Original Article

Clinical Profile and Outcome of Group B Streptococcal Colonization in Mothers and Neonates in Ras Al Khaimah, United Arab Emirates: A Prospective Observational Study

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Abstract

Background: Maternal Group B *Streptococcus* (GBS)/*Streptococcus agalactiae* colonization rates vary worldwide; however, no such recent data are available from the United Arab Emirates (UAE).

Objective: The objective of this study was to determine the prevalence of GBS colonization among pregnant women attending an antenatal clinic of a hospital in Ras Al Khaimah, UAE, along with the antibiotic sensitivity pattern, the clinical profile and pregnancy (maternal and fetal) outcome.

Methods: This prospective observational study routinely offered rectovaginal swab for GBS to all women attending the antenatal clinic at 35–37 weeks of pregnancy between January and December 2019. MASTASTREP kit and Vitek-2 identification system was used for culture and identification. Women with positive cultures were followed up for any maternal and neonatal complications and the use of intrapartum antibiotic prophylaxis (IAP).

Results: A total of 2295 women were included, of which 158 (6.9%) had positive cultures for GBS colonization. The carriage rate was higher in women without any risk factors for early-onset GBS disease (EOGBS) ($P < 0.01$). The GBS isolates were about 97% susceptible to linezolid and vancomycin, 90% to benzyl penicillin and 95% to ampicillin. Resistance to trimethoprim/sulfamethoxazole, clindamycin, erythromycin, and levofloxacin were about 77%, 57%, 57%, and 10%, respectively. Urinary tract infection in GBS colonized women were more common in those aged ≤30 years ($P = 0.009$). Fetal outcome was favorable in women receiving IAP for GBS colonization. No neonate had culture proven EOGBS.

Conclusion: The prevalence of GBS colonization in pregnant women as well as the overall maternal and neonatal complications is low in Ras Al Khaimah, UAE. IAP is effective in preventing early-onset sepsis in newborn, and thus should be initiated in those with GBS colonization. The cultured GBS showed sensitivity to most antibiotics.

Keywords: Colonization, Group B *Streptococcus*, neonatal outcome, pregnancy outcome, sensitivity, UAE

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INTRODUCTION

Group B *Streptococcus* (GBS)/*Streptococcus agalactiae* is a normal body commensal, colonizing the gut and vagina. Maternal GBS colonization rates vary worldwide, with a mean prevalence of about 18%.[1,2] Currently, there is a lack of consensus regarding the association between risk factors, such as age, parity, education, socioeconomic status, and maternal factors (premature rupture of membranes [PROM], low birth weight and puerperal pyrexia), and GBS colonization.[1-5]

In neonates, GBS infection is generally acquired by vertical transmission in the peripartum period and is a significant cause of sepsis and death in many countries.[2,6-9] About 75% of the neonatal GBS infections present as pneumonia, septicemia or meningitis in the first 6 days of life.[10] Meningitis causes long-term disabilities such as blindness, deafness, speech problems or learning impairments in up to 50% of the cases, and these are severe in about 25% of the neonates. In mothers, GBS is also a frequent cause of asymptomatic bacteriuria, urinary tract infection (UTI), chorio-amnionitis, postpartum endometritis, pneumonia, puerperal sepsis and bacteremia without a focus.[11,12]

From the Middle East, studies have found the prevalence of maternal GBS colonization to range from 3.3% to 31.6%;[13-15] however, there is no recent study from the United Arab Emirates (UAE) reporting the clinico-bacterial profile, prevalence, and antibiotic sensitivity pattern. Accordingly, this study was conducted to determine the prevalence of GBS colonization in pregnant women from UAE after 35 weeks of gestation as well as determine their clinical profile, the maternal and fetal outcome of those colonized with GBS, and the antibiotic sensitivity pattern of GBS.

METHODS

Study design and participants

This was a prospective observational study conducted at the Department of Obstetrics & Gynecology, Abdullah Bin Omran Hospital, Ras Al Khaimah, UAE, after receiving the ethical approval from the Ministry of Health and the local ethics committee.

All pregnant women attending the antenatal unit of the hospital between January 1 and December 31, 2019, were routinely offered rectovaginal swab for GBS at 35–37 weeks of pregnancy. In addition, in those who presented with prolonged PROM or preterm labor, high vaginal swab was done as part of the initial assessment. Urine culture was ordered for women presenting with symptoms of UTI. Written consent was obtained prior to the test, and maternal characteristics and antenatal risk factors were noted.

Women with GBS-positive cultures were followed up for antenatal complications, mode of delivery, gestational age at delivery and use of IAP. All the included GBS-positive women delivered at our hospital and their neonates were kept under observation for 48 hours. The neonates were examined by a pediatrician at birth and then at regular intervals during the hospital stay. Thereafter, the patients were followed-up telephonically weekly during the entire neonatal period for any symptoms. For any further neonatal complications, the interventions and outcomes were noted.

Specimen collection

Rectovaginal swabs were collected by brushing the lower vagina and rectum using a sterile cotton swab by obstetricians following universal precautions.

Identification of Group B *Streptococcus*

The isolates were identified as GBS based on being catalase-negative, Gram-positive cocci, CAMP positive,[16] bacitracin resistant and their reaction with commercial latex-group-specific streptococcal typing system (MASTASTREP kit, Mast House, Merseyside, UK) and Vitek-2 identification system (BioMérieux, Inc., Durham, NC).

Antimicrobial susceptibility test

The antibacterial susceptibility of all GBS isolates was tested by automated susceptibility testing using Vitek-2 AST-03 card (BioMérieux, Inc., Durham, NC) according to Clinical Laboratory Standard Institute (CLSI, 2017).[17] The antibacterial agents tested included benzyl penicillin, ampicillin, ceftriaxone, cefotaxime, clindamycin, erythromycin, levofloxacin, trimethoprim/sulfamethoxazole, vancomycin, and linezolid.

Data analysis

Data were analyzed using SPSS version 25 (SPSS, Inc., Chicago, IL, USA). The numerical variables were expressed in percentages. Groups were compared by Chi-square analysis and a P value <0.05 was considered statistically significant.

RESULTS

A total of 3007 antenatal patients attended the hospital during the specified period, of which 2295 women agreed to undergo the test and gave consent. Of these, GBS colonization was found in 158 women (6.9%). All further

analysis only includes the GBS-positive women, unless stated otherwise.

The mean age was 30.67 ± 4.58 years (range: 19–43 years), with 79 women each aged ≤30 and >30 years. Further, 27 (17%) women were primigravida and most had parity ≥1 (*n* = 131; 82.9%). The mean body mass index (BMI) was 32.5 ± 12.1 kg/mt^2; the majority were obese with a BMI of ≥30 (*n* = 105; 66.4%), while 13.2% (*n* = 21) had Class 3 obesity [Table 1].

Prevalence of GBS colonization among women with low vaginal samples (LVS) and/or rectal swab for routine screening was 22.7% (123 of 541). The GBS colonization in women with PROM or preterm labor was 1.1% (20 of 1749). One of the two women with a history of GBS colonization in a previous pregnancy had colonization. Urine culture was carried out in 29 women, of which 13 (44.8%) were positive.

UTI was significantly higher in women aged ≤30 years that those aged >30 years (*P* = 0.009), but there was no statistical difference between primigravida and multipara (*P* = 0.34) or lean and obese (*P* = 0.08) women. The most common pregnancy-associated complication was diabetes 25.9% (*n* = 41), while 10.7% (*n* = 17) of women had other complications including thyroid dysfunction, gestational thrombocytopenia, and blood group Rh-negative pregnancy. The mean birth weight of neonates was 3186 ± 470 g. Among neonates requiring admission, risk factors in were present in six mothers, with the most common being gestational diabetes mellitus (*n* = 3). Two cases had intrauterine growth restriction and one had cholestasis of pregnancy. Maternal antenatal complications were not different between neonates who developed sepsis (and were admitted to NICU) and those who were asymptomatic [Table 2].

Table 1: Maternal and neonatal profile

Parameter	Value
Age (years)	
≤30	79
>30	79
BMI (kg/m^2)	
<25	12
25-29.9	41
30-34.9	52
35-39.9	32
≥40	21
Parity index	
Primigravida	27
Parity 1 or above	131
Pregnancy complications	
Diabetes*	41
Anemia	8
Hypertension**	7
Others***	17
IUGR	11
Type of delivery	
Vaginal delivery	127
Elective LSCS	11
Emergency LSCS	20
Birth weight (g)	
<2500	11
2500-3500	115
>3500	32
Postpartum complications	
Endometritis	3
Symptomatic urinary tract infection	1

*Gestational diabetes (*n*=37) and pregestational diabetes (*n*=4), **Hypertension is defined as gestational hypertension + preeclampsia; ***Others: Obstetric cholestasis=1, Twin pregnancy=2, Hypo/Hyperthyroidism=5, Toxoplasmosis under treatment=1, Rh negative pregnancy=3, Genital wart=1, Treated micro-invasive cervical carcinoma=1, polyhydramnios=1, Gestational thrombocytopenia=2. BMI – Body mass index, IUGR – Intrauterine growth restriction, LSCS – Lower segment Caesarean section

Of the 158 GBS-colonized women, 117 received antibiotic treatment for IAP (74%) and 41 women did not receive IAP due to elective lower segment Caesarean section for other indications or maternal refusal. Women in the IAP group primarily received crystalline penicillin (*n* = 95; 81.2%), while those allergic to penicillin, received clindamycin (*n* = 22, 18.8%).

Two women had intrapartum maternal fever without prolonged PROM; both received IAP, and their neonates did not show signs of sepsis. Postpartum complications in GBS-colonized mother were postpartum endometritis (*n* = 3) and UTI (*n* = 1), while chorioamnionitis and puerperal sepsis were not seen in any women.

Antibiotic sensitivity profile

The most common antibiotics to which GBS were susceptible were linezolid and vancomycin (97.4% for both) followed by ceftriaxone and cefotaxime (96.2% for both), ampicillin (95.6%), and benzyl penicillin (90.5%). Resistance to clindamycin, erythromycin, levofloxacin, and trimethoprim/sulfamethoxazole were found to be 57.6%, 57%, 10.1%, and 77.2%, respectively [Table 3].

Neonatal outcome

A total of 12 neonates were admitted to the NICU. The most common age at admission was <6 hours (*n* = 9; 75%) and most common presentation was respiratory distress (*n* = 8; 66.6%). Only two cases were culture-positive sepsis (*Staphylococcus aureus*); among others with features of sepsis, the culture were negative.

Five neonates received ampicillin and gentamycin; one of them had hyperbilirubinemia and was managed with

phototherapy along with antibiotics. Neonates with *S. aureus* sepsis received vancomycin. One neonate was admitted with bronchopneumonitis at 3 weeks of age and received erythromycin, while four were managed with observation. The mean hospital stay was 6.9 ± 3.2 days and there was no neonatal mortality. Seven cases had received IAP (penicillin); one child with intrauterine growth restriction and prematurity had features of sepsis, but the culture was negative. There was no difference between the groups whose mothers did and did not receive IAP in terms of lengths of hospital stay ($P = 0.921$) or need for admission in the first hour of life ($P = 0.198$) [Table 4].

Table 2: Association of parameters with culture positivity and maternal complications on neonatal outcome

Parameters	*P*
Age and culture positive UTI	0.009
Parity and culture positive UTI	0.336
BMI and culture positive UTI	0.077
Presence of other maternal complications in babies admitted to NICU compared to babies who were asymptomatic	0.819

BMI – Body mass index, NICU – Neonatal intensive care unit, UTI – Urinary tract infection

Table 3: Antibiotic sensitivity

Antibacterial agent	Susceptible, *n* (%)
Vancomycin	154 (97.5)
Linezolid	154 (97.5)
Ceftriaxone	152 (96.2)
Cefotaxime	152 (96.2)
Ampicillin	151 (95.6)
Benzyl penicillin	143 (90.5)
Levofloxacin	142 (89.9)
Erythromycin	68 (43)
Clindamycin	67 (42.4)
Trimethoprim/sulfamethoxazole	36 (22.8)

Table 4: Neonatal complications (*n*=12)

Parameters	Value
Mean±SD gestational age at birth	38 weeks and 4 days±0.757
Mean±SD birth weight (g)	2937.1±353.8
Intrapartum antibiotic prophylaxis	
Received	7
Not received	5
Symptoms	
Respiratory distress	8
Floppy baby with bradycardia	2
Fever	1
Cyanosis	1
Vomiting	1
Mean ± SD age at admission to NICU (h)	9.5±21.3
Treatment received	
Ampicillin + Gentamicin	5
Vancomycin	2
Erythromycin	1
Supportive measures and observation only	4
Mean±SD length of hospital stay	6.1±3.2

SD – Standard deviation, NICU – Neonatal intensive care unit

DISCUSSION

The prevalence of maternal GBS colonization rate in this study was 6.9%. In a meta-analysis that included 78 studies published between 1997 and 2015 with 73,791 pregnant women from 37 countries, the overall mean prevalence was 17.9%, with the highest being in Africa (22.4%) followed by Americas (19.7%), Europe (19.0%) and Southeast Asia (11.1%).[1] Earlier studies from UAE reported prevalence of 10.1% and 21.5%, which is higher than that found in the current study.[18,19] Recent studies from Middle Eastern countries also show significant variance in the prevalence of GBS colonization.[13-15,18-24] The varying rates of colonization can be partly explained by difference in socioeconomic groups, education level and acceptance of medical and diagnostic facilities.

The Royal College of Obstetricians and Gynaecologists recommend that clinicians should be aware of risk factors that increases the risk of delivering a child with EOGBS disease. In our study, the prevalence of GBS carriage was significantly higher among those with no risk factors (123/541) than those with at least one of the risk factors (22/1754) ($P < 0.00001$). A recent study also suggested that testing for GBS with PCR tests among pregnant women with risk factors for EOGBS would reduce the use of IAP by two-thirds compared with the risk-based approach alone.[25] However, in our study, no neonate had culture-proven EOGBS, and no further analysis was possible due to the small sample size.

The UTI and GBS bacteriuria in a pregnant woman is a marker of heavy genital tract colonization and is an indication of IAP.[3] In this study, UTI in GBS colonized women was found to be is significantly higher in younger women (aged ≤30 years), which is in accordance with another study.[26] UTI was not found to be related to parity or BMI in our study. Such comparisons were not found in the other studies.

The type of postpartum complications in our study (endometritis and UTI) is in accordance with another study[3] but is in contrast with others.[27,28] The association of maternal GBS colonization with adverse pregnancy outcomes such as prematurity, low birth weight, PROM, longer duration of labor reported in earlier studies were not found in the present study.[3] Further, GBS was not isolated in any of the neonates born to mothers receiving IAP. This is in accordance with other studies and indicates that IAP likely prevents early-onset sepsis.[3,29]

Although the drug of choice for GBS infection is penicillin, erythromycin and clindamycin are used in those allergic to penicillin. In the current study, resistance of GBS isolates was about 57% for erythromycin, which is much higher than that reported in the literature from different countries (0%–37%).[29,30] Similarly, clindamycin resistance in our study was 58%, while previous studies from different countries have found it to be 17%-50%.[29-31] Resistance to penicillin in our study was 10%, which is lower than that recently reported from Iran (about 17%).[32]

The prospective study design allowed collection of all relevant data regarding the pregnancy outcome and antibiotic sensitivity profile, which is a strength of this study. A major limitation of the study was the relatively small sample size. Finally, as most cases were in women without any risk factors for GBS, the authors recommend a universal screening for GBS in high-income countries such as the UAE to further optimize outcomes.

CONCLUSION

The prevalence of maternal GBS colonization in pregnant women from Ras Al Khaimah, UAE, was found to be low, with carriage significantly higher in women without any risk factors for EOGBS than those with risk factors. GBS was sensitive to most antibiotics, but resistance to erythromycin was high. The study found overall maternal complications were low, and fetal outcome was favorable in women receiving IAP for GBS colonization.

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Ethical considerations

This study was approved by the Ministry of Health and Prevention Research Ethics Committee/RAK Research and Ethics of Research Sub-Committee at RAK Medical and Health Sciences University, Ras Al-Khaimah, UAE, on December 12, 2018 (Approval no.: MOHAP/RAK/SUBC/REC/2018/49-2018-MOH-DR). The study was conducted in accordance with the Declaration of Helsinki, 2013. All participants provided written informed consent before sample collection.

Peer review

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Conflicts of interest

There are no conflicts of interest.

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