and co morbidities noted in patients with GBS infection are given in Table 3. The major risk factor came to be diabetes mellitus (58.6 %) followed by renal disease (13.8%). Peripheral vascular disease and coronary artery disease were other comorbidities noted in our study which came to be 8.6%. Urological malformations were found in seven (12%) subjects, six of them presented with urinary tract infection. Other co morbidities included Liver dysfunction (1.7%), HIV (1.7%), malignancy (1.7%), hypothyroidism (5.1%), hypertension (8.6%), pulmonary disorders (6.9%), gastro intestinal disorder (1.7%) and filariasis (1.7%). No risk factors or co morbidities was identified in 20.7% of the patients. Comparison of demographic features and risk factors for SSTI and UTI is given in Table 4 .

All the 58 isolates of GBS were sensitive to penicillin, vancomycin and linezolid. Antibiogram of the Group B streptococcal isolates are given in Figure 1. Erythromycin was found to be sensitive in 86.2% (n=50) of isolates. Clindamycin and quinupristin were found to be sensitive in 93% (n=54) and 88% (n=51) of isolates respectively. Highest resistance was observed for tetracycline 50% (n=29). Of the total eight macrolide resistant strains, D test was positive in three (37.5%) isolates, one isolate (12.5%) showed constitutive resistance (cMLS_B) and the remaining four (50%) demonstrated M phenotype.

Of the 58 patients with GBS infection 43% (n=25) were subjected to surgical management. Penicillin derivatives were the major antibiotics used for treating GBS infection which accounts to 31% (n=18), followed by fluoroquinolones 27.6% (n=16), cephalosporins 13.8% (n=8) linezolid and clindamycin 8.6% (n=5) nitrofurantoin 5% (n=3), carbapenems and erythromycin 3.4% (n=2) and vancomycin 1.7% (n=1).

In our study 42 (72.4%) patients improved with the treatment. The condition worsened in three (5%) patients and follow up was lost in 11 (19%) cases. Two (3.4%) patients in our study group died due to sepsis, of which one patient had SSTI and second patient had UTI.

4. Discussion

GBS has been recognized as a leading cause of meningitis and sepsis in newborns and as a cause of infection in

pregnant and postpartum adults. Previous studies from developed countries shows a substantial increase in the burden of GBS infection among nonpregnant adults also, particularly among the elderly and those with underlying medical conditions.^{1,2}

In our study, GBS infection in nonpregnant adults was found to be quite higher than that found in pregnant individuals and newborns, which accounts to 73% of the total GBS infection. A female (60.3%) predominance was observed in our study especially among patients with UTI (72.4%) and the mean age of study group was found to be 51.4 years. Various studies from developed countries have shown male preponderance and the mean age of patients with GBS infections was slightly higher than our study finding, mean age ranging from 59 to 62 years.^{5–7}

In our study GBS were commonly isolated from urine (50%) and wound swabs (44.8%). GBS isolation from sterile body fluids was less in our study when compared to studies from other parts of the world.^{6–10} In this study only one (1.7%) isolate was obtained from blood culture and no isolates were obtained from any other sterile body fluids.

Clinical manifestations of GBS infection reported in adults are numerous and quite varied. Urinary tract infection (50%) was the most common GBS infection observed in the present study followed by skin and soft tissue infection (46.6%). In our study sepsis with identified focus constituted 3.4% which includes one case with infected ulcer and other with urosepsis. The most common syndromes due to invasive GBS disease reported in adults are primary bacteremia without a focus and skin and soft tissue infections.^{11–13} Bacteremia secondary to a focal source of infection and polymicrobial bacteremia are also reported in 26%–45% of cases in previous studies.^{12,13} In this study polymicrobial infection of GBS along with Methicillin resistant staphylococcus aureus (MRSA) was noted in a patient with SSTI.

In the present study GBS infection occurred in patients with one or more underlying medical condition. The major risk factor observed in our study was diabetes Mellitus, especially among patients with SSTI. Peripheral vascular disease was the second common risk factor observed in patients with skin and soft tissue infections. In patients with urinary tract infection, urological malformations and renal disorders were also found to contribute to the disease. Malignancy, HIV, coronary artery disease, cerebrovascular disease, dyslipidemia, hypertension, hypothyroidism and filariasis were also observed as co morbidities in our study. However, no risk factors could be identified in 20.7% patients. Previous studies report diabetes mellitus and obesity as common comorbidities, particularly among patients with skin and soft tissue infections.^{14,15} In a surveillance on invasive GBS disease conducted in United states, population attributable risks of invasive GBS disease were 27.2% for obesity and 40.1% for diabetes.¹⁵ In our

study we could not identify obesity as risk factor due to the unavailability of Body Mass Index from the clinical records.

As documented in several studies, GBS is universally sensitive to the penicillins.^{16–18} So it remains the drug of choice in GBS infection. But in case of penicillin allergy, clindamycin, erythromycin can be an alternative, provided their susceptibility is known. In this study, as in many other studies, strains of penicillin-resistant GBS were not found. However, 13.8% and 6.9% isolates showed resistance to erythromycin and clindamycin respectively. High inducible clindamycin resistance (37.5%) noted among macrolide resistant isolates, which emphasize the importance of D test in routine antimicrobial susceptibility testing so as to overcome treatment failure. Previous studies show that over the past few years, the resistance rates to both erythromycin and clindamycin have increased. Among isolates from patients with invasive disease, resistance rates for erythromycin range from 7% to 32%, and for clindamycin, from 3% to 20%.^{17,18} Therefore close monitoring of the GBS susceptibility profile to antimicrobial agents is warranted especially in penicillin allergic cases.

Most of the patients in our study had favorable outcome, but either recurrent infection or worsened condition was noted in 5% patients. The mortality in our study was found to be 3.4% and the two patients expired were diagnosed with sepsis. In several reports, primary bacteremia carries a high fatality rate.^{16–18} Since GBS are susceptible to several commonly used antimicrobials including penicillin and cephalosporins, patients with GBS do not usually suffer from a delay in initiation of appropriate antimicrobial therapy and therefore overall have favorable outcomes, except for few cases with sepsis or urinary tract infections, where treatment failure are reported.¹⁹ In a previous study, despite appropriate treatment, the clinical outcome was poor in about 18% of the patients in case of urinary infection.¹⁹ Treatment failure or relapse in cases of UTI, is most likely the result of persistent vaginal or enteric colonization.²⁰

5. Conclusion

The incidence and severity of GBS infections demonstrate variability over time. A shifting trend of GBS infection from pregnant women and neonates to non-pregnant adults was observed in the present study. In patients with diabetes mellitus GBS could be considered as causative agent of skin and soft tissue infections. Based on our findings, it may be suggested that routine antibiotic susceptibility testing including D test should be performed for all isolates of GBS to accurately identify the resistance pattern and to overcome treatment failure especially in penicillin allergic individuals.

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7. Conflicts of Interest

The authors declare no potential conflict of interest with respect to research, authorship, and/or publication of this article.

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