Group B Streptococcal (GBS) Infections among Infants in Port Harcourt city, Nigeria.

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Abstract: Group B Streptococci (GBS) are among the major causes of Neonatal Sepsis and death in Africa. To unravel the prevalence rates of GBS diseases among infants, and determine the susceptibility rates of GBS isolates to the commonly used antibiotics in Nigeria were the objectives of the study. This study was carried out in some selected and well equipped hospitals in Port Harcourt city, Nigeria. In an eight (8)-month study, GBS were isolated from routine blood and cerebrospinal fluid culture from 145 infants. Results: Out of 94 cases of Early onset Disease (EOD), 11(11.70%) were positive for GBS. Out of 51 cases of late onset Diseases (LOD), 10 were positive for GBS, giving an infection prevalence rate of 19.61% (EOD). Infants within 0 – 6 days, 7 – 10 days, 11 – 15 days, and 16 – 20 days of age showed 16%, 19.23%, 13.04% and 0% prevalence rates of GBS infection respectively. Out of Ten GBS isolates studied for susceptibility to commercially available antibiotics, 100% were resistant to Gentamycin and Streptomycin. The GBS isolates were 70% and 90% susceptible to Chloramphenicol and Ampicillin respectively. The widespread antibiotic resistance among the GBS isolates had led to the recommendation of confirmed chemotherapy and vaccine approach in the war against GBS diseases.

Key word: GBS, Early onset Disease, Late onset Disease, Infants, Antibiotic resistance, Nigeria.

INTRODUCTION

Group B Streptococcus (GBS) has been a leading cause of Neonatal illness and death in many parts of the world, especially in industrialized regions of the world (Isaacs and Royle, 1999; Weisner et al., 2004). Worthy to note is the fact that long before now, GBS infection was not frequently reported in the developing parts of the world including Nigeria among the infants (WHO, 1999).

However, it is worthy to acknowledge that the prevalence of the disease and infant carriage of GBS in developing countries, including tropical Africa, is similar to that identified in populations in United States of America (Saura et al., 1994).

Studies in relatively recent time from South Africa, Kenya, Zimbabwe and Malawi indicate that GBS infection is emerging as an important cause of neonatal sepsis in Africa (Bomela et al., 2001; Madhi et al., 2003; Nathoo and Mason, 19901). In Malawi, a research report documented that out of 801 bacterial isolates from Malawian new born babies, 784 were GBS. GBS is recognized as a major cause of sepsis among new born babies in Blantyre (Milledge et al., 2005).

Group B Streptococcus (GBS) normally live in the intestine, the ear and the vagina (Edward et al., 2005). At least thirty percent (30%) of humans carry GBS without any illness (Edward et al., 2005). In pregnant women, carriage rates range from 30 – 40%. New born babies become infected with GBS in three ways (Edward et al., 2005):

I. Before birth, bacteria in the vagina spread up to the birth canal into the uterus and infect the amniotic fluid surrounding the baby. The baby remains infected by inhaling the infected fluid.
II. During birth by contact with bacteria in the birth canal.
III. After birth by close intimate contact with the mothers.

Most GBS infectious occur in babies less than 3 months of age with an incidence of about 1 case per 100 births (Edward et al., 2005).
There are two (2) major forms of GBS diseases in newborn babies. These diseases are Early Onset Disease (EOD) and Late Onset Disease (LOD). The early onset diseases occurs within the first six days of life, while the later occur between the 7th day of birth and 3 months of age (dAblow et al., 1979; Gray et al., 2007). In both cases, the GBS Diseases manifests signs and symptoms which include; Jaundice, Respiratory distress, anorexia; vomiting, cyanosis, diarrhea, bloody stool, conjunctivitis, and osteomyelitis (Butter and Demoor, 1967; Baker and Edward, 1988).

In Nigeria, research attention on GBS diseases has been towards pregnant women, and pediatric cases of the diseases are rarely reported in Nigeria. The aims and objectives of this study were to unravel the prevalence rates of GBS diseases among infants, and determine the susceptibility rates the GBS isolates to the commonly used antibiotics in Nigeria.

MATERIALS AND METHODS

Study Area:
The study area of this work was Port Harcourt, Nigeria. Port Harcourt is the capital of Rivers State of Nigeria. Port Harcourt is in the Niger Delta region of Nigeria. It is a big city which houses people from different walks of life including Lawyers, Teachers, Farmers, Traders, Students and Pupils etc.

Collection of Samples:
145 cerebrospinal fluid (CFS) and blood samples were obtained from the infants who attended three different Clinics, all in Port Harcourt City, Nigeria. The consent of the mothers of the children was obtained by explaining the aims of the study and the health implications of GBS infection in children/infants. They were asked to fill a questionnaire which contained information such as age of the infant, month of delivery, sex of the infants, early and late onset symptoms, and other relevant data were also obtained from each infant. Mothers who could not read or write nor understand English language were communicated to, through a translator.

CSF and blood samples were taken using sterile specimen bottle. The samples were transported within 1 – 3 hours to the Microbiology Laboratory of Abia State University, Uturu, for bacteriological studies.

Isolation and characterization of Group B Streptococcus (GBS):
Specimens were inoculated aseptically on already prepared sterile nutrient Agar containing Neomycin and Crystal Violet and streaked on the Agar plate using sterile wire loop. The loop was sterilized by flaming it each time.

Each sample was cultured in duplicate. One of the duplicate was inoculated in candle jar to provide 5 – 10% CO₂ inside an anaerobic jar. The other duplicate plates which have been inoculated was inverted upside down and incubated aerobically. Incubation of nutrient Agar plates was done at 37°C ± 2°C for 24 hours. Colonies on both plates were sub culture red to new Blood Agar (Fluka) and incubated for 24 – 48 hours at 37°C ± 2°C under microaerophilic condition.

GBS was identified by Gram reaction, morphology, β-haemolysis on blood agar (α – haemolytic and non haemolytic streptococci were not evaluated), and negative catalase reaction (Gray et al., 2007) Serogrouping of the β- haemolytic Streptococci was performed by using a latex agglutination test (Pro-lab Diagnostics, Wirral, United Kingdom) (Gray et al., 2007).

Antibiotic Susceptibility Studies on GBS Isolates:
The antibiotic susceptibility of the isolates was determined by the disc diffusion method according to the modified Kirby-Bauer technique (CLSI, 2005) (Clinical Laboratory, 2005) on Mueller-Hinton Agar (MHA).

The commercial antibiotic discs used were manufactured by Difco laboratory Ltd, Nigeria. The antibiotics used and their concentration were: Gentamycin (10µg/disc), Streptomycin (30µg/disc), Erythromycin (5µg/disc), Tetracycline (10µg/disc), Penicillin (10µg/disc), Cloxacillin (5µg/disc), Chloramphenicol (30µg/disc), and Ampicillin (10µg/disc).

The inoculum was standardized by adjusting its density to equal the turbidity of a Barium Sulphate (BaSO₄) which is 0.5 McFarland turbidity standard and incubated at 37°C ± 2°C for 18hrs (Dahl et al., 2003) The diameter of the zone of inhibition (including the diameter of the disk) was measured to the nearest whole millimeter and interpretation on the basis of clinical laboratory standard Institute guidelines (CLSI) (Clinical Laboratory, 2005).
Definition of Clinical Cases and Profound Information:
1. Early onset Diseases: GBS diseases which occurred from first minute of birth to 6th day of birth
2. Late onset Diseases: GBS diseases which occurred from the 7th day of birth to 3 months of age.
3. Probable meningitis: no GBS was isolated from blood with no clinical symptom of respiratory diseases.

Table 1: Distribution of GBS infection according to Time of Onset

<table>
<thead>
<tr>
<th>Time of onconset</th>
<th>GBS Disease</th>
<th>Prevalence (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Early Onset (n = 94)</td>
<td>11</td>
<td>11.70</td>
</tr>
<tr>
<td>Late Onset (n = 51)</td>
<td>10</td>
<td>19.61</td>
</tr>
</tbody>
</table>

Table 2: Age distribution of GBS among newborn babies in Port Harcourt, City, Nigeria

<table>
<thead>
<tr>
<th>Age (days)</th>
<th>Prevalence (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 – 6 days (n = 50)</td>
<td>8</td>
</tr>
<tr>
<td>7 – 10 days (n = 50)</td>
<td>10</td>
</tr>
<tr>
<td>11 – 15 days (n = 23)</td>
<td>3</td>
</tr>
<tr>
<td>16 – 20 days (n = 22)</td>
<td>0</td>
</tr>
</tbody>
</table>

Table 3: Antibiogram of Ten (10) isolated of Group B Streptococcus among infants in Port Harcourt City.

<table>
<thead>
<tr>
<th>Antibiotics</th>
<th>Number of isolates tested</th>
<th>Resistance rate (%)</th>
<th>Susceptibility (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gentamycin (10µg/disc)</td>
<td>10</td>
<td>10(100)</td>
<td>-0</td>
</tr>
<tr>
<td>Streptomycin (30µg/disc)</td>
<td>10</td>
<td>10(100)</td>
<td>-0</td>
</tr>
<tr>
<td>Erythromycin (5µg/disc)</td>
<td>10</td>
<td>6(60)</td>
<td>4(40)</td>
</tr>
<tr>
<td>Tetracycline (10µg/disc)</td>
<td>10</td>
<td>7(70)</td>
<td>3(30)</td>
</tr>
<tr>
<td>Penicillin (10µg/disc)</td>
<td>10</td>
<td>8(80)</td>
<td>2(20)</td>
</tr>
<tr>
<td>Cloxacillin (30µg/disc)</td>
<td>10</td>
<td>3(30)</td>
<td>7(70)</td>
</tr>
<tr>
<td>Ampicillin (10µg/disc)</td>
<td>10</td>
<td>1(10)</td>
<td>9(90)</td>
</tr>
</tbody>
</table>

RESULTS AND DISCUSSION

Among the 94 CSF and Blood specimens of Children showing early onset of GBS diseases, 11 were positive for group B Streptococcus (GBS), giving a prevalence rate of 11.70% (Table 1). Out of 51 CSF and Blood specimens of infants showing late onset of GBS Diseases were studied, 10 were positive for GBS. This gives a prevalence rate of 19.61% for late onset Disease (LOD) (Table 1).

According to Age distribution of GBS, out of 50 infants within 0 – 6 days of birth 8 had GBS, giving a prevalence of 16% (Table 2). In addition, out of 50 specimens from infants between 7 – 10 days of age, 10 had GBS, giving a prevalence rate of 19.30% of the 23 infants between 11 – 15 days of age studied, 3 had infection of GBS, giving a prevalence rate of 13.04% (Table 2).

Interestingly, among 22 infants between 16 -20 days of age studied, no single GBS was isolated (Table 2). Ten (10) GBS isolates were randomly selected and tested against Gentamycin, Streptomycin, Erythromycin, Tetracycline, Penicillin, Cloxacillin, Chloramphenicol, and Ampicillin.

Out of the ten(10) GBS isolates tested, 100%, 100%, 40%, 60%, 70%, 80%, and 10% were resistant against Gentamycin, Streptomycin, Erythromycin, Tetracycline, Penicillin, Cloxacillin, Chloramphenicol, and Ampicillin respectively (Table 3). The GBS isolates were 60%, 70% and 90% susceptible to Erythromycin, Chloramphenicol and Ampicillin respectively (Table 3).

Discussion:

This study supports the growing evidence that GBS is an important cause of infectious neonatal illness and death in Africa. The relatively high prevalence rates of early onset diseases (EOD) and late onset Diseases (LOD) support a more active approach for its prevention.

Surveillance for GBS is passive in Nigeria. Only 2 out of 5 children/infants admitted had a blood culture as part of the investigation to track down their illness. This suggests that this study may have under reported the rates of GBS. The relatively high prevalence of EOD to LOD may be as a result of selective sampling of infants with EOD signs and symptoms. This study did not consider the total number of births in the hospitals.

The overall prevalence rate of GBS diseases in Port Harcourt, Nigeria is relatively lower when compared with the prevalence of the diseases in Malawi, Western Europe, United States and Australia (Dahl et al., 2003; Lyytikainen et al., 2003; Gray et al., 2007). Other studies on GBS diseases in East Africa and South Africa...
showed co-relationships between GBS disease and Human Immunodeficiency diseases (French et al., 1998). HIV-infected adult women have defects in the humoral immune responses to polysaccharide antigens. GBS capsular polysaccharides are similar to pneumococcal polysaccharides, and serologic cross-reactivity is recognised (Guttormsen et al., 2007).

In view of this development, HIV-infected women might carry more GBS and might transfer less transplacental protection. Researchers in Nigeria and other parts of the world might direct attention on the co-relationship between HIV infection and GBS disease.

However, if the GBS capsular polysaccharides are similar to pneumococcal capsular antigens, the 9-valent pneumococcal vaccine recommended by Nwachukwu and Orji, might be able to confer herd immunity on the population at risk (Nwachukwu and Orji, 2008). This study discovered that 90% and 70% of the GBS isolates were susceptible to Ampicillin and Chloramphenicol respectively. The 90 % susceptibility of the isolates in this study was surprising as Ampicillin has been much abused in Nigeria, and research reports of methicillin-resistant microbial pathogen is just common.

Nevertheless, GBS isolates studied showed 70% and 80% resistance rates to Penicillin and Cloxacillin respectively. As a result of the widespread report of methicillin resistance in Nigeria, these high resistance rates against Penicillin and Cloxacillin are not surprising. Among the Aminoglycosides used, the GBS organism was 100%, 40%, 60%, and 30% resistant to streptomycin, Erythromycin, Tetracycline, and Chloramphenicol. The implication is that Streptomycin, and Tetracycline may not be good antibiotics of choice against the GBS isolates. In Nigeria, members of the public easily move into pharmacy shops’ to buy antibiotics without prescription. This use of antibiotics is indiscriminate and might account for the high resistance rates observed.

Studies in Malawi had earlier reported that the GBS isolates in the region were 96% susceptible to the β-lactam antimicrobial drugs used (Gray et al., 2007). In addition, it is worthy to recommend that antibiotic susceptibility tests be conducted on all GBS isolates to determine the best drugs/antibiotics of choice.

A vaccine-based strategy would be suitable to combat GBS diseases in Nigeria and other parts of the World. Vaccine-based strategy will be of paramount advantage to developing countries where people get into pharmaceutical shops to purchase antibiotic without prescriptions. This self-chemoprophylaxis leads to strain selection of multi-drug resistant GBS isolates.

Conclusion:

Summarily, this study documented a pattern of neonatal GBS diseases in Port Harcourt City, Nigeria which is slightly similar and slightly different from other studies in other parts of the world. The study identified the problem of drug resistance by the GBS isolates, and recommended laboratory susceptibility testing and vaccine approach against early and late onset diseases.

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REFERENCES


