PREVALENCE OF RECTOVAGINAL GROUP B STREPTOCOCCUS (GBS) AMONG PREGNANT WOMEN AT UNIVERSITY COLLEGE HOSPITAL, IBADAN, NIGERIA

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ABSTRACT

Context: Group B *Streptococcus (GBS)* or *Streptococcus agalactiae*, a Gram-positive bacterium causes disease primarily in infants, pregnant or postpartum women. It is associated with up to 50% neonatal mortality and significant morbidity. GBS is responsible for adverse pregnancy outcomes such as premature rupture of membranes (PROM), preterm labour, low birth weight and chorioamnionitis.

Objectives: To determine the prevalence of GBS carriage among pregnant women and identify the risk factors for colonization.

Study Design: This is a prospective cohort study in which **t**wo hundred and forty consenting pregnant women were screened for GBS from 35 – 40 weeks. Vaginal and rectal swab specimens were collected from the mothers and examined using standard bacteriological methods **-CHROMagar™StreptB agar plate (CHROMagar Ltd, Paris, France)**. All GBS positive isolates were tested for antibiotic sensitivity.

Results: The prevalence of vaginal and rectal GBS colonization among pregnant women in University College Hospital (UCH), Ibadan was 9.6%. Of the 23 pregnant women with GBS colonization, 60.9% (14) were vaginal carriers, 30.4% (7) were rectal carriers while 8.7% (2) had both. GBS colonization is significantly associated with previous preterm birth, abnormal vaginal discharge in current pregnancy and preterm PROM but not with maternal sociodemographic characteristics: age, parity and gestational age.

Conclusion: GBS colonization of vagina and rectum has potential risks for pregnant women and their neonates. These call for screening of women during pregnancy so as to offer intrapartum antimicrobial prophylaxis to those who are carriers.

Keywords: GBS, Colonization, Rectovaginal, Pregnancy and Risk factors.

INTRODUCTION

Group Bbeta haemolytic *Streptococcus* is a Gram-positive bacterium that causes invasive disease primarily in pregnant or postpartum women and neonates. It is the most frequent pathogen isolated from neonates with invasive bacterial diseases and is responsible for serious infections in new-borns such as pneumonia, septicaemia and meningitis and also associated with high mortality rate.[1,2]

In pregnant women, carriage rates range from 10 – 30%.[3] Vertical transmissions to the new-born is the commonest but other routes are nosocomial or community acquisition.

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In order to detect GBS in vaginal specimens and thus identify pregnant women carriers, a rapid screening method and efficient standard culture is required.[1] Swabbing both the lower vagina and rectum (through the anal sphincter) had been shown to increase the culture yield substantially as compared with sampling the cervix or the vagina only.[4]

The administration of intrapartum antibiotic prophylaxis to mothers who were colonized with GBS had led to prevention of early-onset neonatal GBS disease and also decreased the incidence of the disease.[5,9] However, this information is not readily available in many developing countries including Nigeria. This study was designed to determine the prevalence of GBS among pregnant women and provide data that can be used to form a basis for the implementation of a screening program for GBS infection in the University College Hospital (UCH), Ibadan, Nigeria.

MATERIALS AND METHODS

This prospective cohort study was conducted at the University College Hospital, Ibadan, Oyo State, Nigeria between 1st December, 2012 and 31st May, 2013. Two hundred and forty pregnant consenting women attending antenatal clinic with singleton pregnancy at gestational age ≥ 35 weeks who met the study criteria were screened for GBS colonization. Exclusion criteria included use of antibiotics within two weeks prior to recruitment. The Ethical Committee of the hospital approved the study.

A standard questionnaire was used to obtain the sociodemographic data of participants and other relevant details such as maternal age, gestational age, previous obstetric history, history of neonatal infection in previous delivery, history of index pregnancy, parity, marital status, mode of delivery, history of premature rupture of membranes (PROM), administration of antibiotics during labour and history of fever (Temp>37.5°C) during labour. Two **separate** samples were obtained from the vagina and rectum using sterile swab sticks from them during antenatal clinic **at 35 – 40 weeks gestation.** They had the lower one third of the vagina swabbed circumferentially while the second swab was inserted through the anal sphincter about 2 cm into the rectum and rotated 360 degrees.

All the samples were transported to Medical Microbiology and Parasitology laboratory, UCH, Ibadan for immediate processing. The specimens were inoculated directly onto freshly prepared CHROMagar™StreptB agar plate (CHROMagar Ltd, Paris, France) and incubated aerobically for 24 hours. Growth that appeared mauve (pale purple colour) were regarded as *S. agalactiae* isolates while other organisms were blue, colourless or inhibited. Thereafter, suspicious isolates were sub-cultured on blood agar plate for purity and to demonstrate beta-haemolysis. Isolates were also confirmed by biochemical reactions such as Gram reaction and catalase test. Lancefield antigen detection test was not done due to financial constraints. The antibiotic susceptibility patterns of the isolates were carried out according to the recommendations of the National Committee for Clinical Laboratory Standards (NCCLS) for disc diffusion susceptibility test.[6] The isolates were tested against the following antibiotics: ampicillin/sulbactam (20ug), cefuroxime (30ug), cotrimoxazole (25ug), erythromycin (3ug), ampicillin (10ug), and amoxicillin (25ug). Oxford *Staphylococcus aureus* National Collection of Type Cultures (NCTC) was used as control organism.

A pregnant woman was labelled positive for GBS colonization if GBS was isolated from one or both swabs (vaginal or rectal). Pregnant women with positive results were given intrapartum antibiotics during labour or if she had ruptured her membranes before the onset of labour.

Data were analysed using the Statistical Package for

the Social Sciences (SPSS) version 17. (SPSS Inc. Chicago, IL)

RESULTS

Two hundred and forty (240) pregnant women participated in the study and all had lower vaginal and rectal swabs taken with their results analysed.

Twenty – three of the pregnant women had GBS isolated from their vaginal, rectal or both vaginal and rectal swabs giving a prevalence of 9.6%. Vaginal carriers only accounted for 14 (60.9%), a lower percentage 30.4% (7) were rectal carriers only while 2 (8.7%) had both. The prevalence of HIV in the study was 1.7% among GBS colonized pregnant women. All pregnant women are offered voluntary counselling and testing for the Human Immunodeficiency Virus at our centre.

The mean age of the respondents was 31.4+4.4 years (range: 16 - 43 years).In this study, GBS colonization apparently increases as age increases with highest colonization rate among the maternal age 36 years and above (11.9%) and lowest among women aged 25 years and below (6.3%), even though the association was not statistically significant (p=0.776).There was a significant association between GBS status and level of education (p=0.01), all the GBS colonized respondents had tertiary level of education. (Table 1)

Table 2 shows the association between GBS status and respondents' obstetric history. Among the subjects who were colonized with GBS, prevalence was higher among women with gestational age between 37 – 40 weeks (10.0%) compared to 9.1% among women with gestational age between35 and less than 37weeks although the difference was not statistically significant (p=0.082).

There was no significant association between GBS and parity (p=0.544).

Among respondents with previous parous experience, those with past history of preterm birth were more likely to be GBS positive compared with those with negative history of preterm birth (OR = 4.03, 95%CI = 1.32–12.46, p = 0.01). Respondents with history of abnormal vaginal discharge in the current pregnancy were more likely to be GBS positive than those with negative history of abnormal vaginal discharge (OR = 5.50, 95% CI = 1.52–19.96, p = 0.01). Forty percent (40.0%) of respondents who had preterm premature rupture of membranes had positive GBS as compared with 60% of those who did not have preterm PROM.

Intrapartum fever was also noted to be significantly higher among GBS positive respondents compared with those who were GBS negative (OR = 9.72, 95%CI = 2.70–35.00, p = 0.001)(Table 3).

On logistic regression of the risk factors for GBS history of preterm birth, abnormal vaginal discharge, preterm PROM and intrapartum fever remained statistically significant.

DISCUSSION

The prevalence rate of GBS (*Streptococcus agalactiae*) colonization among pregnant women in this study was 9.6%. This rate was higher than 6.6% reported from Jos, Nigeria[7] but lower than 11.0 – 32.0% reported in other parts of the country and elsewhere [4,8-10] although similar to 9% and 9.8% reported in Calabar and Maiduguri respectively.[11-12] These variations may be due to differences in sampling sites, techniques used for sampling, type of culture medium used and gestational age at which samples were obtained.

Similar to a study from our environment, we also found out that GBS colonization increases with maternal age[9] unlike some reports from Malawi and United States of America which showed higher GBS colonization rate in women younger than 20 years and a decrease in rates as the maternal age increases.[10,13]

This study revealed that vaginal colonization rate

(5.8%) is higher than rectal colonization rate (3.7%), which is comparable to a study done in Thailand by Kovavisarach et al in which vaginal and rectal colonization rates were 13.4% and 10.3%, respectively.[4]

In Tanzania the prevalence rate was 12.3% in the vagina as compared to the rectum (5%).[14] The fact that GBS has been at times isolated from one and not the other site clearly indicates that it is important to sample both vagina and rectum when screening for GBS carriage in pregnant women. GBS maternal colonization and prevalence rates have wide geographical variations. The factors that may contribute to this disparity are varying socioeconomic status and ethnicity, differences in clinical practices related to the site of sample collection (low vaginal and high vaginal swab), the techniques used for the sampling and the culturing techniques. Differences in environmental factors such as hygiene and nutrition may also play a role.

Maternal colonization was higher in women at gestational ages 37 to 40 weeks compared to women of gestational ages 35 to 37 weeks, indicating an increased GBS carriage rates with increasing gestational age although the difference was not statistically significant ($p>0.05$). This is in agreement with the findings of Onipede et al, 2012 which showed that the GBS culture positivity among mothers ≤37 weeks gestational age was less than that among mothers >37 weeks [9] although the GBS colonization rate was not significantly related to maternal age or gestational age ($P>0.05$).However, the current recommendation is to screen pregnant women using a culture of vaginal and anal secretions obtained at 35 to 37 weeks of gestation with the United States using the most aggressive strategy of screening all pregnant women and the use of prophylactic antibiotics in all GBS positive mothers while most European countries do not generally screen, but use a risk-based strategy applied at the time of delivery.[1,15]In view of this strategy, United States has recorded a marked reduction in babies born with early-onset infection of GBS.[5]

In our study, the risk factors of previous preterm birth and previous neonatal infection were significantly higher in GBS positive mothers. This was similar to the findings in a study by Allen et al in Ontario, Canada in which GBS colonized mothers were more likely to have had previous preterm labour.[16]

Schuchat and his colleagues in their study showed that GBS colonization was associated with maternal intrapartum fever.[13] This was collaborated in our study with a higher proportion of respondents who were GBS positive (45.5%) having a history of intrapartum fever compared to those who were GBS negative (7.9%), ($p=0.001$). GBS colonization in our study population was not significantly associated with HIV infection (OR = 1.70, 95% CI = 0.53-5.40, $p = 0.37$), probably due to the small number of HIV infected pregnant women among them.

CONCLUSION

In conclusion GBS colonization was significantly associated with previous preterm birth, abnormal vaginal discharge in index pregnancy and preterm PROM but not with maternal socio-demographic characteristics of age and parity.

Prompt antibiotic treatment of culture confirmed antenatal cases and appropriate intrapartumantimicrobial prophylaxis may be beneficial to all pregnant women identified as carriers thus reducing the incidence of neonatal colonization and sepsis.

CONFLICT OF INTEREST

The authors declare no conflict of interest.

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Table 1: Associations between GBS Status and Demographic Characteristics of Study Participants

Variable	GBS +VE Number (%)	GBS –VE Number (%)	TOTAL Number (%)	X^2	P value
Age (years)					
<25	1 (6.2)	15 (93.8)	16 (100)	1.103	0.776
26-30	7 (7.8)	83 (92.2)	90 (100)		
31-35	10 (11.4)	78 (88.6)	88 (100)		
36+	5 (11.9)	37 (88.1)	42 (100)		
Marital status					
Married	23 (9.7)	213(90.3)	236(100)	0.431	1.000
Others	0 (0)	4 (100)	4 (100)		
Level of education					
Secondary and less	0 (0)	44 (100)	44 (100)	5.711	0.010
Tertiary	23 (11.7)	173(88.3)	196(100)		
Occupation					
None	4 (18.2)	18 (81.8)	22(100)	4.372	0.358
Semiskilled	5 (5.5)	86(94.5)	91(100)		
Skilled	8 (11.0)	65 (89.0)	73 (100)		
Professional	6 (11.1)	48 (88.9)	54 (100)		

GBS – Group B Streptococcus

Table 2: Associations between GBS Status and Obstetric Factors

RISK FACTORS FOR GBS	GBS + VE Number (%)	GBS – VE Number (%)	TOTAL Number (%)	X^2	P value
Gestational Age					
35 – 37 weeks	10 (9.1)	100(90.9)	110(100)	0.057	0.082
>37 – 40 weeks	13(10.0)	117(90.0)	130(100)		
Previous preterm birth					
Yes	5 (26.3)	14 (73.7)	19 (100)	6.667	0.010
No	18 (8.1)	203(91.9)	221(100)		
Previous infant with neonatal infection					
Yes	1 (10.0)	9 (90.0)	10(100)	0.002	0.964
No	22 (9.6)	208(90.4)	230(100)		
Preterm labour					
Yes	2 (25.0)	6 (75.0)	8 (100)	2.250	0.134
No	21 (9.1)	210(90.9)	231(100)		
History of abnormal vaginal discharge					
Yes	4 (33.3)	8 (66.7)	12 (100)	8.223	0.004
No	19 (8.3)	209(91.7)	228(100)		
Preterm premature rupture of membranes					
Yes	2 (40.0)	3 (60.0)	5 (100)		
No	21(9.0)	213(91.0)	234(100)	5.418	0.020
HIV status					
+VE	4 (14.3)	24 (85.7)	28 (100)	0.809	0.368
-VE	19 (9.0)	193(91.0)	212(100)		
Parity					
Primigravida	5(7.7)	60(92.3)	65(100)	0.368	0.544
Multigravida	18(10.3)	157(89.7)	175(100)		

GBS – Group B streptococcus; HIV – Human immunodeficiency virus

Table 3: Associations between GBS Status and Maternal Outcome

Maternal Outcome	GBS +VE Number (%)	GBS-VE Number (%)	TOTAL Number (%)	X^2	P value
Type of delivery					
Vaginal	14 (10.3)	122(89.7)	136 (100)	0.063	0.802
Caesarean	9 (11.4)	70 (88.6)	79 (100)		
Intrapartum Fever					
Yes	5 (45.5)	6 (54.5)	11 (100)		
No	18 (7.9)	210(92.1)	228 (100)	17.021	<0.001

GBS –Group B Streptococcus

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