# Mohammed A Asani M Ibrahim M

# Bacterial agents and sensitivity pattern of neonatal conjuctivitis in Aminu Kano Teaching Hospital

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Mohammed A ( ( A sani M, Ibrahim M Department of Paediatrics, Aminu Kano Teaching Hospital, Kano Nigeria. E-mail: muhdpaed@yahoo.com Abstract Introduction: In Africa alone, between 1000 – 4000 children are blinded annually by conjunctivitis. In view of the changing aetiological agents documented in other parts of the world and evolving resistance of infective agents to therapeutic agents, the present study was designed to define the bacterial agents, their antibiotic sensitivity pattern seen in AKTH, Kano, Nigeria.

Patients and methods: This was a cross sectional prospective study done over a period of 3 months. Consecutive neonates who satisfied the inclusion criteria were recruited until the sample size of 175 was obtained. samples were transported to the laboratory within one hour. Gram staining and antibiotic sensitivity were determined using standard

#### technique.

*Results:* The mean age at presentation was  $5.7 \pm 4.6$ days. Results of the eye swabs showed that 97 (55.4%) were bacteriologically positive while 78 (44.6%) yielded no growth. *Staphylococcus aureus* was the most frequently isolated organism and was most sensitive to ceftriaxone, (73.1%). *Escherichia coli* was most sensitive to gentamicin (78.3%). *Pseudomonas aeruginosa* and *Neisseria gonorrhea* showed 100% sensitivity to ceftazidime and ceftriaxone respectively.

*Conclusion:* Staphylococcus aureus is the commonest bacterial agent responsible for neonatal conjunctivitis. *Staphylococcus aureus* was most sensitive to ceftriaxone.

**Key words:** Conjuctivitis, Neonates, Bacteria, Sensitivity.

#### Introduction

Neonatal conjunctivitis was originally described in 1750 by Quellmaz.<sup>1</sup> It is one of the most common infections occurring in the first month of life and remains an important cause of ocular morbidity of great health concern<sup>2</sup>. Faal<sup>3</sup> noted that there were an estimated one and a half million blind children in the world in 1992 and every year about half a million more became blind. Neonatal conjunctivitis was responsible for blindness in the majority of these children in countries of Asia and Africa and.<sup>3</sup> In Africa between 1000 – 4000 children suffer blindness annually as a consequence of conjunctivitis.<sup>4</sup>

The major causes of neonatal conjunctivitis are, in decreasing order of frequency, chemical inflammation, bacterial infections and viral infections while bacteria are the major causes of infectious neonatal conjunctivitis.<sup>5</sup> The bacterial causes include sexually transmitted disease agents (Chlamvdia trachomatis and Neisseria gonorrhoea), microorganisms from the skin (Staphylococcus aureus) and the mother's gastrointestinal tract (Pseudomonas spp and Escherichia coli) and Haemophilus influenzae among others. Neisseria gonorrhoea is an important aetiological agent of neonatal conjunctivitis because of its potential damage to vision.<sup>6</sup> It accounts for up to 1.7% of all neonatal conjunctivitis recorded in the study from Benin, Nigeria.<sup>7</sup> However the introduction of prophylactic measures has led to a decrease in the incidence of gonococcal and chlamydial neonatal conjunctivitis.<sup>8</sup> Recent studies show that Staphylococcus aureus appears to be increasingly a common causative agent of neonatal conjunctivitis. It accounted for 60.5% of cases seen in Benin,<sup>7</sup> and 42.4% of cases seen in Abakaliki<sup>6</sup> both in Nigeria.

In view of the changing aetiological agents documented in Nigeria and other parts of the world as well as evolving resistance of infective agents to routinely used therapeutic agents and the paucity of information on neonatal conjunctivitis in Nigeria, the present study was designed to identify the bacterial agents, their antibiotic sensitivity pattern and ocular clinical presentation of neonatal conjunctivitis among newborn babies seen in AKTH.

### Subjects and methods

This was a cross sectional, prospective study in which subjects were recruited over a period of three months (April to June 2010). Approval was obtained from the Ethics Committee of Aminu Kano Teaching Hospital and informed and written consent of the primary care givers of subjects were obtained. Aminu Kano Teaching Hospital (AKTH) is located in Kano metropolis. It is a tertiary centre with a bed capacity of 500. The catchment areas of the hospital include Jigawa, Bauchi, Katsina and Yobe states. The paediatric department of the hospital consists of five units; the Special Care Baby Unit, the Emergency Paediatric Unit, Paeditric Medical Ward, Paediatric Outpatient Unit and Paediatric Specialty Clinic. The SCBU is located adjacent to labour room and it consists of the inborn unit for neonates delivered in the hospital and out born unit for neonates delivered outside the hospital who require hospitalization.

Consecutive neonates who satisfied the inclusion criteria were recruited from the Special Care Baby Unit, the post natal ward and paediatric outpatient unit of the hospital until the desired sample size of 175 was obtained. The sample size was determined based on the highest prevalence of positive bacterial isolates of 13.15% reported from Ilorin.<sup>2</sup> Inclusion criteria were: all babies within the age of 0 –28 days presenting at Special Care Baby Unit, paediatric outpatient unit, the postnatal ward and labour ward with discharge from one or both eyes.

Relevant information was collected using a pre-tested questionnaire administered to caregivers in interview sessions. Birth weight was recorded for all inborn babies and for those delivered in other hospitals where the information was available. For those without birth records the weight and age at presentation were determined.

Physical examination was conducted on all study subjects and the severity of the conjunctivitis was scored in each case using the method described by Christian.<sup>9</sup> Scores were awarded as 1+, 2+ and 3+ for mild, moderate and severe cases respectively. Conjunctival swabs were collected from the eyes of the subjects with the aid of sterile swab sticks and samples were then immersed in the broth in universal bottles and transported to the laboratory within 30 minutes to one hour. The broth consists of peptone, Beef extracts and sodium chloride which serve as nutrient for the pathologic organisms.

Smears of the specimens were made on glass slides and

fixed using heat and alcohol. Gram staining of the slides was carried out using standard techniques. The swabs were also inoculated on the chocolate agar plates and were incubated for 24-48 hours at 37°C. Aerobic isolates were identified by the standard methods of Cowan (1974).<sup>10</sup> Anaerobes were not studied due to lack of facilities. Antibiotic sensitivity of the isolates was determined using standard disc diffusion technique.<sup>11</sup> However antibiotic sensitivity for *Chlamydia* was not done due to lack of facilities. Diagnosis of chlamydial infection was done through detection of Chlamydial antigens using a rapid immunochromatographic technique (ICT). After collection of specimens, patients were managed in accordance with standard departmental guidelines.

The data generated were entered into a Microsoft Excel spreadsheet and analyzed using EPI INFO version 3.5.1 2002. Continuous variables were summarized using means, medians, and ranges as appropriate. Frequency tables were generated and cross-tabulations to observe the relationship between categorical variables were done. Proportions were compared using Chi-square test of significance. A probability (p-value) of less than 0.05 was considered statistically significant.

#### Results

A total of one hundred and seventy five (175) neonates that met the study criteria were studied. The age range of subjects at presentation was 1-24 days with the mean of  $5.7 \pm 4.6$  days. Ninety one (52.0%) neonates were males while eighty four (48%) were females with a male: female ratio of 1.1:1. A total of 1602 neonates were seen in AKTH during the study period thus giving an incidence of neonatal conjunctivitis of 60.5 per 1000 live births in this study.

<b>Table 1:</b> Distribution of age at onset of conjunctivitis							
Age in	Total Number	Male	Sex %	0/2			
uays#	Number	wint	/0	Temale	/0		
0 - 2	82	47	26.8	35	20		
3 – 5	76	39	22.3	37	21.1		
6 – 14	10	5	2.9	5	2.9		
>14	7	-	-	7	4.0		
Total	175	91	52	84	48		

# The unequal age intervals were used to reflect the incubation periods of common aetiologic agents of neonatal conjunctivitis.

Table 2: shows the bacterial agents isolated in neonates with conjunctivitis. Results of the eye swabs showed that 97 (55.4%) were bacteriologically positive while 78 (44.6%) yielded no growth. Six bacterial genera were isolated, of which *Staphylococcus aureus* was the most frequently isolated organism. *Klebsiella species* and *Neisseria gonorrhoea* were the least isolated organisms accounting for 1.7% each.

 Table 2:
 Bacterial isolates and Chlamydia antigen positivity in neonates with conjunctivitis.

Bacteria isolated	Frequency	Percent of total
Staphylococcus aureus	52	29.7
Escherichia coli	23	13.1
Pseudomonas aeruginosa	11	6.3
Chlamydia trachomatis	5	2.9
Klebsiella spp	3	1.7
Neisseria gonorrhoea	3	1.7
No growth	78	44.6
Total	175	100

Antibiotic sensitivity of bacterial agents isolated

The sensitivity of 92 bacterial agents isolated was tested. Staphylococcus aureus was most sensitive to ceftriaxone, recorded in 38 cases (73.1%), followed by gentamicin and ceftazidime in 32 cases (61.5%) and 30 (57.7%) cases each. *Escherichia coli* was most sensitive to gentamicin observed in 18 (78.3%) cases, followed by ceftazidime, ceftriaxone and ofloxacin with 17 (73.9%), 15 (65.1%) and 12 (52.2%) cases respectively.

Sensitivity of *Neisseria gonorrhoea* to ceftriaxone was demonstrated in all the 3 (100%) cases but it was resistant to ceftazidime, erythromycin, ofloxacin, ciprofloxacin, augmentin and amoxicillin.

Table 3: Antibiotic sensitivity pattern of bacterial isolates seen in neonatal conjunctivitis											
	Antibiotic	s									
Organisms	No of	AMX	AUG	CPF	CTR	OFL	ERY	GEN	CTZ	CPC	LEV
6	isolates										
SA	52	3(5.8)	11(21.1)	11(21.1)	38(73.1)	11(21.1)	10(10.9)	32(61.5)	30(57.7)	20(38.5)	8(15.4)
ECO	23	1(4.3)	1(4.3)	10(43.5)	15(65.2)	12(52.2)	-	18(78.3)	17(73.9)	3(13.0)	4(17.4)
CHL	5	NT	NT	NT	NT	NT	NT	NT	NT	NT	NT
PSEUD	11	-	-	-	4(36.4)	-	-	4(36.4)	11(100)	5(45.5)	2(18.2)
KLEB	3	-	1(33.3)	1(33.3)	1(33.3)	-	-	1(33.3)	2(66.7)	-	-
NEISS	3	-	-	-	3(100)	-	-	1(33.3)	-	1(33.3)	1 (33.3)
Total	07	4(4.2)	14(15.2)	22(22.0)	61(66.2)	22(25.0)	10(10.0)	56(60.0)	60(65.2)	20(21.5)	15(16.2)
10181	91	4(4.3)	14(15.2)	22(23.9)	01(00.5)	23(25.0)	10(10.9)	50(00.9)	00(05.2)	29(31.3)	13(10.3)

AMX=Amoxicillin AUG=Augmentin ERY=Erythromycin GEN=Gentamicin CPC=Chloramphenicol CTZ=Ceftazidime OFL = Ofloxacin NT= Not tested

LEV=Levofloxacin CPF=Ciprofloxacin CTR=Ceftriaxone ns=number sensitiveNT = Not tested

#### Discussion

The mean age at presentation of 5.7 days of the neonates with neonatal conjunctivitis in this study is similar to 4.6 days observed in Abakaliki, Nigeria, by Ibekwe.<sup>6</sup> It is however lower than 12.9 days documented by Ugbode<sup>13</sup> from Zaria (Nigeria). On the other hand, it is slightly higher than five days obtained by Abdulkadir<sup>14</sup> in a later Zaria study in 2008. The incubation period of the predominant aetiological agent in a locality may partly explain the difference in age at presentation.

The male to female ratio in the current study of 1.1:1 is similar to the 1.2:1 ratio recorded by Ibekwe<sup>6</sup> from Abakaliki but differs from that of Olatunji<sup>13</sup> and Mohile et al <sup>15</sup> who documented a male: female ratio of 1:1.5. It is however lower than the ratio of 1.5:1 recorded by Ugbode<sup>12</sup> from Zaria, Nigeria. Males have approximately twofold higher incidence of sepsis than females suggesting the possibility of a sex-linked factor in host susceptibility to infection.<sup>16</sup> *Staphylococcus aureus* was the most commonly isolated bacterium in this study. This was in keeping with the findings of Ugbode<sup>12</sup> in Zaria as well as Iyamu and Enabule<sup>7</sup> in Benin City. However, it differed from that of Ernest<sup>2</sup> who recorded *Chlamydia trachomatis* as the predominant organism of neonatal conjunctivitis in Ilorin.

The predominance of *Staphylococcus aureus* in this study may suggest that most of the cases of neonatal conjunctivitis were postnatally acquired rather than during passage through the birth canal. Ibrahim et al<sup>17</sup> in Kano also reported *S. aureus* as the dominant isolate (42.1%) among neonates from a study of bacteramia among febrile children aged 0-14 years conducted over a period of one year. Virulence factors possessed by *S. aureus* make it to be the commonest agent of infection in children including neonates.<sup>18</sup>

The positive isolate rate of (13.1%) for *Escherichia coli* in neonatal conjunctivitis found in this study is comparable to the report by Kolade<sup>19</sup> and Iyamu et al<sup>7</sup> from Ilorin and Benin who found positive isolate rate of 10.08% and 12.5% for *E. coli* respectively. It is however higher than 6.1% reported by Ibekwe et al.<sup>6</sup> A low rate of *Neisseria gonorrhoea* (1.7%) neonatal conjunctivitis was found in this study. This is similar to 1.6% positive isolate rate recorded by Iyamu<sup>7</sup> from Benin but higher than 0.84% rate reported by Kolade<sup>19</sup> from Ilorin\_It may be suggested that the low rate *N. gonorrhoea* obtained in this study may be due to availability of health facilities and improved health habits. It may also be due to fastidious nature of *N. gonorrhea* 

*Staphylococcus aureus* showed a good sensitivity to ceftriaxone (73.1%) and ceftazidime (57.7%). This finding is in keeping with that by Schobers.<sup>21</sup> The sensitivity rate of *Staphylococcus aureus* to gentamicin in this study (61.5%) is lower than the findings of Kolade<sup>20</sup> and

Onile et al<sup>22</sup> who reported much higher sensitivities of 89.29% and 100% respectively. It is however higher than 42.8% reported by Ibekwe<sup>6</sup> from Abakaliki. The relatively high sensitivity of *Staphylococcus aureus* to ceftriaxone, ceftazidime and gentamicin could be explained by low potential for abuse as these drugs are present only in injectable and topical forms.

*Escherichia coli* showed a high sensitivity of 78.3% to gentamicin which is however, lower than the 100% reported by Ibekwe et al.<sup>6</sup> The sensitivity of *Escherichia coli* to ceftazidime(73.9%) and ceftriaxone(65.2%) is similar to the report of Kolade.<sup>19</sup> *Neisseria gonorrhoea* was highly sensitive to ceftriaxone (100%). The higher sensitivity of E. coli to these antibiotics may be due to the fact that they are present only in injectable forms, hence not commonly abused, thus less likelyhood of resistance.

## Conclusion

*Staphylococcus aureus* and *Escherichia coli* are the commonest bacterial agents responsible for neonatal conjunctivitis in Aminu Kano Teaching Hospital. We therefore, recommend the use of Ceftriaxone and topical Gentamycin to treat neonatal conjunctivitis in Kano.Periodic survey should also be carried out to identify any change in the aetiological agents of neonatal conjunctivitis so as to guide modification in the treatment plan of the disease.

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