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Aetiology and Antibiotic Sensitivity Pattern of Ophthalmia Neonatorum in Ebonyi State University Teaching Hospital, Abakaliki

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Summary

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Background: Ophthalmia neonatorum (ON), a major cause of blindness in neonates, may be septic or aseptic. Its infective causes have shown changing patterns over time and in different centres worldwide. In view of the paucity of information on various aspects of ON in our environment, we decided to study its aetiological factors and antibiotic sensitivity pattern of the causative organisms at Ebonyi State University Teaching Hospital (EBSUTH), Abakaliki, South-Eastern Nigeria.

Method: This was a retrospective review of the case notes and bacteriological culture results of all cases of ophthalmia neonatorum seen over a five-year period, June 2003-June 2008, in EBSUTH, Abakaliki.

Results: Forty neonates out of 8509 live births, had ophthalmia neonatorum during the study period, giving an incidence of 4.7/1000 live births. Twenty two (55 percent) were males while 18 (45 percent) were females. Thirty three (82.5 percent) neonates presented with symptoms within seven days of life. Results of eye swab cultures were retrieved in 33 cases (82.5 percent), of which 24 (72.7 percent) yielded growth and nine (27.3 percent), no growth. Six bacterial genera were isolated, of which *Staphylococcus aureus* in 14 (42.4 percent) patients was the most prevalent followed by Pseudomonas spp in four (12.1 percent) and *Escherichia coli* in two others (6.1 percent). Fifteen (62.5 percent) of the 24 isolates were sensitive to gentamicin, 10 (41.7 percent) to ciprofloxacin, and eight (33.3 percent) to ofloxacin.

Conclusion: *Staphylococcus aureus* was the predominant infective cause of ophthalmia neonatorum in EBSUTH, Abakaliki and gentamicin was the drug to which most of the causative organisms, including *Staphylococcus aureus* were sensitive. Therefore, we recommend gentamicin eye drops as the preferred empirical antibiotic.

Introduction

OPHTHALMIA neonatorum (ON) is defined as conjunctivitis in the first 28 days of life.[1,2] It could be septic or aseptic, but most commonly infective and was once a major cause of neonatal blindness.[1] It presents with purulent discharge from the eyes, usually bilateral and associated with chemosis, marked hyperemia and lid oedema. If left untreated, it can lead to blindness through corneal ulcerations and scarifications.[1,2] The frequency of ON is said to be directly related to the prevalence of maternal genital infection with the infecting organisms and inversely related to the practice of ocular application of prophylactic agents.[1,2] Studies done in Mount Sinai Hospital (MSH), United States showed an incidence of 3.1 per 1000 live births,[3] but in Kenya, an incidence of 23.2 per 1000 live birth was reported.[4] A previous Nigerian study in Benin, reported a low incidence of 8.9 per 1000 live births, in spite of the fact that ocular prophylaxis was not practised.[5]

Aetiological agents in ON include *Neisseria gonorrhoeae, Chlamydia trachomatis, Staphylococcus aureus,*

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Pseudomonas aeruginosa, Escherichia coli, Haemophilus influenza, among others.[1-5] *Neisseria gonorrhoeae* is an important aetiological agent in ON because of its capacity to damage vision.[1] It accounted for up to 3.1 percent of all ON recorded in a study from MSH[3] and 1.7 percent in the study from Benin.[5] Equally significant is *Chlamydia trachomatis* which has been reported as being responsible for 50 percent and 28.5 percent respectively, of cases seen in two different studies in the USA.[6] In a review of ON in developing countries by Forster and Klauss,[7] the organism was reported to be the most common non-gonococcal cause of ON. Previous studies carried out in Nigeria did not report chlamydia as one of the aetiological agents of ON.[5,8] With the introduction of ocular prophylaxis, the incidence of gonococcal and chlamydia ophthalmia has been on the downward trend.[1,2] Recent studies suggest that *Staphylococcal aureus* appears to be an increasingly common causative agent of ON. It accounted for 60.5 percent of cases seen in Benin[4] and 30 percent of cases seen in MSH.[3]

As the clinical presentation of ON is not diagnostic of the particular aetiological agent, microbiological work up is mandatory for all cases and the selection of definitive therapy must be based on the sensitivity reports from the laboratories.[1,2] In developing countries like Nigeria where laboratory facilities are in short supply, there is need to conduct periodic audits of the aetiological agents and antibiotic sensitivity patterns of ON in order to determine empirical antibiotics for therapeutic management.

The purpose of this study was to determine the aetiological agents of ON, and the antibiotic sensitivity pattern of the causative agents as seen at the Ebonyi State University Teaching Hospital, Abakaliki, South Eastern Nigeria in the past five years, as a guide in the management of this condition and the development of preventive policies.

Subjects and Methods

The case files of all neonates (0-28 days) delivered at, or presenting to EBSUTH, a tertiary hospital in Abakaliki, South Eastern Nigeria from June 2003 to June 2008 that were diagnosed with conjunctivitis or ophthalmia neonatorum (ON), were reviewed. The diagnosis of ON was based on the presence of eye discharge in one or both eyes, and redness of the eyes with or without positive swab cultures.[1,2]

Eye swabs were obtained by the attending physicians and immediately sent to the laboratory. One swab was collected for each patient even in cases of bilateral eye discharges. In the laboratory, each swab was immediately inoculated into blood, chocolate and MacConkey agar plates, after which a portion was gram stained. The blood and chocolate agar plates were inoculated in duplicates. Each respective pair and MacConkey agar plates were incubated aerobically, while the other pair was incubated overnight under increased CO_2 atmosphere at 37° C. The isolates were identified using standard bacteriological methods and the antimicrobial sensitivity pattern determined by using the Stroke's disc diffusion method. Focus was on the antibiotics that produced zones of inhibition of 11mm in diameter and above when tested against the isolates individually. The isolated organisms as well as their sensitivity patterns were noted, with emphasis on the most and least sensitive drugs.

Ocular prophylaxis is not yet a routine in our centre and as such, none of the babies received any prophylactic medication. All infants received empirical treatment consisting of chloramphenicol or gentamicin eye drops, and in some, this was combined with systemic ampicillin and/or gentamicin. Thereafter, definitive therapy was made based on the sensitivity reports from the laboratory. Other supportive measures were introduced as and when indicated.

Data collected from the case files included age, sex, presence or absence of fever, incubation period, the eye(s) involved, culture results and antibiotic sensitivity test. Statistical analysis was done using simple statistical methods.

Results

Forty neonates out of 8509 live births were diagnosed with ophthalmia neonatorum during the study period giving an incidence of 4.7/1000 live births and an average of eight cases per year. The cumulative monthly distribution shows that 19 (47.5 percent) cases presented between April and June compared to 21 (52.5 percent) cases that presented between July and March. Thirteen neonates (32.5 percent) had co-morbid conditions including congenital malaria in five (12.5 percent), septicaemia in five (12.5 percent), neonatal jaundice in four (10.0 percent), and birth asphyxia in one (2.5 percent); two children had multiple co-morbidities. The mean age of the subjects at presentation was 4.56 days $\pm$ 5.22, the mean birth weight was 2.64 kg $\pm$ 0.87 and the mean gestational age was 36.16 weeks $\pm$ 3.67.

Table I highlights some clinical characteristics of the study population. Twenty two (55 percent) were males, while 18 (45 percent) were females, a M:F ratio of 1.2:1. Thirty three (82.5 percent) neonates presented with symptoms within seven days of life; this number included 15 (37.5 percent) who presented in the first two days. Thirty three (82.5 percent) were delivered vaginally, and both eyes were involved in 35 (87.5 percent) of the 40 neonates.

Table I

Clinical Characteristics of 40 Neonates with Ophthalmia Neonatorum

Characteristic	*No of Cases (n=40)*	*Percent of Total*
Age at onset		
≤2 days	15	37.5
3-7 days	18	45
≥7 days	6	15
Not known	1	2.5
Sex		
M	22	55
F	18	45
Route of delivery		
Vaginal	33	82.5
Caesarean Section	7	17.5
Maternal Booking Status		
Booked	14	35
Unbooked	8	20
Not known	18	45
Eye involved		
Both	35	87.5
Right	2	5.0
Left	1	2.5
Not known	2	5.0
Fever		
Present	11	27.5
Absent	29	72.5

Results of eye swab cultures were retrieved in 33 (82.5 percent) of the 40 cases (Table II). Twenty four (72.7 percent) of the 33 eye swabs yielded growths, while no organism was cultured in nine cases (27.3 percent). Six bacterial genera were isolated, of which *Staphylococcus aureus* in 14 (42.4 percent) of the 33 cases swabbed, was the most prevalent, followed by *Pseudomonas spp* in four (12.1 percent).

The antibiotic sensitivity patterns of the cultured bacteria are highlighted in Table III. Fifteen (62.5 percent) of the 24 isolates were sensitive to gentamicin, 10 (41.6 percent) to ciprofloxacin and eight (33.3 percent) to ofloxacin. *Staphylococcus aureus* alone, was sensitive to gentamicin in six (42.8 percent)

Table II

Bacterial Isolates in 33 Cases of Ophthalmia Neonatorum

Bacteria	*No of Isolates*	*Percent*
Staph aureus	14	42.4
Pseudomonas spp	4	12.1
â haemolytic strept	2	6.1
E coli	2	6.1
Klebsiella spp	1	3.0
Streptococcus spp	1	3.0
No growth	9	27.3
Total	33	100

Note: Results of cultures were not available in seven cases

Table III

Antibiotic Sensitivity of Bacterial Isolates in Ophthalmia Neonatorum

Organism	*No of Isolates*	*Gent (percent)*	*Cefur (percent)*	*Pefla (percent)*	*Ceftr (percent)*	*Eryth (percent)*	*Ofla (percent)*	*Cipro (percent)*	*Cefta (percent)*
Staph aureus	14	6(42.8)	2(14.3)	2(14.3)	2(14.3)	2(14.3)	3(21.3)	3(21.3)	1(7.1)
Pseudomonas	4	4(100.0)	0(0.0)	2(50.0)	0(0.0)	0(0.0)	3(75.0)	4(100.0)	0(0.0)
E. Coli	2	2(100.0)	1(50.0)	0(0.0)	1(50.0)	0(0.0)	1(50.0)	2(100.0)	1(50.0)
ß haem. strept	2	2(100.0)	0(0.0)	0(0.0)	0(0.0)	0(0.0)	0(0.0)	0(0.0)	1(50.0)
Klebsiella spp	1	0(0.0)	0(0.0)	0(0.0)	1(100.0)	0(0.0)	0(0.0)	1(100.0)	0(0.0)
Strept spp	1	1(100.0)	1(100.0)	0(0.0)	1(100.0)	1(100.0)	0(0.0)	0(0.0)	0(0.0)
Total	24	15(62.5)	4(16.7)	4(16.7)	5(20.5)	3(12.5)	8(33.3)	10(41.6)	3(12.5)

Gent = gentamicin, Cefur = cefuroxime, Perfla = perflacine, Ceftr = ceftriaxone,

Eryth = erythromycin, Ofla= oflaxocin, Cipro = ciprofloxacin, Cefta = ceftazidime

of 14 cultures while it was resistantto all tested antibiotics in four (28.6 percent).

Discussion

The incidence of ophthalmia neonatorum in this study was lower than the 8.9 per 1000 live births reported from Benin.[5] Some cases of ophthalmia neonatorum most probably escaped detection because of the mild nature of the process and it is also possible that neonates born in our hospital presented elsewhere. This is however balanced by the children who were delivered elsewhere but presented in our institution. Therefore, this series was probably a fairly reliable representation of the incidence of ophthalmia neonatorum in Ebonyi State University Teaching Hospital. The reason for this low value is not clear especially as ocular prophylaxis was not practised in this centre. There is a need to conduct further studies on the epidemiology of sexually transmitted diseases in EBSUTH, in order to determine if this finding is reflective of a low incidence of sexually transmitted diseases in EBSUTH. Unlike the New York study[3] where no seasonal variation was noticed, a significant peak was noted between April and June, the peak of the rainy season in this study. The reason for this is not clear and should elicit further research.

The most common isolate in this study was *Staphylococcus aureus* followed by *Pseudomonas spp* and *Beta haemolytic streptococcus*. This is similar to the finding of Iyamu and Enabulele[5] in Benin City where *Staphylococcus aureus* was also the most prevalent organism, accounting for 62.5 percent of the cases, and to findings from recent studies in USA,[3] UAE[9] and Nigeria[8] that showed *Staphylococcus aureus* as being the most common organism causing ON, accounting for 30 to 59 percent of all isolates. While *Neisseria gonorrhoeae* and *Chlamydia trachomatis* were not isolated in this study, and Ibhanesebhor and Otobo[8] did not isolate either organism in their studies, Iyamu and Enabulele[5] reported that *Neisseria gonorrhoeae* accounted for 1.7 percent of their cases. The significance of this finding in this study centre is limited by the absence of facilities to isolate *Chlamydia trachomatis*.

The high incidence of sterile cultures may be due to a variety of reasons. There may have been pre-presentation antibiotic use as access to drugs, prescribed or otherwise, is unrestricted in the country.[10] The other probable reason could be that in the absence of specialized isolation techniques, there might have been cases of *Chlamydia trachomatis* or other fastidious organisms which could not be isolated due to lack of adequate facilities locally. This high incidence of sterile cultures could be reduced by the use of improved diagnostic techniques, including the use of newer methods that do not necessarily require the presence of live pathogens.

Antibiotic sensitivity pattern revealed that gentamicin was the drug to which the highest percentage (62.5 percent) of all the isolated organisms were sensitive, including 42.8 percent of *Staphylococcus aureus*. Ibhanesebhor and Otobo[8] in Benin City, reported a similar high sensitivity of both *Staphylococcus aureus* (100 percent) and *coliforms* (42 percent) to gentamicin. In contrast, Iyamu and Enabulele[5] also working in the same centre, reported that *Staphylococcus aureus* showed 62.5 percent susceptibility to erythromycin. The problem of antibiotic abuse has led to increasing resistance of bacterial organisms to commonly used

antibiotics as highlighted by the resistance of 29 percent of *Staphylococcus aureus* to all tested antibiotics. In conclusion, *Staphylococcus aureus* was the predominant infective cause of ophthalmia neonatorum in EBSUTH, Abakaliki and gentamicin was the drug to which the organisms isolated were most sensitive. It is therefore the preferred empirical antibiotic and should be given as eye drops.

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