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Microbial Isolates in Puerperal Sepsis and their *in vitro* Antibiotic Sensitivity in North Eastern Nigeria

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Abstract

Purpose: To determine the microbial isolates and their *in vitro* antibiotic sensitivity in puerperal sepsis.

Methods: Two years records of all requests for endocervical swab microbial culture and antibiotic sensitivity tests for suspected cases of puerperal sepsis at the University of Maiduguri Teaching Hospital, Maiduguri, Borno state and Federal Medical Centre Azare, Bauchi state, both in North-East geopolitical zone of Nigeria were retrieved and analysed using the SPSS statistical package.

Results: One hundred and thirty nine patient's records were analysed. The most frequently cultured organism was *Staphylococcus aureus* in 43/139 (30.9%), followed by *Eschericia coli* which was isolated in 22/139 (15.8%) and *Streptococcus* Species in 8/139 (5.8%). *Pseudomonas* Species was cultured on one occasion only. Mixed growth occurred in 13 specimens (10.8%). In 30 cases (21.6%) there was either no growth (12/139) or the growth was not significant (18/139).

Overall, the isolated micro-organisms had high susceptibility of >93% to Ofloxacin, Ciprofoxacin and cefuroxime while the susceptibility to Gentamycin and Augmentin were 68.8% and 51.6% respectively. In over 80% of the specimen there was marked resistance to Nalidixic Acid, Co-trimoxazole, Ampiclox and Amoxicillin.

Conclusion: *Staphylococcus aureus*, *Escherichia coli* and *Streptococcus* species are the common bacteria isolates in puerperal sepsis in north-eastern, Nigeria and they are highly sensitive to Ofloxacin, Ciprofoxacin and Cefuroxime. Prompt treatment of cases with appropriate antibiotics will go a long way in reducing the associated morbidity and mortality.

Keywords: Puerperal; Sepsis; Endocervical; Swab; Ofloxacin; Ciprofloxacin; Cefuroxime

Introduction

Puerperal sepsis is the third leading cause of maternal death in developing countries and contributes 9.7% of maternal mortality in Africa [1].

In spite of the efforts at reducing maternal mortality such as the Nigerian Safe motherhood initiative and other programmes by various Non Governmental Organisations (NGOs), studies from various Tertiary health centres show a rising trend in maternal mortality across Nigeria [2-5]. While advocacy and campaign on attitudinal change can modify some of the risk factors for developing the disease [6], knowledge of the epidemiology and changing antibiotic sensitivity is necessary for institution of prompt and effective treatment. This is particularly important in areas where the facilities for isolating the causative organisms are either limited or lacking, or the man-power to do so is absent. The objective use of empirical antibiotic coupled with epidemiological data becomes the bedrock of management in such situation or indeed while awaiting sensitivity results. Clearly, aseptic precautions, advances in investigative tools and the guided use of antibiotics have played a major role in reducing the incidence of puerperal infections in developed world[7]. However, the same cannot be claimed for the developing world where the disease is more prevalent.

Puerperal sepsis is commonly caused by bacterial infection. The causative organisms are typically categorized into nosocomial, exogenous and endogenous [7]. Nosocomial infections are acquired in hospitals or other health facilities and may come from the hospital environment or from other patients. Exogenous infections come from external contamination, especially when deliveries take place under unhygienic conditions. Endogenous organisms, consisting of mixed flora colonizing the woman's own genital tract are also a source of infection in puerperal sepsis.

Puerperal sepsis complicates about 0.78% of our deliveries [6] and it is the third leading cause of maternal mortality [5]. The departmental policy requires that all patients with puerperal sepsis be placed on broad spectrum antibiotics empirically and the treatment modified based on the endocervical swab antibiogram. This antibiotic sensitivity test takes 3-5 days and the mortalities from puerperal sepsis often occur within 24-48 hours of admission. It is necessary to know the antibiotic sensitivity pattern of the micro-organisms causing puerperal sepsis for effective management of cases in our environment. The objective of the study was to determine the commonly isolated microorganism from the endocervical swabs of patients with suspected puerperal sepsis and to identify their *in vitro* sensitivity to tested antibiotics at the University of Maiduguri Teaching Hospital, Maiduguri and Federal Medical Centre, Azare.

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Materials and Methods

This study was conducted in the departments of microbiology of two tertiary health facilities: University of Maiduguri Teaching Hospital, Maiduguri, Borno state and Federal Medical Centre Azare, Bauchi state, both in North-East geopolitical zone of Nigeria from January 2009 to December 2010.

Records of all requests for endocervical swab microbial culture and antibiotic sensitivity tests for suspected cases of puerperal sepsis were retrieved and analysed using the SPSS statistical package. Puerperal sepsis was defined in accordance with the World Health Organisation (WHO) criteria for diagnosis of puerperal sepsis [8] and only patients that have met these criteria were selected for the study.

The information collected included the age, nature of the specimen, type and number of bacterial and/or fungi isolated and the spectra of activity to antibacterial agents.

All samples were collected aseptically on to a swab stick and were immediately routinely processed. Microscopy using wet preparation and Germ-tube test were performed to identify Candida Albicans, while the bacteria isolated were characterised by standard protocol as described by Cowan and Steel [9].

Antibiotic sensitivity tests were performed using disc diffusion technique as described by Bauer and Kirby, modified slightly to include multidisks per plate. The multi-antibiotic discs were commercially prepared by Optum laboratory Nigeria Limited. Isolates were considered moderately sensitive, intermediate or resistant [10]. For the purpose of this study, these were considered essentially as sensitive or resistant.

Results

During the study period one hundred and thirty nine endocervical swabs were cultured. Table 1 shows the seven different microorganisms that were isolated (*Staphylococcus aureus*, *Escherichia coli, Streptococcus* spp, *Klebsiella* spp, *Proteus* spp, *Pseudomonas, Candida* spp) in 109 (78.4%) cases, while in 30 cases (21.6%) there was either no growth (12/139) or the growth was not significant (18/139), implying that no pathogen was cultured. The most frequently cultured organism was *Staphylococcus aureus* in 43/139 (30.9%) of cultures followed by *Eschericia coli* which was isolated in 22/139 (15.8%) and *Streptococcus* Species in 8/139 (5.8%). *Pseudomonas* Species was cultured on one occasion only. Mixed growth occurred in 13 specimens (10.8%), 5 contained *Staphylococcus aureus* and *Escherichia coli*, 5 contained *Staphylococcus aureus* and Candida while the remaining cases 3 contained *Escherichia coli* and *Candida.*

Table 2 shows the antibiotic discs used in testing the antibiotic sensitivity. Ofloxacin, Ciprofloxacin, Amoxicillin, Ampiclox, Nalidixic Acid, Streptomycin and Gentamycin were the most frequently tested antibiotics for sensitivity; each was tested for 93 specimens of the 109 (85.3%) that grew organisms on culture. Augmentin and Erythromycin were tested for 90 specimens and Cefuroxime was tested for 62 specimens. Overall, the isolated micro-organisms had high susceptibility of >93% to Ofloxacin, Ciprofoxacin and cefuroxime while the susceptibility to Gentamycin and Augmentin were 68.8% and 51.6% respectively. In over 80% of the specimen there was marked resistance to Nalidixic Acid, Co-trimoxazole, Ampiclox and Amoxicillin.

Table 3 shows the antibiotic sensitivity of the 3 commonly isolated bacteria in the study. *Staphylococcus aureus* maintained high sensitivity to Ofloxacin, Ciprofloxacin and Cefuroxime. The sensitivity

Micro-organism	Frequency	Percentage
1. *Staphylococcus aureus.*	43	30.9
2. *Escherichia coli.*	22	15.8
3. *Streptococcus* species	8	5.8
4. *Klebsiella* species.	4	2.9
5. *Proteus* species	2	1.4
6. *Pseudomonas* species.	1	0.7
7. Candida species.	16	11.5
8. Mixed growth	13	9.4
9. No Isolate	30	21.6
TOTAL	139	100

Table 1: Micro-organism Isolated.

Antibiotics	Sensitivity (%)	Resistance (%)	Total
Ofloxacin	91 (97.8)	2 (2.2)	93
Ciprofloxacin	88 (94.6)	5 (5.4)	93
Amoxicillin	18 (19.4)	75 (80.6)	93
Ampiclox	12 (12.9)	81 (87.1)	93
Nalidixic Acid	2 (2.1)	91 (97.8)	93
Streptomycin	45 (48.4)	48 (51.6)	93
Gentamycin	64 (68.8)	29 (31.2)	93
Augmentin	48 (51.6)	45 (48.4)	90
Erythromycin	56 (60.2)	37 (39.8)	90
Perflacine	79 (94.0)	5 (5.0)	84
Tetracycline	58 (70.7)	24 (29.3)	82
Co-trimoxazole	8 (10.8)	66 (89.2)	74
Cefuroxime	60 (96.8)	2 (3.2)	62

Table 2: Antibiotic sensitivity and resistance of the isolated bacteria.

Antibiotics	*Staphlococcus aureus* N= 53(%)	*Escherichia coli* N= 30(%)	*Streptococcus* N= 8(%)
Ofloxacin	52/53 (98.1)	29/30 (96.7)	8/8 (100)
Ciprofloxacin	51/53 (96.2)	28/30 (93.3)	7/8 (87.5)
Amoxicillin	10/53 (18.9)	4/30 (13.3)	1/8 (12.5)
Ampiclox	12/53 (22.6)	3/30 (10.0)	1/8 (12.5)
Nalidixic Acid	1/53 (1.8)	5/30 (16.7)	0/8 (0.0)
Streptomycin	16/53 (30.2)	12/30 (40.0)	2/8 (25.0)
Gentamycin	34/53 (64.2)	13/30 (43.3)	3/8 (37.5)
Augmentin	21/53 (39.6)	11/30 (36.7)	3/8 (37.5)
Erythromycin	44/53 (83.0)	23/30 (76.7)	4/8 (50.0)
Perflacine	38/50 (76.0)	22/28 (78.6)	4/6 (66.7)
Tetracycline	20/48 (41.7)	8/28 (28.6)	0/8 (0.0)
Co-trimoxazole	5/53 (9.4)	1/30 (3.3)	0/8 (0.0)
Cefuroxime	38/41 (92.7)	20/22 (90.9)	5/6 (83.3)

Table 3: Antibiotic susceptibility of the 3 commonly isolated bacteria.

to Erythromycin rose to 83%, while that of Augmentin dropped to 39.6% and the lowest sensitivity was to Nalidixic acid and Co-trimoxazole. *Eschericia coli* had the lowest sensitivity to Ampiclox and Co-trimoxazole. *Streptococcus* showed highest sensitivity of 100% to Ofloxacin and was completely resistant to Nalidixic acid, tetracycline and Co-trimoxazole.

Discussion

Puerperal sepsis is a preventable cause of maternal mortality that is still prevalent in Nigeria [11]. This may not be unconnected to the poor adherence to asepsis particularly with home deliveries. The recent Nigerian demographic and health survey found a home delivery rate of 62% in north-eastern region [12].

The commonest isolated micro-organism in our study is *Staphyloccus aureus,* and this finding is similar to the findings of Dare

et al. and Akerele in southern, Nigeria [13,14] but contrast with the reports from developed nations [7,15] and some health personals in Enugu, Nigeria [16] who believe that *Streptococcus* is more prevalent. In our study *Streptococcus* Species were the third commonest isolate. *Staphylococcus aureus* may be a contaminant or secondary invader but the former is unlikely because of the aseptic method of specimen collection employed in this study. Reports from the western world showed that puerperal sepsis are generally polymicrobial reflecting vaginal colonisation but only 9.4% of our specimens showed mixed growth. This could be because our specimens were taken from the endocervix and therefore devoid of vaginal contamination. The fewer infective micro-organism may suggest that our patients may be more responsive to antimicrobial agents and therefore a better chance of reducing the scourge of the disease with early commencement of antibiotic therapy.

The high susceptibility (>93%) exhibited by the 3 commonest isolate to Ofloxacin, Ciprofloxacin and Cefuroxime as evidenced by this study means that these antibiotics should be included in choice of regimen for empirical treatment of puerperal sepsis in this region pending the availability of the endocervical swab sensitivity result. While the high resistance to Augumentin and Gentamycin suggest that these antibiotics should only be used based on sensitivity pattern of the infective organism. Cefuroxime, has a broad spectrum antimicrobial activity and because of its safety in breast feeding mothers [17], it can be used for all patients except those with hypersensitivity to the Cephalosporins. Ofloxacin and Ciprofloxacin should be avoided in breast feeding mothers because of the potential for arthropathy and other serious toxicity in the infant [17,18]. Therefore this drug can only be used in non breast feeding mothers. Additionally, the high resistance of the isolated micro-organisms to Ampiclox, Streptomycin, Tetracycline, Co-trimoxazole and Nalidixic acids suggest that these antibiotics may not be used for the treatment of puerperal sepsis for much longer in this region.

The high level of resistance of the isolates to the cheaper and readily available penecillins, beta-lactams, macrolides and aminoglycosides compared to the more expensive quinolones and cephalosporins poses a great therapeutic challenge, as these expensive drugs may not be affordable for most of our patients. The emerging resistance may not be unconnected to the use and often abuse of antimicrobial agents in our communities, as antibiotic policies are non-existent. This underscores the need to develop a regional centre with such capabilities to serve as a source of epidemiological trends to other centres in our environment, especially considering how common the disorder is and its immense contribution to maternal mortality and morbidity.

We recommend the use of Ofloxacin, Ciprofloxacin or Cefuroxime as first line drugs in the treatment of puerperal sepsis while awaiting sensitivity result. A regional laboratory that will regularly review the microbial isolates and their sensitivity pattern will go a long way in reducing the menace of puerperal sepsis in our environment. Also, the provision of antibiotic policy will also reduce the problem drug resistance in the region.

Limitations of this study include its retrospective nature and been a hospital-based study. Some women with the disease may not present to the health facility and the cultured microbes may not reflect the whole spectrum of the causative organism in the community. There is need for a case-control study to determine the whole spectrum of the causative agents.

Conclusion

Staphylococcus aureus, Escherichia coli and *Streptococcus* species are the common bacteria isolates in puerperal sepsis in northeastern, Nigeria and they are highly susceptible to Ofloxacin, Ciprofoxacin and Cefuroxime. Prompt treatment of cases with appropriate antibiotics will go a long way in reducing the associated morbidity and mortality.

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